MAHATHMA GANDHI UNIVERSITY

KOTTAYAM

BOARD OF STUDIES IN MATHEMATICS (UG)

CURRICULAM

FOR

B.Sc MATHEMATICS MODEL I

B.Sc MATHEMATICS MODEL II

AND

MATHEMATICS COMPLEMENTARY COURSES

UNDER

CHOICE BASED CREDIT SYSTEM (UGCBCS 2016)

(Effective from 2016 admission onwards)

CONTENTS

MAHATHMA GANDHI UNIVERSITY KOTTAYAM

Board of Studies in Mathematics (U G)

Chairman

Prof. P. J. Joy, Associate Professor & HOD, K. E . College, Mannanam

Mobile No. 9446196156, e-mail: pjjoyalways@gmail.com

Members

1. **Dr. Mathew M. George, Associate Professor & Principal , B A M College, Thuruthikad.**
2. **Prof. Sony Sebastian.T, Associate Professor & HOD, Nirmala College, Muvattupuzha.**
3. **Prof. W. T. Paul, Associate Professor, S H College, Thevara.**
4. **Dr. V. K. Jose, Associate Professor, St. Thomas College, Pala.**
5. **Dr. Paul Issac, Associate Professor, Bharata Matha College, Thrikkakara.**
6. **Dr. Rajesh K. Thumbakara, Assistant Professor, M A College, Kothamangalam**
7. **Prof. Raju Varghese, Associate Professor, Catholicate College, Pathanamthitta.**
8. **Dr. Jayaprasad, Principal, Sreekrishna College, Guruvayur.**
9. **Dr. Eswaran Namboothiri, Associate Professor, Govt. College, Kasaragod.**
10. **Prof. Deepthy Sreedhar, Associate Professor, N S S College, Changanassery**

B.Sc
MATHEMATICS
MODEL - I

B.Sc MATHEMATICS MODEL I

MAHATHMA GANDHI UNIVERSITY, KOTTAYAM

B.Sc MATHEMATICS

UNDER

CHOICE BASED CREDIT SYSTEM (UGCBCS 2016)

(Effective from 2016 admission onwards)

The courses for the UG Programme are framed using time tested and internationally popular text books so that the courses are at par with the courses offered by any other reputed university around the world.

Only those concepts that can be introduced at the UG level are selected and instead of cramming the course with too many ideas the stress is given in doing the selected concepts rigorously. The idea is to make learning mathematics meaningful and an enjoyable activity rather than acquiring manipulative skills and reducing the whole thing an exercise in using thumb rules.

As learning Mathematics is doing Mathematics, to this end, some activities are prescribed to increase students' participation in learning.

Every student has to do a project during 6^{th} semester. The topics for the project can be selected as early as the beginning of the 4^{th} semester.

Course Structure:

The U.G. Programme in Mathematics must include (a) Common courses, (b) Core courses, (c) Complementary Courses, (d) Generic Elective courses (e) Choice based courses (f) Project and no course shall carry more than 4 credits.

Courses:

The number of Courses for the restricted programme should contain 12 core courses, 1 Generic Elective course, 1 choice based course and 8 complementary courses. There should be

10 common courses, or otherwise specified, which includes the first and second language of study.

Objectives :

The syllabi are framed in such a way that it bridges the gap between the plus two and post graduate levels of Mathematics by providing a more complete and logic frame work in almost all areas of basic Mathematics.

By the end of the second semester, the students should have attained a foundation in basic Mathematics and other relevant subjects to complement the core for their future courses.

By the end of the fourth semester, the students should have been introduced to powerful tools for tackling a wide range of topics in Calculus, Theory of Equations and Geometry. They should have been familiar with additional relevant mathematical techniques and other relevant subjects to complement the core.

By the end of sixth semester, the students should have covered a range of topics in almost all areas of Mathematics, and had experience of independent works such as project, seminar etc.

B.Sc Programme in Mathematics (Core Courses):

The following table shows the structure of the programme which indicates the title of the courses, instructional hours, credits, university examination style and the components for internal and external evaluation.

CURRICULUM FOR B.Sc MATHEMATICS MODEL I

(UGCBCS 2016)

Course Structure

Total Credits :-120 (Eng:22+S.Lang:16+Complementary:28+Generic:3+Core:51)

Total hours :-150(Eng:28+S.Lang:18+Complementary:36+Generic:3+Core:65)

Sl: No	Semester	Papers	Hours	Credits	Internal Marks	External Marks	Total Marks
1	I	English I	**5**	**4**	**20**	**80**	**100**
		English /Common course I	**4**	**3**	**20**	**80**	**100**
		Second Language I	**4**	**4**	**20**	**80**	**100**
		Mathematics Core Course - 1	**4**	**3**	**20**	**80**	**100**
		Complimentary1 Course - 1 (Statistics)	**4**	**3**	**20**	**80**	**100**
		Complimentary 2 Course – 1 (Physics Theory/ Computer)	**2 (T)**	**2**	**10**	**60**	**70**
			2 (P)	**0**			
	Total		**25**	**19**			**570**
2	II	English II	**5**	**4**	**20**	**80**	**100**
		English /Common course II	**4**	**3**	**20**	**80**	**100**
		Second Language II	**4**	**4**	**20**	**80**	**100**
		Mathematics Core Course- 2	**4**	**3**	**20**	**80**	**100**
		Complimentary1 Course –II (Statistics)	**4**	**3**	**20**	**80**	**100**
		Complimentary2 Course-II (Physics/ Computer)	**2 (T)**	**2**	**10**	**60**	**70**
			2 (P)	**2**	**20**	**40**	**60**
	Total		**25**	**21**			**630**

3	**III**	English III	**5**	**4**	**20**	**80**	**100**
		Sec. Lang./Common course I	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 3	**5**	**4**	**20**	**80**	**100**
		Complimentary1 Course – II (Statistics)	**5**	**4**	**20**	**80**	**100**
		Complimentary2 Course –II (Physics Theory/ Computer)	**3 (T)**	**3**	**10**	**60**	**70**
			2 (P)	**0**			
	Total		**25**	**19**			**470**
4	**IV**	English IV	**5**	**4**	**20**	**80**	**100**
		Sec. Lang./Common courseII	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 4	**5**	**4**	**20**	**80**	**100**
		Complimentary1 Course III	**5**	**4**	**20**	**80**	**100**
		Complimentary2 Course III (Physics/ Computer)	**3 (T)**	**3**	**10**	**60**	**70**
			2 (P)	**2**	**20**	**40**	**60**
	Total		**25**	**21**			**530**
5	**V**	Mathematics Core Course – 5	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 6	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 7	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 8	**5**	**4**	**20**	**80**	**100**
		Generic Elective Course	**3**	**3**	**20**	**80**	**100**
	Total		**25**	**19**			**500**
6	VI	Mathematics Core Course – 9	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course-10	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course-11	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course-12	**5**	**4**	**20**	**80**	**100**
		Choice Based Course	**3**	**3**	**20**	**80**	**100**
		Project	**0**	**2**	**20**	**80**	**100**
	Total		**25**	**21**			**600**

English:

Semester	Title of the Course	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	English I	5	4	90	3 hrs	20	80
	English /Common course I	4	3	72	3 hrs	20	80
2	English II	5	4	90	3 hrs	20	80
	English /Common course II	4	3	72	3 hrs	20	80
3	English III	5	4	90	3 hrs	20	80
4	English - IV	5	4	90	3 hrs	20	80

Second Language:

Semester	Title of the Course	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Second Language I	4	4	72	3 hrs	20	80
2	Second Language II	4	4	72	3 hrs	20	80
3	Sec. Lang./ Common course I	5	4	90	3 hrs	20	80
4	Sec. Lang./ Common course II	5	4	90	3 hrs	20	80

MATHEMATICS CORE COURSES

Semester	Title of the Course	Number of hours	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
I	MM1CRT01: Foundation of Mathematics	4	3	72	3 hrs	20	80
II	MM2CRT02: Analytic Geometry, Trigonometry And Partial Differentiation	4	3	72	3 hrs	20	80
III	MM3CRT03: Calculus	5	4	90	3 hrs	20	80
IV	MM4CRT04: Vector Calculus And Theory of Equations	5	4	90	3 hrs	20	80
V	MM5CRT05: Real Analysis (1)	6	4	108	3 hrs	20	80
	MM5CRT06: Differential Equations	6	4	108	3 hrs	20	80
	MM5CRT07: Abstract Algebra	5	4	90	3 hrs	20	80
	MM5CRT08: Fuzzy mathematics And Integral Transforms	5	4	90	3 hrs	20	80
	Generic Elective course	3	3	54	3 hrs	20	80
VI	MM6CRT09:Real Analysis (II)	6	4	108	3 hrs	20	80
	MM6CRT10: Discrete Mathematics	6	4	108	3 hrs	20	80
	MM6CRT11:Complex Analysis	5	4	90	3 hrs	20	80
	MM6CRT12: Linear Algebra And Metric Spaces	5	4	90	3 hrs	20	80
	Choice Based Course	3	3	54	3 hrs	20	80
	MM6PRT01: Project	-	2	-	-	20	80

GENERIC ELECTIVE COURSE DURING THE FIFTH SEMESTER

Title of the Course	No. of contact hrs/week	No. of Credit	Duration of Exam
MM5GET01: History of Indian Mathematics	**3**	**3**	**3 hrs**
MM5GET02: Mathematics For Economics Analysis	**3**	**3**	**3 hrs**
MM5GET03: Basic Python Programming And Typesetting in LaTeX	**3**	**3**	**3 hrs**

CHOICE BASED COURSE DURING THE SIXTH SEMESTER

Title of the Course	No. of contact hrs/week	No. of Credit	Duration of Exam
MM6CBT01: Operations Research	**3**	**3**	**3 hrs**
MM6CBT02: Combinatorics	**3**	**3**	**3 hrs**
MM6CBT03: Numerical Analysis	**3**	**3**	**3 hrs**

Projects :

All students are to do a **project in the area of core course.** This project can be done individually or in groups (not more than five students) for all subjects which may be carried out in or outside the campus. The projects are to be identified during the II semester of the programme with the help of the supervising teacher. The report of the project in duplicate is to be submitted to the department at the sixth semester and are to be produced before the examiners appointed by the University. External Project evaluation and Viva / Presentation is compulsory for all subjects and will be conducted at the end of the programme.

a) Marks of external Examination : 80
b) Marks of internal evaluation : 20

Components of External Evaluation of Project		**Marks**
Dissertation (External)	**Content**	**20**
	Presentation	**30**
Viva-Voce (External)		**30**
Total		**80**

All the four components of the internal assessment are mandatory.

Components Internal Evaluation of project	**Marks**
Punctuality	**5**
Experimentation/Data collection	**5**
Knowledge	**5**
Report	**5**
Total	**20**

Examinations :

The evaluation of each paper shall contain two parts:

(i) Internal or In-Semester Assessment (ISA)

(ii) External or End-Semester Assessment (ESA)

The internal to external assessment ratio shall be 1:4. There shall be a maximum of **20** marks for internal evaluation and a maximum of 80 marks for external evaluation. Both internal and external marks are to be mathematically rounded to the nearest integer. For all papers (theory & practical), grades are given **on a 10-point scale** based on the total percentage of marks, ***(ISA+ESA)*** as given below:-

Percentage of Marks	Grade	Grade Point
95 and above	**S Outstanding**	**10**
85 to below 95	**A^+ Excellent**	**9**
75 to below 85	**A Very Good**	**8**
65 to below 75	**B^+ Good**	**7**
55 to below 65	**B Above Average**	**6**
45 to below 55	**C Satisfactory**	**5**
40 to below 45	**D Pass**	**4**
Below 40	**F Failure**	**0**
	Ab Absent	**0**

CREDIT POINT AND CREDIT POINT AVERAGE

Credit Point (CP) of a paper is calculated using the formula:-

CP = C × GP, where C is the Credit and GP is the Grade point

Semester Grade Point Average (SGPA) of a Semester is calculated using the formula:-

SGPA = TCP/T C, where TCP is the Total Credit Point of that semester, ie, $\sum_1^n$ CPi*;*

TC is the Total Credit of that semester ie, $\sum_1^n$ Ci*, where n is the number of papers in that semester*

Cumulative Grade Point Average (CGPA) is calculated using the formula:-

CGPA = TCP/TC, where TCP is the Total Credit Point of that programme ie, $\sum_1^n$ CPi*; TC is the Total Credit of that programme, ie,* $\sum_1^n$ Ci *, where n is the number of papers in that programme*

Grade Point Average (GPA) of a Course (Common Course I, Common Course II, Complementary Course I, Complementary Course II, Vocational course, Core Course) is calculated using the formula:-

GPA = TCP/TC, where TCP is the Total Credit Point of course ie, $\sum_1^n$ CPi*;*

TC is the Total Credit of that course, ie, $\sum_1^n Ci$, *Where n is the number of papers in that course.*

Grades for the different courses, semesters and overall programme are given based on the corresponding CPA as shown below:

GPA	Grade
9.5 and above	***S Outstanding***
8.5 to below 9.5	***A+ Excellent***
7.5 to below 8.5	***A Very Good***
6.5 to below 7.5	***B+ Good***
5.5 to below 6.5	***B Above Average***
4.5 to below 5.5	***C Satisfactory***
4.0 to below 4.5	***D Pass***
Below 4.0	***F Failure***

A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 40% are required for a pass for a paper. For a pass in a programme, a separate minimum of **Grade D** is required for all the individual papers. If a candidate secures **F Grade** for any one of the paper offered in a Semester/Programme **only F grade** will be awarded for that Semester/Programme until he/she improves this to **D GRADE** or above within the permitted period.

Internal or In-Semester Assessment (IA):

Internal evaluation is to be done by continuous assessments on the following components. The Components of the internal evaluation for each theory paper is given below.

Theory :

<table>
<tr><td colspan="3">Component</td><td>Marks</td></tr>
<tr><td colspan="3">Attendance</td><td>5</td></tr>
<tr><td>Assignment</td><td>Seminar</td><td>Viva</td><td rowspan="2">5</td></tr>
<tr><td>Semester
I, II, III, IV</td><td>Semester
V</td><td>Semester
VI</td></tr>
<tr><td colspan="3">Test Paper(s) (1 or 2)
(1x10=10; 2x5=10)</td><td>10</td></tr>
<tr><td colspan="3">Total</td><td>20</td></tr>
</table>

Attendance

% of Attendance	Marks
90 and above	**5**
85- 89	**4**
80 -84	**3**
76- 79	**2**
75	**1**

(Decimals are to be rounded to the next higher whole number.)

The evaluation of all components is to be published and is to be acknowledged by the candidate. All documents of internal assessments are to be kept in the institution for 2 years and shall be made available for verification by the university. The responsibility of evaluating the internal assessment is vested on the teacher(s) who teach the course.

External or End-Semester Assessment (EA) :

The external examination of all semesters shall be conducted by the university on the close of each semester. There will be no supplementary exams. For reappearance/ improvement, students can appear along with the next batch.

Pattern of Question Paper :

Questions shall be set to assess knowledge acquired, standard and application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. She/he shall also submit a detailed scheme of evaluation along with the question paper.

A question paper shall be a judicious mix of very short answer type, short answer type, short essay type /problem solving type and long essay type questions.

Pattern	Marks	Choice of questions	Total Marks
Part A Short Answer	**2**	**9/12**	**18**
Part B Paragraph Answer	**4**	**6/9**	**24**
Part C Short Essay	**6**	**3/5**	**18**
Part D Long Essay	**10**	**2/4**	**20**
Total		**20/30**	**80**

External Examination

The external theory examination of all semesters shall be conducted by the University at the end of each semester.

Students having a minimum of 75% average attendance for all the courses only can register for the examination. Condonation of shortage of attendance to a maximum of 10 days in a semester subject to a maximum of 2 times during the whole period of the programme may be granted by the University on valid grounds. This condonation shall not be counted for internal assessment. Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also. Those students who are not eligible even with condonation of shortage of attendance shall repeat the **semester** along with the next batch after obtaining readmission.

There will be no supplementary exams. For reappearance/ improvement, the students can appear along with the next batch.

A student who registers his/her name for the external exam for a semester will be eligible for promotion to the next semester.

A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.

A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the University examination for the same semester, subsequently.

All programmes, courses and papers shall have unique alphanumeric code. Each teacher working in affiliated institutions shall have a unique identification number and this number is to be attached with the codes of the courses for which he/she can perform examination duty.

MARK CUM GRADE CARD

The University under its seal shall issue to the students a MARK CUM GRADE CARD on completion of each semester, which shall contain the following information:

(a) Name of the University
(b) Name of the College
(c) Title & Model of the Undergraduate Programme
(d) Name of the Semester
(e) Name and Register Number of the student
(f) Date of publication of result
(g) Code, Title, Credits and Maximum Marks (Internal, External & Total) of each paper opted in the semester.
(h) Internal, External and Total Marks awarded, Grade, Grade point and Credit point in each paper opted in the semester
(i) Institutional average (IA) of the marks of all papers and University Average (UA) of the marks of all papers.

(j) The total credits, total marks (Maximum & Awarded) and total credit points in the semester

(k) Semester Grade Point Average (SGPA) and corresponding Grade.

(l) Cumulative Grade Point Average (CGPA), GPA corresponding to Common Courses I and II, Core Course, Complementary Courses, Vocational Courses and Generic Elective paper.

(m) The final Mark cum Grade Card issued at the end of the final semester shall contain the details of all papers taken during the final semester examination and shall include the final Grade/Marks(SGPA) scored by the candidate from **1st to 5th** semesters, and the overall Grade/Marks for the total programme.

There shall **be 3 level monitoring** committees for the successful conduct of the scheme. They are -

1. Department Level Monitoring Committee (DLMC), comprising HOD and two senior-most teachers as members.

2. College Level Monitoring Committee (CLMC), comprising Principal, College Council secretary and A.O/Superintendent as members.

3. University Level Monitoring Committee (ULMC), headed by the Vice-Chancellor, Pro-Vice-Chancellor, Conveners of Syndicate Standing Committee on Examination, Academic Affairs and Registrar as members and the Controller of Examinations as member-secretary.

TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Vice-Chancellor shall, for a period of one year from the date of coming into force of these regulations, have the power to provide by order that these regulations shall be applied to any programme with such modifications as may be necessary.

The Vice Chancellor is authorized to make necessary criteria for eligibility for higher education in the grading scheme, if necessary, in consultation with other Universities. The Vice Chancellor is also authorized to issue orders for the perfect realization of the Regulations.

Syllabus of Courses:

The detailed syllabus of the courses for core, complimentary etc is appended.

For the Board of Studies in Mathematics (U G)

Prof. P. J. Joy (Chairman)

HOD Of Mathematics

K.E.College, Mannanam

~~~~~~

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)

FIRST SEMESTER

MM1CRT01: FOUNDATIONS OF MATHEMATICS

4 hours/week (Total Hours : 72) 3 credits

Brief Description of the Course

This course introduces the concepts of mathematical logic methods of proofs, sets, functions relations and partial orderings. A brief introduction of theory of Matrices and its application is also included. These topics are foundations of most areas of modern mathematics and are applied frequently in the succeeding semesters.

Syllabus

Text Books

1. **K.H.Rosen : Discrete Mathematics And Its Applications (6^{th} Edition) ,**

   Tata McGraw-Hill Publishing Company Limited New Delhi
2. **Frank Ayres Jr : Matrices , Schaum's Outline Series , TMH Edition.**

MODULE I : LOGIC (20 hrs)

Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Rules of Inference, Introduction to Proofs .

Text 1. Chapter 1 (Sections 1.4 and 1.7 are excluded)

MODULE II :SETS AND FUNCTIONS(12 hrs)

Sets, Set operations, and Functions

Text 1. Chapter 2 (Section 2.4 is Excluded)

MODULE III : RELATIONS(20 hrs)

Relation and Their Properties , Representing Relatiion, Equivalence Relations and Partial Orderings

Text 1. Chapter 7 (Sections 7.2 and 7.4 are excluded)

MODULE IV : MATRICES (20 hrs)

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skew-hermitian matrices. Rank of Matrix , Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non homogenous equations using Augmented matrix and by Cramers Rule , Homogenous Equations, Characteristic Equation , Characteristic roots and Characteristic vectors of matix , Cayley Hamilton theorem and applications.

Text 2. Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module IV are Excluded)

References

1. **Clifford Stien, Robert L Drysdale, KennethBogart ; Discrete Mathematics for Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd**
2. **Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
3. **Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson Education; Dorling Kindersley India Pvt. Ltd**
4. **Richard Johnsonbaugh; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
5. **Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd**
6. **Shanti Narayan: Matrices , S Chand & Company**
7. **Lipschutz:Set Theory And Related Topics (2nd Edition), Schaum OutlineSeries, Tata McGraw-Hill Publishing Company, New Delhi**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	8
II	2	2	0	1	5
III	4	3	1	1	9
IV	3	2	2	1	8
Total No. of Questions	12	9	5	4	30
No. Questions to be answered	9	6	3	2	20
Total Marks	18	24	18	20	80

Model Question Paper

QP Code : **Reg No:……**

Name:……

B.Sc MATHEMATICS (UGCBCS2016) EXAMINATION NOVEMBER ……

First Semester

MM1CRT01 : FOUNDATION OF MATHEMATICS

(Common For Model I , Model II B.Sc Mathematics and B.Sc Computer Applications)

Time : 3 Hours **Maximum Marks : 80**

Part A: Short Answer Questions (Answer Any 9 Questions)

(2 Marks For Each Question)

1 . Write the converse and inverse of the statement

"The home team wins whenever it is raining"

2 . What is the truth value of $\exists x P(x), where\ P(x) is\ the\ statement\ x^2>10$

and the universe of discourse consists of the positive integers not exceeding 3.

3 . Explain counter example .

4 . What is the power set of the set {φ} and the null set φ

5 . If A = {-1.5,-$\pi, 0, \sqrt{2}$**} , find f(A) where f is the ceiling function**

6 . Define a lattice

7 . Write the equivalence class of 0 for the relation Congruence modulo 4 in Z

8 . When we say a relation R on a set A is antisymmetric . Write a relation which is antisymmetric

9 . Write an example of a poset which is not totally ordered

10.Check whether the matrix $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ **is idempotent**

11. Explain elementary Raw transformations

12. Define Rank of a matrix with example **(9 x 2 = 18)**

Part B: Paragraph Answer Questions (Answer Any 6 Questions)

(4 Marks For Each Question)

13. Construct a truth table for $(p \leftrightarrow q) \vee (\sim q \leftrightarrow r)$

14. 15. If A = {-1,1 } , find the set $(A \times A) \times A$ **and** $A \times A \times A$

15.Show that $\sim(p \vee (\sim p \wedge q))$ **and** $\sim p \wedge \sim q$ **are logically equivalent by devoleping a series of logical equivalences**

16. Determine whether f(x) = ax + b, invertible ? If so find $f^{-1}(x)$ **,** $x \in R$

17. Prove that the relation R on a set A is transitive if and only if $R^n \subseteq R$ **for n = 1,2,3,……..**

18. Draw a directed graph of the relation R = {(1,3),(2,3),(2,1), (2,4),(4,1) }. Also find R^2

19. How many reflexive relations are there on a set with n elements ? Explain.

20. Obtain the row equivalent canonical matrix C of the matrix $\begin{bmatrix} 0 & 1 & 3 & -2 \\ 1 & 2 & 6 & 0 \\ 2 & 3 & 9 & 2 \\ 1 & 1 & 3 & 2 \end{bmatrix}$

21. Using Cramers rule solve the system of equations

3x - 2y + z - 4 = 0, x + y - 2z = 2, 3y – z + 1 = 0 **(6 x 4 = 24)**

Part C: Short Essay Type Questions (Answer Any 3 Questions)

(6 Marks For Each Question)

22. p_1**: n is even ,** p_2**: n-1 is odd ,** p_3**:** n^2 **is even. Show that these statements about the integer n are equivalent**

23. Show that the hypothesis "If you send me an e mail message , then I will finish writing the program", "If you do not send me an e mail message , then I will go to sleep early",and "If I go to sleep early, then I will wake up feeling refreshed"lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed".

24. Define the relation congruence modulo 8 on Z. Prove this relation is equivalence.

What are the sets in the partition of Z arising from this relation.

25.Solve the System $x_1 + x_2 - 2x_3 + 3x_5 = 1,\ \ 2x_1 - x_2 + 2x_3 + 2x_4 + 6x_5 = 2$

$3x_1 + 2x_2 - 4x_3 - 3x_4 - 9x_5 = 3$ **using Matrix method**

26. Reduce the matrix $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$ **to normal form , hence find it's rank (3 x 6 = 18)**

Part D: Long Essay TypeQuestions(Answer any 2 Questions)

(10 Marks For Each Question)

27. (i)Find a counter example of the statement $\forall x(x^2 \neq x)$ **, x∈R**

(ii) C(x) is 'x is a comedian'and F(x) is 'x is funny' and the domain consists of all people

Transalate the statements into English (a) $\forall x\big(C(x) \rightarrow F(x)\big)$ $(b)\ \forall x(C(x) \wedge F(x))$

(iii) Explain proof by contraposition and proof by contradiction.

28. (a) Draw the graph of the function f(x) = $\lfloor x-2 \rfloor + \lceil x+2 \rceil$ **, x ∈ R**

(b) Determine whether f(x) = -3x^2+7 a bijection. Justify

29. (a) Draw the Hesse diagram representing the partial ordering {(a,b) / a divides b } on the set {1,2,3,4,6,8,12}

(b) Show that { (x,y)/ x-y is rational } is an equivalence relation on the set R . Find the equivalence class of 1 and equivalence class of π

30. State Cayley-Hamilton theorem. Verify the theorem for the matrix A = $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

Hence find the inverse of the matrix A (2 x 10 = 20)

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
SECOND SEMESTER
MM2CRT02 : ANALYTIC GEOMETRY, TRIGONOMETRY AND PARTIAL DIFFERENTIATION

4 hours/week (Total Hours : 72) **3 credits**

Syllabus

Text books:

1. **Manicavachagom Pillay, Natarajan : Analytic Geometry (Part I Two Dimensions)**
2. **S.L.Loney : Plane Trigonometry Part II , S.Chand and Company Ltd**
3. **George B Thomas Jr: Thomas' Calculus (12thEdition) , Pearson**

MODULE I Conic Sections (Cartesian And Parametric) **(22 hrs)**

Tangent and Normals, Orthoptic Locus, Parametric Equations of Tangents And Normals, Chords in terms of given points, Pole And Polar and Conjugate diameters of Ellipse.

Relevant Sections of Text 1

MODULE II Polar Co-ordinate (15 hrs)

Polar Co-ordinates, Polar Equation of line , Polar Equation of Circles, Polar Equation of Conic , Polar Equations of tangents, Normals , Chords of Conic Sections.

Relevant Sections of Text 1

MODULE III Trigonometry (17 hrs)

Circular And Hyperbolic functions of complex variables, Separation of functions of complex variables into real and imaginary parts, Factorisation of x^n-1 , x^n+1 , $x^{2n}-2x^na^n\cos n\theta+a^{2n}$, and Summation of infinite Series by C+iS method

Relevant Sections of Text 2 Chapters V , VII , IX.

Module IV: Partial Differentiation (18 hrs)

Partial derivatives, The chain rule., Extreme values and saddle points, Lagrange multipliers.

Text 3 Chapter 14 (Sections 14.3 , 14.4, 14.7 and 14.8 only.All other sections are excluded)

References :

1.S.K.Stein : Calculus And Analytic Geometry, McGraw Hill

2.P.K.Jain , Khalil Ahmad : Analytic Geometry of Two Dimensions ,(2nd Edition) New Age International (P) Limited Publishers

3.Thomas and Finney : Calculus and Analytic Geometry , Addison Wesley

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	2	1	**9**
II	2	2	1	1	**6**
III	3	2	1	1	**7**
IV	3	3	1	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
THIRD SEMESTER
MM3CRT03 : CALCULUS

5 hours/week (Total Hours : 90) 4 credits

Syllabus

Text Books:

1. **Shanti Narayan , P.K.Mittal : Differential Calculus , S.Chand and Company**
2. **George B Thomas Jr: Thomas' Calculus (12thEdition) , Pearson**

Module I: Differential Calculus (18 hrs)

Successive Differentiation and Indeteminate forms

Text 1 : Chapter 5 and Chapter 10

Module II: Differential Calculus (27 hrs)

Expansion of functions using Maclaurin's theorem and Taylor's theorem. Concavity and points of inflexion. Curvature and Evolutes. Length of arc as a function derivatives of arc, radius of curvature – Cartesian equations only. (Parametric, Polar, Pedal equation and Newtonian Method are excluded) Centre of curvature, Evolutes and Involutes, properties of evolutes. Asymptotes and Envelopes.

Text 1 : Chapter 6, Chapter 13, Chapter 14 , Chapter 15 (Section 15.1 to 15.4 only), Chapter 18 (Section 18.1 to 18.8 only).

Module III: Integral Calculus (20 hrs.)

Volumes using Cross-sections, Volumes using cylindrical shells, Arc lengths, Areas of surfaces of Revolution.

Text 2: Chapter 6 (Section 6.1 to 6.4 only)

Module IV: Multiple Integrals (25 hrs)

Double and iterated integrals over rectangles, Double integrals over general regions, Area by double integration, Triple integrals in rectangular coordinates, Triple integrals in cylindrical and spherical coordiniates, Substitutions in multiple integrals.
Text 2: Chapter 15 (Sections 15.4 and 15.6 are excluded)

Reference:

1. **T. M. Apostol – Calculus Volume I & II (Wiley India)**
2. **Widder – Advanced Calculus ,2nd edition**
3. **K. C. Maity & R. K. Ghosh – Differential Calculus (New Central Books Agency)**
4. **K. C. Maity & R. K. Ghosh – Integral Calculus (New Central Books Agency)**
5. **Shanti Narayan, P.K. Mittal - Integral Calculus – (S. Chand & Co.)**
6. **Anton: Calculus, Wiley.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	2	2	1	1	**6**
II	4	2	2	1	**9**
III	3	2	1	1	**7**
IV	3	3	1	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FOURTH SEMESTER
MM4CRT04 : VECTOR CALCULUS AND THEORY OF EQUATIONS

5 hours/week (Total Hours : 90) 4 credits

Syllabus

Text Books:

1. **Anton, Bivens and Davis, Calculus (10th Edition) International Student Version, John Wiley & sons 2015**
2. **Bernard and Child - Higher Algebra, AITBS Publishers, India 2010**

Module I: Vector Calculus I (25 hrs)

Vector valued functions, Derivatives and Definite integrals of vector valued functions, Arc length, Unit tangent, Normal, and Binormal vectors, Curvature, Velocty, acceleration , and speed.Normal and Tangential Components of acceleration.Directional derivatives and gradient vectors.Tangent planes and Normal lines. Inverse Square and gradient fields, Potential functions, Divergence and curl – the ∇ operator, the Laplacian ∇^2.

Text 1 (Sections 12.1 to 12 .6, 13. 6, 13.7 and 15.1 only)

Module II: Vector Calculus II (25 hrs)

Line integrals, work as a line integral, Path independence, and conservative vector fields, Green's theorem (without proof- only for simply connected plane),Surface integrals, Orientation of a smooth parametric and non parametric surfaces , flux integrals , Divergence theorem (without proof) , Stokes' theorem (without proof).

Text 1 (Sections 15.2 to 15.8 only)

Module III: Theory of Equations (20 hrs)

The statement of the fundamental Theorem of the theory of equations Deduction that every equation of the n^{th} degree has exactly n roots, Relations connecting the roots and coefficients of an equation, Transformation of equations, Character and position of the roots, Descartes Rule of signs, Method to find rational roots of an equation, Newton's method of divisors, Symmetric functions of the roots.equations whose roots are symmetric functions.

Text 2 (Chapter 6)

Module IV: Solutions of Equation (20 hrs)

Reciprocal equations, the Binomial equations $x^n - 1 = 0$,The cubic equation, Cardan's Solution, trignometrical solution , Two important functions of the roots, The standard form of the Biquadratic equation, Ferrari's solution of the Biquadratic. Newton's method of finding an upper limit to the roots, Sturm's functions, Sturm's theorem

Text 2 (Chapters 11, 12 and 28)

References

1. **Thomas Jr., Weir M.D, Hass J.R – Thomas' Calculus (12th Edition) Pearson, 2015.**
2. **Erwin Kreyszig: Advanced Engineering Mathematics, 9th edition, Wiley, 2013**
3. **H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.**
4. **Shanti Narayan, P.K Mittal – Vector Calculus (S. Chand)**
5. **Merle C. Potter, J. L. Goldberg, E. F. Aboufadel – Advanced Engineering Mathematics (Oxford)**
6. **Ghosh, Maity – Vector Analysis (New Central books)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	-	**6**
II	3	3	2	2	**10**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)

FIFTH SEMESTER

MM5CRT05 : REAL ANALYSIS (I)

6 Hrs/Week (Total Hours : 108) 4 Credits

SYLLABUS

Text Book :

S.C.Malik , Savita Arora:Mathematical Analysis (2nd Edition), New Age International (P) Limited, Publishers

MODULE I: Real Number System (20 hrs)

Field structure, Order structure,Intervals, Bounded Sets, Completeness, Archimedean Property, Dedekind's Form and Absolute value of a real number

Chapter 1(Section 2 onwards only)

MODULE II : Real Space (30 hrs)

Neighbourhood, Interior, Open Set, Limit Point, Bolzano Weierstrass Theorem,Closed Set, Closure, Dense Set and Countable Set.

Chapter 2

MODULE III : Real Sequence(35 hrs)

Bounded Sequence , Convergence of Sequence , Cauchy's Principle , Limit Theorems , Monotonic Sequence.

Chapter 3 (Section 3.7 is excluded)

MODULE IV : Real Continuous Functions (23 hrs)

Continuous and Discontinuous Functions , Theorems on Continuity , Uniform Continuity.

Chapter 5 (Sections 2 Onwards Only)

References

1 . Principles of Real Analysis – S.L.Gupta and N.R.Gupta (2nd Edition) Pearson Education

2 . Elements of Real Analysis – Shanti Narayan and M.D. Raisinghania (Revised Edition)

S Chand and Company Ltd .

3 . A First Course in Mathematical Analysis – D Somasundaram and B Choudhary (Corrected Edition) Narosa Publishing House

4. Introduction to Real Analysis – Robert G Bartle and Donald R Sherbert (3rd Edition)

John Wiley & Sons, In

5. Real Analysis A First Course – Russel A Gordon (2nd Edition) Pearson Education

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	2	2	1	1	**6**
II	3	2	1	1	**7**
III	4	3	2	1	**10**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FIFTH SEMESTER

MM5CRT06 : DIFFERENTIAL EQUATIONS

6 hours/week (Total: 108 hours) 4 credits

Syllabus

Text Book:

1. **G.F. Simmons, S.G. Krantz - Differential Equations, (Tata McGraw Hill-New Delhi). (Walter Rudin Student Series)**
2. **Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)**

Module I What is a differential equation(26 hrs.)

The nature of solutions, Separable equations, First order linear equations, Exact equations, Orthogonal trajectories and families of curves, Homogeneous equations, Integrating factors, Reduction of order-dependent variable missing-independent variable missing

Text 1. Chapter 1 (Sections 1.2 to 1.9)

Module II Second order linear equations(26 hrs.)

Second order linear equations with constant coefficients (which includes Euler's equidimensional equations given as exercise 5 in page 63 of Text 1), The method of undetermined coefficients, The method of variation of parameters, The use of a known solution to find another, Vibrations **and** oscillations (first two subsections), Higher order linear equations

Text 1. Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4, 2.5 (2.5.3and 2.5.4 are excluded), 2.7 (example 2.17 is excluded)

Module III Power Series solutions and special functions(26 hrs.)

Series solutions of first order differential equations, Second order linear equations: ordinary points (specially note Legendre's equations given as example 4.7), Regular singular points, More on regular singular points.

Text 1. Chapter 4 (Sections 4.2, 4.3, 4.4, 4.5)

Method IV Partial Differential equations (30 hrs.)

Methods of solution of $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$, Pfaffian differential forms and equations (proof of theorem 5 on condition for integrability is excluded), Solution of Pfaffian differential equations in three variables (By inspection, Variables separable, One variable separable and homogeneous equations only). Origin of first order partial differential equations, Linear equations of the first order (proof of theorem 2 and theorem 3 are excluded)

Text 2. Chapter 1 (Section 3,5 (no proof of theorem-5) and section 6 (a,b,c and d only)
Chapter 2 (Section 1, 2 and section 4 (no proof of theorem 2 and theorem 3)

Reference:

1. **Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).**
2. **A.H.Siddiqi& P. Manchanda – A First Course in Differential Equation with Applications (Macmillian)**
3. **G.F. Simmons – Differential equation with applications and historical notes 2ndEdn (Tata McGraw Hill)**
4. **E.A. Coddington- An Introduction to Ordinary Differential Equation, PHI.**
5. **Zafar Ahsan - Differential Equations and their Applications, 2nd edition, PHI**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

BSc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FIFTH SEMESTER
MM5CRT07 : ABSTRACT ALGEBRA

5 hours/week (Total Hrs: 90) 4 credits

Syllabus

Text book :
A First Course in Abstract Algebra (7th Edition) John B. Fraleigh (Pearson)

Module I(25 hrs)/

Groups and subgroups-Binary operations, Isomorphic binary structures, Groups-definition and examples, elementary properties of groups, finite groups and group tables, subgroups, cyclic subgroups, cyclic groups, elementary properties of cyclic groups.

Part I Sections 2, 3, 4, 5 and 6

Module II (20 hrs)

Permutations, cosets, and direct products-groups of permutations, Cayley's theorem, orbits, cycles and the alternating groups, cosets and the theorem of Lagrange, direct products.

Part II Sections 8, 9, 10, 11.1and 11.2

Module III (25 hrs)

Homomorphisms and Factor groups- Homomorphisms, properties ofhomomorphisms, factor groups, The Fundamental Homomorphism theorem, normal subgroups and inner automorphisms, simple groups.

Part III Sections 13, 14, 15.14 to 15.18

Module IV (20 hrs)

Rings and fields-definitions and basic properties, homomorphisms and isomorphisms, Integral domains- divisors of zero and cancellation, integral domains ,The characteristic of a ring.
Ideals and factor rings-Homomorphisms and factor rings.

Part IV Sections 18 and 19 Part V Section 26

References :

1. **I.N Herstein - Topics in Algebra**
2. **Joseph A Gullian - A Contemporary Abstract Algebra,NarosaPub.House .**
3. **Artin – Algebra , PHI**

QUESTON PAPER PATTERN

Module	Part A	Part B	Part C	Part D	Total
I	3	3	2	1	**9**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

BSc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FIFTH SEMESTER
MM5CRT08 : FUZZY MATHEMATICS AND INTEGRAL TRANSFORMS

5 hours/week (Total Hrs : 90) **4 credits**

Syllabus

Text Books:

1. **George J. Klir / BoYuan, *Fuzzy Sets and Fuzzy Logic, Theory and Applications'*, Prentice Hall of India Private Limited, New Delhi, 2009.**
2. **Erwin Kreyszig, Advanced Engineering Mathematics, Tenth Edition Wiley New Delhi, 2015.**

Module I Fuzzy Sets (20 Hrs)

Introduction, Crisp Sets: An Overview, Fuzzy Sets: Basic Types, Fuzzy Sets: Basic concepts , Additional properties of α cuts, Representations of fuzzy sets

Text 1: Chapter 1 (Sections 1.1, 1.2, 1.3 and 1.4) and Chapter 2 (Sections 2.1, 2.2, 2.3)

Module II Operations on Fuzzy Sets (30 Hrs)

Types of Operations , Fuzzy complements , Fuzzy intersections: t – norms , Fuzzy Unions: t – conorms , Combinations of operations.

(Theorems 3.1 to 3.6 , 3.9 to 3.10, 3.12, 3.14 to 3.15, 3.17 and 3.19 to 3. 24 with proof & Statements Only of Theorems 3.7 ,3.8 ,3.11 ,3.13, 3.16 and 3.18)

Text 1: Chapter 3 (Sections 3.1, 3.2, 3.3, 3.4, 3.5)

Module III Laplace Transforms (20 Hrs)

Laplace Transform, Linearityof Laplace Transform, , First- shifting Theorem(s- Shifting), Transforms of derivative and integral of a function, solutions of ordinary differential equations & initial value problems, Convolution, convolution theorem, integral equations, Differentiation & integration of transforms, Special linear ODE's with variable coefficients

Text 2 Chapter 6 (Sections 6.1, 6.2, 6.5, 6.6)

Module - IV Fourier Transforms (20 Hrs)

Fourier Integral, Fourier cosine integral, Fourier sine integral, Fourier cosine transform , Fourier sine transform and their Linearity, transforms of derivatives, Complex form of the Fourier Integral, Fourier transform, inverse Fourier transform, condition for the existence of Fourier transform, Linearity of the Fourier transforms, Fourier transform of the derivative of f(x),convolution, convolution theorem.

Text 2 Chapter 11(Sections 11.7, 11.8, 11.9 (upto convolution theorem)

References:

1. **Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley & Sons, 2013**
2. **Klir, G. J and T. Folger, *Fuzzy Sets, Uncertainty and Information,* Prentice Hall of India Private Limited New Delhi, (1988)**
3. **H.J Zimmermann, *Fuzzy Set Theory and its Applications,* Allied Publishers, 1996**
4. **A.C. Srivastava, P.K. Srivasthava, Engineering MathematicsVol II PHI Learning Private Limited Delhi 2015**
5. **Merle C. Potter, J. L. Goldberg, E. F. Aboufadel – Advanced Engineering Mathematics Third edition (Oxford)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	3	1	1	**8**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
SIXTH SEMESTER
MM6CRT09 : REAL ANALYSIS (II)

6 Hrs/Week (Total Hours : 108) **4 Credits**

SYLLABUS

Text Book :

S.C.Malik , Savita Arora:Mathematical Analysis (2nd Edition), New Age Internationa l (P) Limited, Publishers

Module I : Infinite Series (33 hrs)

Sequence of partial sums, Caushy's Principle ,Geometric series , Comparison series , Comparisn Test, (All forms) , Root Test , Ratio Test and Raabe's Test , Alternating series , Leibnitz Test, Absolute convergence and Conditional Convergence .

Chapter 4 : Sections 1.1 to 6 , 10.1 and 10.2 are included . (Sections 7 , 8 , 8.1 , 9 and Sections from 10.3 to 11.2 are excluded)

Module II : Differentiability of Real functions(20 hrs)

Derivability, Increasing Decreasing functions , Sign of the derivative, Darboux's Theorem, Rolles Theorem , Lagrange's Mean value Theorem .

Chapter 6 Sections from 1.1 to 3.1 , from Sections 5 to 6.2 (Section 7 onwards excluded)

Module III: Riemann Integration (30 hrs)

Definition , Darboux's Theorem , Integrability of sum , difference , product, quotient , and modulus of integrable functions , Riemann Sum , Some Integrable functions, Integration and Differentiation, Fundamental Theorem of Calculus .

Chapter 9 Sections from 1 to 9 (Sections 10 onwards are excluded)

Module IV: Uniform Convergence And Fourier Series (25 hrs)

Pointwise convergence , Uniform Convergence ,Cauchy's Criterion for uniform convergence, Test for uniform convergence of sequence , Weierstrass M – Test , Abel's Test (statement only) ,Dirichlet's Test (statement only) . Fourier Series (Proofs of all the theorems in Fourier Series are excluded)

Chapter 12 Sections from 1 to 3.2 and Chapter 14 (Proofs of all theorems in this chapter are excluded)

References

1 . Principles of Real Analysis – S.L.Gupta and N.R.Gupta (2nd Edition) Pearson Education

2. Elements of Real Analysis – Shanti Narayan and M.D. Raisinghania (Revised Edition) S Chand and Company Ltd .

3. A First Course in Mathematical Analysis – D Somasundaram and B Choudhary (Corrected Edition) Narosa Publishing House

4 . Introduction to Real Analysis – Robert G Bartle and Donald R Sherbert (3rd Edition) John Wiley & Sons, In

5. Real Analysis A First Course – Russel A Gordon (2nd Edition) Pearson Education

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	**8**
II	3	2	1	1	**7**
III	3	3	1	1	**8**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME(UGCBCS2016)
SIXTH SEMESTER
MATHEMATICS (CORE COURSE 10)

MM6CRT10 : DISCRETE MATHEMATICS

6 hours/week (Total Hrs : 108) 4 credits

Text books:

1. **John Clark Derek Allen Holton - A first look at graph theory, Allied Publishers**
2. **David M Burton - Elementary Number Theory, 7th Edition ,McGraw Hill Education(India) Private Ltd.**

Module I : Graph Theory (36 Hrs)

An introduction to graph. Definition of a Graph,More definitions, Vertex Degrees, Sub graphs, Paths and cycles The matrix representation of graphs (definition & example only)
Trees.Definitions and Simple properties, Bridges, Spanning trees.

Text 1 (Sections 1.1,1.3 to 1.7, 2.1, 2.2 & 2.3)

Module II : Graph Theory (22 Hrs)

Cut vertices and Connectivity. Euler's Tours, The Chinese postman problem.Hamiltonian graphs&The travelling salesman problem.
Text 1 (Sections2.6, 3.1(algorithm deleted), 3.2(algorithm deleted) 3.3, and 3.4 (algorithm deleted))

Module III : Number Theory (20 Hrs)

The Division Algorithm, The Greatest Common Divisor,The Euclidean Algorithm,
The Fundamental Theorem of Arithmetic and Basic Properties of Congruence
Text 2 (Sections 2.2, 2.3, 2.4, 3.1 and 4.2)

Module IV : Number Theory (30 Hrs)

Fermat's Theorem, Wilson's Theorem, Number Theoretic Functions, Euler's Phi-Function, Euler's Theorem and Perfect Numbers.
Text 2 (Sections 5.2(pseudoprimes is excluded), 5.3, 6.1(upto theorem 6.3),7.2 ,7.3,(Second proof onwards excluded), 11.2 (upto theorem 11.1))

Reference:

1. **Douglas B West Peter Grossman - Introduction to Graph Theory**

2. **R. Balakrishnan, K. Ranganathan - A textbook of Graph Theory, Springer International Edition**

3. **S.Arumugham, S. Ramachandran - Invitation to Graph Theory, Scitech. Peter Grossman,**

4. **S. Bernard and J.M Child:Higher Algebra, AITBS Publishers, India,2009**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	**8**
II	3	2	1	1	**7**
III	2	2	1	1	**6**
IV	4	3	1	1	**9**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
SIXTH SEMESTER
MM6CRT11 COMPLEX ANALYSIS

5 hours/week (Total Hrs: 90) 4 credits

Syllabus

Text book:
James Ward Brown& Ruel. V. Churchill- Complex variables and applications (8^{th} edition)

Module I : Analytic functions (30 hours)

Functions of a complex variable-limits-theorems on limits-continuity-derivatives-differentiation formulas-Cauchy-Riemann equations-sufficient condition for differentiability-analytic functions examples-harmonic functions.Elementary functions, Exponential function –logarithmic function –complex exponents –trigonometric functions- hyperbolic functions- inverse trigonometric and hyperbolic functions.
Chapter 2 (Sections 12, 15, 16, 18 to 22, 24, 25, 26) Chapter 3 (Sections 29, 30, 33 to 36)

Module II : Integrals (25 hours)

Derivatives of functions –definite integrals of functions –contours –contour integrals –some examples –upper bounds for moduli of contour integrals –ant derivates –Cauchy-Goursat theorem (without proof)- simply and multiply connected domains- Cauchy's integral formula- an extension of Cauchy's integral formula- Liouville's theorem and fundamental theorem of algebra- maximum modulus principle.
Chapter 4 (Sections 37 to 41, 43, 44, 46, 48 to 54) Chapter 5 (Sections 55 to 60 and 62)

Module III : Series (15 hours)

Convergence of sequences and series -Taylor's series -proof of Taylor's theorem-examples-Laurent's series(without proof)-examples.
Chapter 6 (Sections 68 to 70 and 72 to 74)

Module IV: Residues and poles (20 hours)

Isolated singular points –residues –Cauchy's residue theorem –three types of isolated singular points-residues at poles-examples –evaluation of improper integrals-example –improper integrals from Fourier analysis –Jordan's lemma (statement only) –definite integrals involving sines and cosines.

Chapter 7 (Sections 78 to 81 and 85)

Reference:

1. **Lars V.Ahlfors - Complex Analysis – An Introduction to the Theory of Analytic Functions of one Complex Variables (4th edition), (McGRAW-HILL)**
2. **Shanti Narayan - Theory of functions of a complex variable**
3. **Kasana - Complex Variables: Theory and Applications , 2nd edition**
4. **B. Choudhary - The Elements of Complex Variables.**
5. **A. David Wunsch – Complex Analysis with Applications (Pearson)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	2	1	**9**
II	3	3	1	1	**8**
III	2	2	1	1	**6**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)

SIXTH SEMESTER
MM6CRT12 : LINEAR ALGEBRA AND METRIC SPACES

5 hours/week (Total Hrs: 90) 4 credits

Syllabus

Text Book :

1. **Richard Bronson, Gabriel B. Costa - Linear Algebra An Introduction (Second Edition), Academic Press 2009, an imprint of Elsevier.**
2. **G. F. Simmons -- Introduction to Topology and Modern analysis (Tata Mc Graw Hill)**

Module I (25 hours)

Vector spaces: Vectors, Subspace, Linear Independence, Basis and Dimension, Row Space of a Matrix.

Text 1 Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4 and 2.5)

Module II (30 hours)

Linear Transformations: Functions, Linear Transformations, Matrix Representations, Change of Basis, Properties of Linear Transformations.

Text 1 Chapter 3 (Sections 3.1, 3.2, 3.3, 3.4 and 3.5)

Module III (15 hours)

Metric Spaces – Definition and Examples, Open sets, Closed Sets. , Cantor set

Text 2 Chapters 2 (Sections 9, 10 and 11)

Module IV (20 hours)

Convergence, Completeness, Continuous Mapping (Baire's Theorem included)

Text 2 Chapter 2 (Sections 12 and 13)

Reference:

1 **I. N. Herstein – Topics in Algebra , Wiley India**

2 **Harvey E. Rose - Linear Algebra, A Pure Mathematical Approach, Springer**

3 **Devi Prasad, - Elementary Linear Algebra, Narosa Publishing House**

4 **K. P. Gupta – Linear Algebra, Pragathi Prakashan**

5 **Promode Kumar Saikia – Linear Algebra, Pearson**

6 **Derek J. S. Robinson – A Course in Linear Algebra with Applications, Allied.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	3	1	1	**9**
II	3	2	2	1	**8**
III	3	2	1	1	**7**
IV	2	2	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

MAHATHMA GANDHI UNIVERSITY

B.Sc. DEGREE PROGRAMME(UGCBCS2016)

MATHEMATICS (GENERIC ELECTIVE COURSES)

(DURING THE FIFTH SEMESTER)

SYLLABUS

(Effective from 2016 admission onwards)

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
FIFTH SEMESTER
MM5GET01 : HISTORY OF INDIAN MATHEMATICS

3 hours/week (Total Hrs: 54) 3 credits

Syllabus

Objectives:

1. To introduce the students the history of ancient Indian Mathematics.
2. To make aware of the students about the Indian contributions to Mathematics.

Text Book: The Crest of the Peacock - 3rd Edition, George Gheverghese Joseph. Princeton University Press, Princeton & Oxford.

Module I Ancient Indian Mathematics (12 hrs.)

Chapter 8 Sections: A restatement of intent and a brief historical sketch, Maths from bricks: Evidence from the Harappan culture, Mathematics from the Vedas

Module II Ancient Indian Mathematics (12 hrs.)

Chapter 8 Sections: Early Indian Numerals and their development, Jaina Mathematics, Mathematics on the eve of the classical period.

Module III Indian Mathematics: The Classical Period and After (18 hrs.)

Chapter 9 Sections: Major Indian mathematician-astronomers, Indian algebra, Indian trigonometry, Other notable contributions.

Module IV A Passage to Infinity: The Kerala Episode (12 hrs.)

Chapter 10 Sections: The actors, Transmission of Kerala Mathematics

References:

1. **Kim Plofker ; Mathematics In India ; Hndustan Book Agency**
2. **History of Science and Technology in ancient India: the beginnings, D. Chattopadhyaya. Firma KLM Pvt Calcutta 1986.**
3. **History of Hindu Mathematics, B. Datta and A.N. Singh, Bharatiya Kala Prakashan N.Delhi 2001(reprint)**
4. **Studies in the History of Indian Mathematics (Culture and History of Indian Mathematics) C. S. Seshadri (Editor), Hindustan Book Agency (15 August 2010)**
5. **An introduction to the history of Mathematics 5th Edn, H. Eves. Saunders Philadelphia 1983.**
6. **A history of Mathematics, C.B. Boyer. Princeton University Press, NJ, 1985.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	2	2	1	1	**6**
II	3	2	1	1	**7**
III	4	3	2	1	**10**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
FIFTH SEMESTER
MM5GET02 : MATHEMATICS FOR ECONOMICS ANALYSIS

3 hours/week(Total Hrs: 54) 3 credits

Syllabus

Text books:

1. Sydsaeter, Knut, Peter Hammond, and Arne Strom, *Essential Mathematics for Economic Analysis* (Dorling Kindersley, 2014)

2.Henderson, James M. and Richard E. Quandt, *Microeconomic Theory: A Mathematical Approach* (McGraw Hill, 1980)

3. Baldani, Jeffrey, James Bradfield, and Robert W. Turner, *An Introduction to Mathematical Economics* (South-Western, 2007)

Module I: Financial Mathematics(14 hours)

Annual (nominal) rate of interest – Compounding and the effective rate of interest – Continuous compounding – Present value (PV) and the discount factor – Nominal and effective rates of discount – Continuous discounting – Geometric series and the summation formula – Annuities and the present value of an ordinary annuity – Present value of an annuity (continuous discounting) – Perpetual annuities – *Amortization of loans*: finding the periodic payment – Finding the loan balance amount after 'k' installments – Finding the number of periods needed to pay off a loan – *Investment appraisal*: Net Present Value (NPV) Criterion – Internal Rate of Return (IRR) Criterion.

Text 1 (Relevent Sections Of Chapter 10)

Module II: Theory of Consumer Behaviour(14 hours)

Ordinal approach to consumer behavior – Utility function – marginal utility of a good – Indifference curves – Slope of an indifference curve and Marginal rate of Substitution (MRS) – Diminishing MRS – Budget constraint and budget line – Constrained utility maximization – First and second order conditions – Graphical interpretation of consumer's equilibrium choice – Cobb- Douglas utility function – Demand curve for a good – Slutsky equation – Substitution and income effects – Numerical problems.

Text 2 (Relevant Chapters And Sections)

Module III: Consumer's Choice under Risky Conditions(12 hours)

St. Petersburg paradox – Lotteries – Expected utility property – Axioms necessary for the expected utility property – Risk aversion, risk neutrality, risk loving and the graph of the expected utility function – Arrow-Pratt measure of absolute risk aversion – Functional form: $U(W) = -e^{-rW}$ (U: utility, W: wealth) – Demand for insurance – Allais paradox – Ellsberg paradox – Numerical problems.

Text 2 (Relevant Chapters And Sections)

Module IV: Strategic Choice and Game Theory (Only Static Games with Complete Information) (14 hours)

Strategic interactions and description of a game – Static games vs. dynamic games – Games of complete information vs. games of incomplete information – Normal form (or strategic form or matrix form) of a static game – Dominant strategy and strictly dominated strategies – Prisoner's dilemma – Solution concept: Iterated elimination of strictly dominated strategies – Solution concept: Nash equilibrium – Pure strategy vs. mixed strategy – Best-response functions and Nash equilibria – Numerical problems.

Text 3 (Relevant Sections Of Chapter 17)

Reference

1.Soni, R. S. and Avneet Kaur Soni, *Mathematics for Business, Economics and Finance* (Ane Books Pvt. Ltd., 2011)

2. Edward T. Dowling - Introduction to Mathematical Economics, Third edition, Schaum's Outline Series, TMH.

3. R.G.D. Allen - Mathematical Analysis for Economists, Macmillan, ELBS

4. Taro Yamane - Mathematics for Economists: An elementary survey. Second Edition, PHI.

5. Singh, Parashar, Singh --*Econometrics & Mathematical Economics*, S. Chand & Co. 1997

6. Srinath Baruah - Basic Mathematics and its Application in Economics, Macmillan.

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMM MATHEMATICS E(UGCBCS 2016)
FIFTH SEMESTER
MM5GET03 : BASIC PYTHON PROGRAMMING AND TYPESETTING IN LATEX

3 hours/week (Total Hrs: 54) 3 credits

Syllabus

Text Books

1 . **The online Wiki book "Non-Programmer's Tutorial for Python 3" which can be downloaded as a free PDF book from the URL https://en.wikibooks.org/wiki/Non-Programmer's_Tutorial_for_Python_3**

2 . **The free to download book "Formatting information : A beginner's introduction to typesetting with LaTeX" by Peter Flynn. This can be downloaded free from the URL https://www.ctan.org/pkg/beginlatex**

The course is meant for students with very little or no computer programming background. They should be introduced to how to use the operating system Ubuntu/or a friendly Linux OS for day today activities like preparing a basic office document, using multimedia files, creating, renaming and deleting files and folders etc. Therefore, an introduction to these things should be given before starting the actual course content. It is not necessary to make them experts in using "Terminals" or such highly powerful tools. The course should start with how to start an Ubuntu OS, how to login to the system giving the username and password, how to start an office typesetting document in Libre Office Writer, how to use multimedia players like VLC media player, etc.

(4 hours can be given to these topics, though this need not be considered for the examination part)

Module I : Beginning Python Programming (12 hours)

Python 3.x version with IDLE support should be used for introducing the concepts in Python programming. How to use the command line and invoke Python shell also should be discussed. Displaying output and showing output to user should be discussed as in chapters 3 & 4. Conditional statement if, else etc should be discussed as in Chapter 6. Looping using while, for should be discussed as in chapters 5 and 11.

Text 1 Chapters 2, 3, 4, 5, 6 and 11

Module II: Advanced features (12 hours)

Defining functions and using modules should be discussed as in chapters 8 and 14. Topics like lists, string operations should be discussed based on 10, 15, and 16. To end the programming part, file input/output operatios should be discussed as in chapter 17.

Text 1 Chapters 8, 10, 15, 16 and 17

Module III: Beginning typesetting with using LaTeX (13 hours)

Using the editor TeXniccenter to create a file, LaTeX commands, Quotation marks, Dimensions, hyphenation, justification, and breaking (Section 2.3.4, section 2.4, 2.6, 2.7, 2.8), The Document Class Declaration, The document environment, Titling, Abstracts and summaries, sections, Ordinary paragraphs, Table of contents (Chapter 3 complete), Typesetting and generating the PDF file, how to understand errors and warnings while compiling, preview the output as PDF (Chapter 4 sections 4.1, 4.2, 4.3.3)

Text 2

Module IV: Advanced features (13 hours)

Using packages (Chapter 5 section 5.1.1), Generating varius lists, including figures/images (Chapter 6 sections 6.2, 6.3, 6.4), Quotations, footnotes, margin notes, references (Chapter 7 sections 7.1, 7.2, 7.3, 7.4), Changing page layout, and experimenting with fonts (Chapter 8 section 8.1, 8.2)

Text 2

References:

1. **Dive Into Python by Mark Pilgrim, Free to download from the URL http://www.diveintopython.net/**

2. **The Not So Short Introduction to LaTeX2e by Tobias Oetiker Hubert Partl, Irene Hyna and Elisabeth Schlegl. Free to download from https://www.ctan.org/pkg/lshort-english**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	3	1	1	**8**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

MAHATHMA GANDHI UNIVERSITY

B.Sc. DEGREE PROGRAMME(UGCBCS2016)

MATHEMATICS (CHOICE BASED COURSE)

(DURING THE SIXTH SEMESTER)

SYLLABUS

(effective from 2016 admission onwards)

B.Sc. DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
SIXTH SEMESTER
MM6CBT01 : OPERATIONS RESEARCH

3 hours/week (Total Hrs : 54) 3 credits

Syllabus

Text Books:

1. **K. V Mital and C. Mohan - Optimization Methods in Operations Research and System Analysis (3rd edition) (New Age International)**
2. **Operation Research by Kanti Swarup, P. K. Gupta and Man Mohan - (Sultan Chand and Sons)**

Module I : Mathematical Preliminaries (10 hrs)

Vectors and vector spaces , Linear Dependence, Dimension of a vector space, basis; Euclidean Space, Open and closed sets in E_n, Convex linear combination, convex sets; Vertices or extreme points of a convex set; Convex polyhedron, Hyperplanes, half spaces and polytopes, Seperating and Supporting Hyperplanes; Vertices of a closed bounded convex set.**(Definitions and examples only . Proofs of all theorems are excluded)**
Text 1 Chapter 1 (Section 1 to 5 and 11 to 18)

Module II :Linear Programming(8 Hrs)

General LPP, Feasible solution, Basic and basic feasible solution, optimal solution.
Text 1 Chapter 3 (section 3 to 7) (All Theorems without proof)

Module III: Linear Programming Contd. (18 hrs)

Simplex method (numerical example) Simplex tableau, Finding the first b.f.s., artificial variables, Degeneracy, Duality in LPP, Application of duality, Dual simplex method.
Text 1 Chapter 3 (Section 9 to 14, 17, 19 and 20)

Module IV: Transportation and Assignment Problems(18 hrs)

Introduction, transportation problem, Different methods for finding an initial basic feasible solution**(Chapter 10 section 8 of Text 2)** Transportation matrix, triangular basis (excluding the theorem), finding a basic feasible solution, testing of optimality, loop in a transportation array (definition only), changing the basis, Degeneracy, Unbalanced problem, Assignment problem.
Text 1 Chapter 4 (Section 1 to 11 and 14) Text 2 Chapter 10 (Section 8 only)

References:

1. **Gupta P.K.and Hira D.S. , S Chand Problems in Operations Research**
2. **Ravindran A, Philip D.T. and Solberg J.J. , John Wiley and Sons**
3. **B.K.Mishra , B. Sharma , Optimizastion Linear Programming (Ane Books)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	0	**6**
II	3	2	1	0	**6**
III	3	2	2	2	**9**
IV	3	3	1	2	**9**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
SIXTH SEMESTER
MM6CBT02 : COMBINATORICS

3 hours/week (Total Hrs : 54) 3 credits

Syllabus

Text Book:

1. **Chen Chuan -Chong, Koh Khee Meng, Principles and Techniques in Combinatorics, World Scientific,1999.**

Module I: Permutations and Combinations (18 hrs)

Two basic counting principles, Permutations, Circular permutations, Combinations,The injection and bijection principles, Arrangements and selection with repetitions, Distribution problems

Text 1 : Chapter 1

Module II: The Piegeonhole Principle (12 hrs)

Introduction, The piegeonhole principle, More examples.

Text 1 : Chapter 3 (Section 3.1 to 3.3)

Module III: Principle of Inclusion and Exclusion (12 hrs)

Introduction, The principle, A generalization, Integer solutions and shortest routes, The Sieve of Eratosathenes and Euler φ -function.

Text 1 : Chapter 4 (Section 4.1 to 4.4 and 4.7)

Module IV: Generating Functions (12 hrs)

Ordinary generating functions, Some modeling problems, Partitions of integer, Exponential generating functions

Text 1 : Chapter 5

References:-

1. V Krishnamoorthy, Combinatorics theory and applications, E. Hoewood, 1986
2. Hall,Jr, Combinatorial Theory, Wiley- Interscinice, 1998.
3. Brualdi, R A, Introductory Combinatorics, Prentice Hall,1992

Question Paper Pattern

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	2	1	**9**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)

SIXTH SEMESTER

MM6CBT03 : NUMERICAL ANALYSIS

3 hours/week (Total Hrs : 54) 3 Credits

Syllabus

Use of Non Programmable Scientific Calculator is Permitted

Text Book :

S.S.Sastry, Introductory Methods of Numerical Analysis , PHI LearningPrivate Limited Fourth Edition

Module I : Solution of Equations (17 hrs)

Bisection Method, Method of False Position,m Iteration Method, Aitken's Δ^2 process, Newton – RaphsonMethod, Generalised Newton's Method and Ramanujan's Method

Chapter 2 (Sections 2.2, 2.3, 2.4, 2.5 and 2.6)

Module II : Interpolation (17 hrs)

Errors in Polynomial Interpolation , Forward Differences, Backward Differences, Central Differences Symbolic Relations, Difference of a Polynomial and Newton's Formulae for Interpolation .

Chapter 3 (Sections 3.2, 3.3, 3.5 and 3.6)

Module III : Numerical Differentiation (10 hrs)

Introduction, Numerical Differentiation, Errors in Numerical Differentiation and The Cubic Spline Method

Chapter 5 (Sections 5.1, 5.2, 5.2.1 and 5.2.2)

Module IV: Numerical Integration (10 hrs)

Numerical Integration, Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Boole's and Weddle's Rules, Use of Cubic Spines.

Chapter 5 (Sections 5.4, 5.4.1, 5.4.2, 5.4.3, 5.4.4 and 5.4.5)

References

1. **Scarborough , Numerical Mathematical Analysis**
2. **Francis Shield (Schaum's Series) Numerical Analysis**
3. **Hilderbrand , Introduction to Numerical Analysis**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	2	1	**9**
II	4	3	1	1	**9**
III	2	2	1	1	**6**
IV	2	2	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc
MATHEMATICS
MODEL - II

MAHATHMA GANDHI UNIVERSITY, KOTTAYAM

B.Sc MATHEMATICS MODEL II
UNDER
CHOICE BASED CREDIT SYSTEM (UGCBCS 2016)

(Effective from 2016 admission onwards)

The courses for the UG Programme are framed using time tested and internationally popular text books so that the courses are at par with the courses offered by any other reputed university around the world.

Only those concepts that can be introduced at the UG level are selected and instead of cramming the course with too many ideas the stress is given in doing the selected concepts rigorously. The idea is to make learning mathematics meaningful and an enjoyable activity rather than acquiring manipulative skills and reducing the whole thing an exercise in using thumb rules.

As learning Mathematics is doing Mathematics, to this end, some activities are prescribed to increase students' participation in learning.

Every student has to do a project during 6^{th} semester. The topics for the project can be selected as early as the beginning of the 4^{th} semester.

Course Structure:

The U.G. Programme in Mathematics must include (a) Common courses, (b) Core courses, (c) Complementary Courses, (d) Generic Elective courses (e) Choice based courses (f) Project and no course shall carry more than 4 credits.

Courses:

The number of Courses for the restricted programme should contain 12 core courses, 1 Generic Elective course, 1 choice based course 4 complementary courses and 8 vocational courses. There should be 6 common courses, which includes the first and second language of study.

Objectives :

The syllabi are framed in such a way that it bridges the gap between the plus two and post graduate levels of Mathematics by providing a more complete and logic frame work in almost all areas of basic Mathematics.

By the end of the second semester, the students should have attained a foundation in basic Mathematics and other relevant subjects to complement the core for their future courses.

By the end of the fourth semester, the students should have been introduced to powerful tools for tackling a wide range of topics in Calculus, Theory of Equations and Geometry. They should have been familiar with additional relevant mathematical techniques and other relevant subjects to complement the core.

By the end of sixth semester, the students should have covered a range of topics in almost all areas of Mathematics, and had experience of independent works such as project, seminar etc.

B.Sc Programme in Mathematics (Core Courses):

The following table shows the structure of the programme which indicates the title of the courses, instructional hours, credits, university examination style and the components for internal and external evaluation.

B.Sc MATHEMATICS MODEL II (UGCBCS 2016)

Course Structure

Total Credits :-120 (Eng:16+S.Lang:8+Complementary:12+Vocational:30+Generic:3+Core:51)

Total hours :-150(Eng:20+S.Lang:10+Complementary:12+Vocational:40+Generic:3+Core:65)

Sl: No	Semester	Papers	Hours	Credits	Internal Marks	External Marks	Total Marks
1	I	English I	5	4	20	80	100
		Seccond Language I	5	4	20	80	100
		Mathematics Core Course - 1	4	3	20	80	100
		Complimentary Course - 1(Operations Research)	3	3	20	80	100
		Vocational Course 1 (Computer Theory)	4	4	20	80	100
		Vocational Course 2 (Computer Practical)	4	3	20	80	100
	Total		25	21			600
2	II	English II	5	4	20	80	100
		Second Language II	5	4	20	80	100
		Mathematics Core Course- 2	4	3	20	80	100
		Complimentary Course - 2(Operations Research)	3	3	20	80	100
		Vocational Course 3 (Computer Theory)	4	4	20	80	100
		Vocational Course 4 (Computer Practical)	4	3	20	80	100
	Total		25	21			600
3	III	English III	5	4	20	80	100
		Mathematics Core Course – 3	5	4	20	80	100
		Complimentary Course - 3(Operations Research)	3	3	20	80	100
		Vocational Course 5 (Computer Theory)	6	4	20	80	100
		Vocational Course 6 (Computer Practical)	6	4	20	80	100
	Total		25	19			500

4	**IV**	English IV	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 4	**5**	**4**	**20**	**80**	**100**
		Complimentary Course - 4(Operations Research)	**3**	**3**	**20**	**80**	**100**
		Vocational Course 7 (Computer Theory)	**6**	**4**	**20**	**80**	**100**
		Vocational Course 8 (Computer Practical& Project)	**6**	**4**	**20**	**80**	**100**
	Total		**25**	**19**			**500**
5	**V**	Mathematics Core Course – 5	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 6	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 7	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course – 8	**5**	**4**	**20**	**80**	**100**
		Generic Elective Course	**3**	**3**	**20**	**80**	**100**
	Total		**25**	**19**			**500**
6	VI	Mathematics Core Course – 9	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course-10	**6**	**4**	**20**	**80**	**100**
		Mathematics Core Course-11	**5**	**4**	**20**	**80**	**100**
		Mathematics Core Course-12	**5**	**4**	**20**	**80**	**100**
		Choice Based Course	**3**	**3**	**20**	**80**	**100**
		Project	**0**	**2**	**20**	**80**	**100**
	Total		**25**	**21**			**600**

Examinations :

The evaluation of each paper shall contain two parts:

(i) Internal or In-Semester Assessment (ISA)

(ii) External or End-Semester Assessment (ESA)

The internal to external assessment ratio shall be 1:4. There shall be a maximum of **20** marks for internal evaluation and a maximum of 80 marks for external evaluation. Both internal and external marks are to be mathematically rounded to the nearest integer. For all papers (theory & practical), grades are given **on a 10-point scale** based on the total percentage of marks, ***(ISA+ESA)*** as given below:-

Percentage of Marks	Grade	Grade Point
95 and above	**S Outstanding**	**10**
85 to below 95	**A^+ Excellent**	**9**
75 to below 85	**A Very Good**	**8**
65 to below 75	**B^+ Good**	**7**
55 to below 65	**B Above Average**	**6**
45 to below 55	**C Satisfactory**	**5**
40 to below 45	**D Pass**	**4**
Below 40	**F Failure**	**0**
	Ab Absent	**0**

CREDIT POINT AND CREDIT POINT AVERAGE

Credit Point (CP) of a paper is calculated using the formula:-

CP = C × GP, where C is the Credit and GP is the Grade point

Semester Grade Point Average (SGPA) of a Semester is calculated using the formula:-

SGPA = TCP/T C, where TCP is the Total Credit Point of that semester, ie, $\sum_1^n$ **CPi**;

TC is the Total Credit of that semester ie, $\sum_1^n$ **Ci**, *where n is the number of papers in that semester*

Cumulative Grade Point Average (CGPA) is calculated using the formula:-

CGPA = TCP/TC, where TCP is the Total Credit Point of that programme ie, $\sum_1^n$ **CPi**; *TC is the Total Credit of that programme, ie,* $\sum_1^n$ **Ci** , *where n is the number of papers in that programme*

Grade Point Average (GPA) of a Course (Common Course I, Common Course II, Complementary Course I, Complementary Course II, Vocational course, Core Course) is calculated using the formula:-

GPA = TCP/TC, where TCP is the Total Credit Point of course ie, $\sum_1^n$ CPi*;*

TC is the Total Credit of that course, ie, $\sum_1^n$ Ci*, Where n is the number of papers in that course.*

Grades for the different courses, semesters and overall programme are given based on the corresponding CPA as shown below:

GPA	Grade
9.5 and above	***S Outstanding***
8.5 to below 9.5	***A+ Excellent***
7.5 to below 8.5	***A Very Good***
6.5 to below 7.5	***B+ Good***
5.5 to below 6.5	***B Above Average***
4.5 to below 5.5	***C Satisfactory***
4.0 to below 4.5	***D Pass***
Below 4.0	***F Failure***

A separate minimum of 30% marks each for internal and external (for both theory and practical) and aggregate minimum of 40% are required for a pass for a paper. For a pass in a programme, a separate minimum of **Grade D** is required for all the individual papers. If a candidate secures **F Grade** for any one of the paper offered in a Semester/Programme **only F grade** will be awarded for that Semester/Programme until he/she improves this to **D GRADE** or above within the permitted period.

Internal or In-Semester Assessment (IA):

Internal evaluation is to be done by continuous assessments on the following components. The Components of the internal evaluation for theory and practical and their weights are as below.

Theory :

<table>
<tr><th colspan="3">Component</th><th>Marks</th></tr>
<tr><td colspan="3">Attendance</td><td>5</td></tr>
<tr><td>Assignment</td><td>Seminar</td><td>Viva</td><td rowspan="2">5</td></tr>
<tr><td>Semester
I, II, III, IV</td><td>Semester
V</td><td>Semester
VI</td></tr>
<tr><td colspan="3">Test Paper(s) (1 or 2)
(1x10=10; 2x5=10)</td><td>10</td></tr>
<tr><td colspan="3">Total</td><td>20</td></tr>
</table>

Attendance

% of Attendance	Marks
90 and above	5
85- 89	4
80 -84	3
76- 79	2
75	1

(Decimals are to be rounded to the next higher whole number.)

The evaluation of all components is to be published and is to be acknowledged by the candidate. All documents of internal assessments are to be kept in the institution for 2 years and shall be made available for verification by the university. The responsibility of evaluating the internal assessment is vested on the teacher(s) who teach the course.

External or End-Semester Assessment (EA) :

The external examination of all semesters shall be conducted by the university on the close of each semester. There will be no supplementary exams. For reappearance/ improvement, students can appear along with the next batch.

Pattern of Question Paper :

Questions shall be set to assess knowledge acquired, standard and application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. She/he shall also submit a detailed scheme of evaluation along with the question paper.

A question paper shall be a judicious mix of very short answer type, short answer type, short essay type /problem solving type and long essay type questions.

Pattern	Marks	Choice of questions	Total Marks
Part A Short Answer	2	9/12	18
Part B Paragraph Answer	4	6/9	24
Part C Short Essay	6	3/5	18
Part D Long Essay	10	2/4	20
Total		20/30	80

External Examination

The external theory examination of all semesters shall be conducted by the University at the end of each semester.

Students having a minimum of 75% average attendance for all the courses only can register for the examination. Condonation of shortage of attendance to a maximum of 10 days in a semester subject to a maximum of 2 times during the whole period of the programme may be granted by the University on valid grounds. This condonation shall not be counted for internal assessment. Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also. Those students who are not eligible even with condonation of shortage of attendance shall repeat the **semester** along with the next batch after obtaining readmission.

There will be no supplementary exams. For reappearance/ improvement, the students can appear along with the next batch.

A student who registers his/her name for the external exam for a semester will be eligible for promotion to the next semester.

A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.

A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the University examination for the same semester, subsequently.

All programmes, courses and papers shall have unique alphanumeric code. Each teacher working in affiliated institutions shall have a unique identification number and this number is to be attached with the codes of the courses for which he/she can perform examination duty.

MARK CUM GRADE CARD

The University under its seal shall issue to the students a MARK CUM GRADE CARD on completion of each semester, which shall contain the following information:

(n) Name of the University
(o) Name of the College
(p) Title & Model of the Undergraduate Programme
(q) Name of the Semester
(r) Name and Register Number of the student
(s) Date of publication of result
(t) Code, Title, Credits and Maximum Marks (Internal, External & Total) of each paper opted in the semester.
(u) Internal, External and Total Marks awarded, Grade, Grade point and Credit point in

each paper opted in the semester

(v) Institutional average (IA) of the marks of all papers and University Average (UA) of the marks of all papers.

(w) The total credits, total marks (Maximum & Awarded) and total credit points in the semester

(x) Semester Grade Point Average (SGPA) and corresponding Grade.

(y) Cumulative Grade Point Average (CGPA), GPA corresponding to Common Courses I and II, Core Course, Complementary Courses, Vocational Courses and Generic Elective paper.

(z) The final Mark cum Grade Card issued at the end of the final semester shall contain the details of all papers taken during the final semester examination and shall include the final Grade/Marks(SGPA) scored by the candidate from **1st to 5th** semesters, and the overall Grade/Marks for the total programme.

There shall **be 3 level monitoring** committees for the successful conduct of the scheme. They are -

4. Department Level Monitoring Committee (DLMC), comprising HOD and two senior-most teachers as members.

5. College Level Monitoring Committee (CLMC), comprising Principal, College Council secretary and A.O/Superintendent as members.

6. University Level Monitoring Committee (ULMC), headed by the Vice-Chancellor, Pro-Vice-Chancellor, Conveners of Syndicate Standing Committee on Examination, Academic Affairs and Registrar as members and the Controller of Examinations as member-secretary.

TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Vice-Chancellor shall, for a period of one year from the date of coming into force of these regulations, have the power to provide by order that these regulations shall be applied to any programme with such modifications as may be necessary.

The Vice Chancellor is authorized to make necessary criteria for eligibility for higher education in the grading scheme, if necessary, in consultation with other Universities. The Vice Chancellor is also authorized to issue orders for the perfect realization of the Regulations.

Syllabus of Courses:

The detailed syllabus of the courses for core, complimentary etc is appended.

For the Board of Studies in Mathematics (U G)

Prof. P. J. Joy (Chairman)

HOD Of Mathematics

K.E.College, Mannanam

~~~~~~

DEGREE MATHEMATICS PROGRAMME (UGCBCS 2016)
CURRICULUM FOR B.Sc MATHEMATICS Model II (Vocational)

Total Credits:120(Eng:16+S.Lang:8+Complem:12+Vocational:30+Generic:3+Core:51)

Total hours :150(Eng:20+S.Lang:10+Complem:12+Vocational:40+Generic:3+Core:65)

Semester I

No	Course Title	Hrs/ Week	Credit
1	Common Course English 1	5	4
2	Common Course Sec. Lang 1	5	4
3	**Core Course 1 Foundation Of Mathematics**	4	3
4	Complementary Course 1 Linear Programming	3	3
5	Vocational Course-1 Computer Fundamentals	4	4
6	Vocational Course-2 Software Lab:I- Introduction to WEB Technologies	4	3
	Total	**25**	**21**

Semester II

No	Course Title	Hrs/ week	Credit
1	Common Course English 2	5	4
2	Common Course Sec. Lang 2	5	4
3	**Core Course 2 Analytic Geometry,Trigonometry, And Partial Differentiation**	4	3
4	Complementary Course 2 Duality , Transportation And Assignment Problem	3	3
5	Vocational Course-3 Object Oriented Programming in C++	4	4
6	Vocational Course-4 Software Lab:II Using C++	4	3
	Total	**25**	**21**

Semester III

No	Course Title	Hrs/ week	Credit
1	Common Course English 3	5	4
2	**Core Course 3 Calculus**	5	4
3	Complementary Course 3 Queueing Theory	3	3
4	Vocational Course-5 Database Management System	6	4
5	Vocational Course-6 Software Lab:III Using SQL	6	4
	Total	**25**	**19**

Semester IV

No	Course Title	Hrs/ week	Credit
1	Common Course English 4	5	4
2	**Core Course 4 Vector Calculus And Theory of Equations**	5	4
3	Complementary Course 4 Non Linear Programming	3	3
4	Vocational Course- 7 Operating System	6	4
5	Vocational Course -8 Software Lab IV Project	6	4
	Total	**25**	**19**

Semester V

No	Course Title	Hrs/ week	Credit
1	**Core Course 5 Real Analysis (I)**	6	4
2	**Core Course 6 Differential Equations**	6	4
3	**Core Course 7 Abstract Algebra**	5	4
4	**Core Course 8 Fuzzy Mathematics And Integral Transforms**	5	4
5	**Generic Elective Paper** 1.History of Indian Mathematics 2.Mathematical Economics 3.Basic Python Programming And Typesetting in LaTeX	3	3
	Total	**25**	**19**

Semester VI

No	Course Title	Hrs/ week	Credit
1	**Core Course 9 Real Analysis (II)**	6	4
2	**Core Course 10 Discrete Mathematics**	6	4
3	**Core Course 11 Complex Analysis**	5	4
4	**Core Course 12 Linear Algebra And Metric Spaces**	5	4
5	**Core Choice Based Course** 1.Operations Research 2.Combinatorics 3.Numerigcal Analysis	3	3
6	**Core Project**		2
	Total	**25**	**21**

CORE COURSES MATHEMATICS

Course - 1 MM1CRT01: Foundation of Mathematics

Course - 2 MM2CRT02: Analytic geometry, Trigonometry and Partial Differentiation

Course - 3 MM3CRT03: Calculus

Course - 4 MM4CRT04: Vector Calculus and Theory of Equations

Course - 5 MM5CRT05: Real Analysis (I)

Course - 6 MM5CRT06: Differential Equations

Course - 7 MM5CRT07:Abstract Algebra

Course - 8 MM5CRT08: Fuzzy Mathematics And Integral Transforms

Course - 9 MM6CRT09: Real analysis (II)

Course - 10 MM6CRT10: Discrete Mathematics

Course - 11 MM6CRT11: Complex Analysis

Course - 12 MM6CRT12: Linear Algebra and Metric Spaces

GENERIC COURSES

1. **MM5GET01: History Of Indian Mathematics**
2. **MM5GET02: Mathematics For Economics Analysis**
3. **MM5GET03: Basic Python Programming And Typesetting in LaTeX**

CHOICE BASED COURSE

1. **MM6CBT01: Operation Research**
2. **MM6CBT02: Combinatorics**
3. **MM6CBT03: Numerical Analysis**

COMPLEMENTARY COURSES OPERATIONS RESEARCH

Course - 1 Linear Programming

Course - 2 Duality, Transportation And Assignment Problem

Course - 3 Queueing Theory

Course - 4 Non Linear Programming

VOCATIONAL COURSES COMPUTER SCIENCE

Semester - 1 **Computer Fundamentals**- hrs :4/week , Credits: 4 , Total Marks - 80 marks

Semester - 1 **Software Lab:I Introduction to WEB Technologies**

hrs :4/week , Credits: 3 , Total Marks - 80 marks

Semester- 2 **Object Oriented Programming in C++**

hrs :4/week , Credits: 4 , Total Marks - 80 marks

Semester - 2 **Software Lab:II Using C++**

hrs :4/week , Credits: 3 , Total Marks - 80 marks

Semester -3 **Database Management System**

hrs :6/week , Credits: 4 , Total Marks - 80 marks

Semester -3 **Software Lab:III Using SQL**

hrs :6/week , Credits: 4 , Total Marks - 80 marks

Semester- 4 **Operating Systems**

hrs :6/week , Credits: 4 , Total Marks - 80 marks

Semester -4 **Software Lab:IV Project**

hrs :6/week , Credits: 4 , Total Marks - 80 marks

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)

FIRST SEMESTER

MM1CRT01: FOUNDATIONS OF MATHEMATICS

4 hours/week (Total Hours : 72) 3 credits

Brief Description of the Course

This course introduces the concepts of mathematical logic methods of proofs, sets, functions relations and partial orderings. A brief introduction of theory of Matrices and its application is also included. These topics are foundations of most areas of modern mathematics and are applied frequently in the succeeding semesters.

Syllabus

Text Books

2. **K.H.Rosen : Discrete Mathematics And Its Applications (6^{th} Edition) ,**

   Tata McGraw-Hill Publishing Company Limited New Delhi

2. **Frank Ayres Jr : Matrices , Schaum's Outline Series , TMH Edition.**

MODULE I : LOGIC (20 hrs)

Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Rules of Inference, Introduction to Proofs .

Text 1. Chapter 1 (Sections 1.4 and 1.7 are excluded)

MODULE II :SETS AND FUNCTIONS(12 hrs)

Sets, Set operations, and Functions

Text 1. Chapter 2 (Section 2.4 is Excluded)

MODULE III : RELATIONS(20 hrs)

Relation and Their Properties , Representing Relatiion, Equivalence Relations and Partial Orderings

Text 1. Chapter 7 (Sections 7.2 and 7.4 are excluded)

MODULE IV : MATRICES (20 hrs)

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skew-hermitian matrices. Rank of Matrix , Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non homogenous equations using Augmented matrix and by Cramers Rule , Homogenous Equations, Characteristic Equation , Characteristic roots and Characteristic vectors of matix , Cayley Hamilton theorem and applications.

Text 2. Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module IV are Excluded)

References

8. **Clifford Stien, Robert L Drysdale, KennethBogart ; Discrete Mathematics for Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd**
9. **Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
10. **Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson Education; Dorling Kindersley India Pvt. Ltd**
11. **Richard Johnsonbaugh; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
12. **Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd**
13. **Shanti Narayan: Matrices , S Chand & Company**
14. **Lipschutz:Set Theory And Related Topics (2nd Edition), Schaum OutlineSeries, Tata McGraw-Hill Publishing Company, New Delhi**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	8
II	2	2	0	1	5
III	4	3	1	1	9
IV	3	2	2	1	8
Total No. of Questions	12	9	5	4	30
No. Questions to be answered	9	6	3	2	20
Total Marks	18	24	18	20	80

Model Question Paper

QP Code : **Reg No:……**

Name:……

B.Sc MATHEMATICS (UGCBCS2016) EXAMINATION NOVEMBER ……

First Semester

MM1CRT01 : FOUNDATION OF MATHEMATICS

(Common For Model I , Model II B.Sc Mathematics and B.Sc Computer Applications)

Time : 3 Hours **Maximum Marks : 80**

Part A: Short Answer Questions (Answer Any 9 Questions)

(2 Marks For Each Question)

1 . Write the converse and inverse of the statement

"The home team wins whenever it is raining"

2 . What is the truth value of $\exists x P(x), where\ P(x) is\ the\ statement\ x^2>10$

and the universe of discourse consists of the positive integers not exceeding 3.

3 . Explain counter example .

4 . What is the power set of the set {φ} and the null set φ

5 . If A = {-1.5,-$\pi, 0, \sqrt{2}$**} , find f(A) where f is the ceiling function**

6 . Define a lattice

7 . Write the equivalence class of 0 for the relation Congruence modulo 4 in Z

8 . When we say a relation R on a set A is antisymmetric . Write a relation which is antisymmetric

9 . Write an example of a poset which is not totally ordered

10.Check whether the matrix $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ **is idempotent**

11. Explain elementary Raw transformations

12. Define Rank of a matrix with example **(9 x 2 = 18)**

Part B: Paragraph Answer Questions (Answer Any 6 Questions)

(4 Marks For Each Question)

13. Construct a truth table for $(p \leftrightarrow q) \vee (\sim q \leftrightarrow r)$

14. 15. If A = {-1,1 } , find the set $(A \times A) \times A$ **and** $A \times A \times A$

15.Show that $\sim(p \vee (\sim p \wedge q))$ **and** $\sim p \wedge \sim q$ **are logically equivalent by devoleping a series of logical equivalences**

16. Determine whether f(x) = ax + b, invertible ? If so find $f^{-1}(x)$ **,** $x \in R$

17. Prove that the relation R on a set A is transitive if and only if $R^n \subseteq R$ **for n = 1,2,3,……..**

18. Draw a directed graph of the relation R = {(1,3),(2,3),(2,1), (2,4),(4,1) }. Also find R^2

19. How many reflexive relations are there on a set with n elements ? Explain.

20. Obtain the row equivalent canonical matrix C of the matrix $\begin{bmatrix} 0 & 1 & 3 & -2 \\ 1 & 2 & 6 & 0 \\ 2 & 3 & 9 & 2 \\ 1 & 1 & 3 & 2 \end{bmatrix}$

21. Using Cramers rule solve the system of equations

3x - 2y + z - 4 = 0, x + y - 2z = 2, 3y – z + 1 = 0 **(6 x 4 = 24)**

Part C: Short Essay Type Questions (Answer Any 3 Questions)

(6 Marks For Each Question)

22. p_1**: n is even ,** p_2**: n-1 is odd ,** p_3**:** n^2 **is even. Show that these statements about the integer n are equivalent**

23. Show that the hypothesis "If you send me an e mail message , then I will finish writing the program", "If you do not send me an e mail message , then I will go to sleep early",and "If I go to sleep early, then I will wake up feeling refreshed"lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed".

24. Define the relation congruence modulo 8 on Z. Prove this relation is equivalence.

What are the sets in the partition of Z arising from this relation.

25.Solve the System $x_1 + x_2 - 2x_3 + 3x_5 = 1,\ \ 2x_1 - x_2 + 2x_3 + 2x_4 + 6x_5 = 2$

$3x_1 + 2x_2 - 4x_3 - 3x_4 - 9x_5 = 3$ **using Matrix method**

26. Reduce the matrix $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$ **to normal form , hence find it's rank (3 x 6 = 18)**

Part D: Long Essay TypeQuestions(Answer any 2 Questions)

(10 Marks For Each Question)

27. (i)Find a counter example of the statement $\forall x(x^2 \neq x)$ **, x∈R**

(ii) C(x) is 'x is a comedian'and F(x) is 'x is funny' and the domain consists of all people

Transalate the statements into English (a) $\forall x\big(C(x) \rightarrow F(x)\big)$ $(b)\ \forall x(C(x) \wedge F(x))$

(iii) Explain proof by contraposition and proof by contradiction.

28. (a) Draw the graph of the function f(x) = $\lfloor x-2 \rfloor + \lceil x+2 \rceil$ **, x ∈ R**

(b) Determine whether f(x) = -3x^2+7 a bijection. Justify

29. (a) Draw the Hesse diagram representing the partial ordering {(a,b) / a divides b } on the set {1,2,3,4,6,8,12}

(b) Show that { (x,y)/ x-y is rational } is an equivalence relation on the set R . Find the equivalence class of 1 and equivalence class of π

30. State Cayley-Hamilton theorem. Verify the theorem for the matrix A = $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

Hence find the inverse of the matrix A (2 x 10 = 20)

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
SECOND SEMESTER
MM2CRT02 : ANALYTIC GEOMETRY, TRIGONOMETRY AND PARTIAL DIFFERENTIATION

4 hours/week (Total Hours : 72) 3 credits

Syllabus

Text books:

1. **Manicavachagom Pillay, Natarajan : Analytic Geometry (Part I Two Dimensions)**
2. **S.L.Loney : Plane Trigonometry Part II , S.Chand and Company Ltd**
4. **George B Thomas Jr: Thomas' Calculus (12thEdition) , Pearson**

MODULE I Conic Sections (Cartesian And Parametric) **(22 hrs)**

Tangent and Normals, Orthoptic Locus, Parametric Equations of Tangents And Normals, Chords in terms of given points, Pole And Polar and Conjugate diameters of Ellipse.

Relevant Sections of Text 1

MODULE II Polar Co-ordinate (15 hrs)

Polar Co-ordinates, Polar Equation of line , Polar Equation of Circles, Polar Equation of Conic , Polar Equations of tangents, Normals , Chords of Conic Sections.

Relevant Sections of Text 1

MODULE III Trigonometry (**17 hrs**)

Circular And Hyperbolic functions of complex variables, Separation of functions of complex variables into real and imaginary parts, Factorisation of x^n-1 , x^n+1 , $x^{2n}-2x^na^n\cos n\theta+a^{2n}$, and Summation of infinite Series by C+iS method

Relevant Sections of Text 2 Chapters V , VII , IX.

Module IV: Partial Differentiation (18 hrs)

Partial derivatives, The chain rule., Extreme values and saddle points, Lagrange multipliers.

Text 3 Chapter 14 (Sections 14.3 , 14.4, 14.7 and 14.8 only.All other sections are excluded)

References :

1.S.K.Stein : Calculus And Analytic Geometry, McGraw Hill

2.P.K.Jain , Khalil Ahmad : Analytic Geometry of Two Dimensions ,(2nd Edition) New Age International (P) Limited Publishers

3.Thomas and Finney : Calculus and Analytic Geometry , Addison Wesley

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	2	1	**9**
II	2	2	1	1	**6**
III	3	2	1	1	**7**
IV	3	3	1	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
THIRD SEMESTER
MM3CRT03 : CALCULUS

5 hours/week (Total Hours : 90) 4 credits

Syllabus

Text Books:

3. **Shanti Narayan , P.K.Mittal : Differential Calculus , S.Chand and Company**
4. **George B Thomas Jr: Thomas' Calculus (12thEdition) , Pearson**

Module I: Differential Calculus (18 hrs)

Successive Differentiation and Indeteminate forms

Text 1 : Chapter 5 and Chapter 10

Module II: Differential Calculus (27 hrs)

Expansion of functions using Maclaurin's theorem and Taylor's theorem. Concavity and points of inflexion. Curvature and Evolutes. Length of arc as a function derivatives of arc, radius of curvature – Cartesian equations only. (Parametric, Polar, Pedal equation and Newtonian Method are excluded) Centre of curvature, Evolutes and Involutes, properties of evolutes. Asymptotes and Envelopes.

Text 1 : Chapter 6, Chapter 13, Chapter 14 , Chapter 15 (Section 15.1 to 15.4 only), Chapter 18 (Section 18.1 to 18.8 only).

Module III: Integral Calculus (20 hrs.)

Volumes using Cross-sections, Volumes using cylindrical shells, Arc lengths, Areas of surfaces of Revolution.

Text 2: Chapter 6 (Section 6.1 to 6.4 only)

Module IV: Multiple Integrals (25 hrs)

Double and iterated integrals over rectangles, Double integrals over general regions, Area by double integration, Triple integrals in rectangular coordinates, Triple integrals in cylindrical and spherical coordiniates, Substitutions in multiple integrals.
Text 2: Chapter 15 (Sections 15.4 and 15.6 are excluded)

Reference:

7. **T. M. Apostol – Calculus Volume I & II (Wiley India)**
8. **Widder – Advanced Calculus ,2nd edition**
9. **K. C. Maity & R. K. Ghosh – Differential Calculus (New Central Books Agency)**
10. **K. C. Maity & R. K. Ghosh – Integral Calculus (New Central Books Agency)**
11. **Shanti Narayan, P.K. Mittal - Integral Calculus – (S. Chand & Co.)**
12. **Anton: Calculus, Wiley.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	2	2	1	1	**6**
II	4	2	2	1	**9**
III	3	2	1	1	**7**
IV	3	3	1	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FOURTH SEMESTER
MM4CRT04 : VECTOR CALCULUS AND THEORY OF EQUATIONS

5 hours/week (Total Hours : 90) 4 credits

Syllabus

Text Books:

3. **Anton, Bivens and Davis, Calculus (10th Edition) International Student Version, John Wiley & sons 2015**
4. **Bernard and Child - Higher Algebra, AITBS Publishers, India 2010**

Module I: Vector Calculus I (25 hrs)

Vector valued functions, Derivatives and Definite integrals of vector valued functions, Arc length, Unit tangent, Normal, and Binormal vectors, Curvature, Velocty, acceleration , and speed.Normal and Tangential Components of acceleration.Directional derivatives and gradient vectors.Tangent planes and Normal lines. Inverse Square and gradient fields, Potential functions, Divergence and curl – the ∇ operator, the Laplacian ∇^2.

Text 1 (Sections 12.1 to 12 .6, 13. 6, 13.7 and 15.1 only)

Module II: Vector Calculus II (25 hrs)

Line integrals, work as a line integral, Path independence, and conservative vector fields, Green's theorem (without proof- only for simply connected plane),Surface integrals, Orientation of a smooth parametric and non parametric surfaces , flux integrals , Divergence theorem (without proof) , Stokes' theorem (without proof).

Text 1 (Sections 15.2 to 15.8 only)

Module III: Theory of Equations (20 hrs)

The statement of the fundamental Theorem of the theory of equations Deduction that every equation of the n^{th} degree has exactly n roots, Relations connecting the roots and coefficients of an equation, Transformation of equations, Character and position of the roots, Descartes Rule of signs, Method to find rational roots of an equation, Newton's method of divisors, Symmetric functions of the roots.equations whose roots are symmetric functions.

Text 2 (Chapter 6)

Module IV: Solutions of Equation (20 hrs)

Reciprocal equations, the Binomial equations $x^n - 1 = 0$,The cubic equation, Cardan's Solution, trignometrical solution , Two important functions of the roots, The standard form of the Biquadratic equation, Ferrari's solution of the Biquadratic. Newton's method of finding an upper limit to the roots, Sturm's functions, Sturm's theorem

Text 2 (Chapters 11, 12 and 28)

References

7. **Thomas Jr., Weir M.D, Hass J.R – Thomas' Calculus (12th Edition) Pearson, 2015.**
8. **Erwin Kreyszig: Advanced Engineering Mathematics, 9th edition, Wiley, 2013**
9. **H.F. Davis and A.D. Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.**
10. **Shanti Narayan, P.K Mittal – Vector Calculus (S. Chand)**
11. **Merle C. Potter, J. L. Goldberg, E. F. Aboufadel – Advanced Engineering Mathematics (Oxford)**
12. **Ghosh, Maity – Vector Analysis (New Central books)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	-	**6**
II	3	3	2	2	**10**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)

FIFTH SEMESTER

MM5CRT05 : REAL ANALYSIS (I)

6 Hrs/Week (Total Hours : 108) **4 Credits**

SYLLABUS

Text Book :

S.C.Malik , Savita Arora:Mathematical Analysis (2nd Edition), New Age International (P) Limited, Publishers

MODULE I: Real Number System (20 hrs)

Field structure, Order structure,Intervals, Bounded Sets, Completeness, Archimedean Property, Dedekind's Form and Absolute value of a real number

Chapter 1(Section 2 onwards only)

MODULE II : Real Space (30 hrs)

Neighbourhood, Interior, Open Set, Limit Point, Bolzano Weierstrass Theorem,Closed Set, Closure, Dense Set and Countable Set.

Chapter 2

MODULE III : Real Sequence(35 hrs)

Bounded Sequence , Convergence of Sequence , Cauchy's Principle , Limit Theorems , Monotonic Sequence.

Chapter 3 (Section 3.7 is excluded)

MODULE IV : Real Continuous Functions (23 hrs)

Continuous and Discontinuous Functions , Theorems on Continuity , Uniform Continuity.

Chapter 5 (Sections 2 Onwards Only)

References

1 . Principles of Real Analysis – S.L.Gupta and N.R.Gupta (2nd Edition) Pearson Education

2 . Elements of Real Analysis – Shanti Narayan and M.D. Raisinghania (Revised Edition)

S Chand and Company Ltd .

3 . A First Course in Mathematical Analysis – D Somasundaram and B Choudhary (Corrected Edition) Narosa Publishing House

4. Introduction to Real Analysis – Robert G Bartle and Donald R Sherbert (3rd Edition)

John Wiley & Sons, In

5. Real Analysis A First Course – Russel A Gordon (2nd Edition) Pearson Education

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	2	2	1	1	**6**
II	3	2	1	1	**7**
III	4	3	2	1	**10**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FIFTH SEMESTER

MM5CRT06 : DIFFERENTIAL EQUATIONS

6 hours/week (Total: 108 hours) 4 credits

Syllabus

Text Book:

3. **G.F. Simmons, S.G. Krantz - Differential Equations, (Tata McGraw Hill-New Delhi). (Walter Rudin Student Series)**
4. **Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)**

Module I What is a differential equation(26 hrs.)

The nature of solutions, Separable equations, First order linear equations, Exact equations, Orthogonal trajectories and families of curves, Homogeneous equations, Integrating factors, Reduction of order-dependent variable missing-independent variable missing

Text 1. Chapter 1 (Sections 1.2 to 1.9)

Module II Second order linear equations(26 hrs.)

Second order linear equations with constant coefficients (which includes Euler's equidimensional equations given as exercise 5 in page 63 of Text 1), The method of undetermined coefficients, The method of variation of parameters, The use of a known solution to find another, Vibrations **and** oscillations (first two subsections), Higher order linear equations

Text 1. Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4, 2.5 (2.5.3and 2.5.4 are excluded), 2.7 (example 2.17 is excluded)

Module III Power Series solutions and special functions(26 hrs.)

Series solutions of first order differential equations, Second order linear equations: ordinary points (specially note Legendre's equations given as example 4.7), Regular singular points, More on regular singular points.

Text 1. Chapter 4 (Sections 4.2, 4.3, 4.4, 4.5)

Method IV Partial Differential equations (30 hrs.)

Methods of solution of $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$, Pfaffian differential forms and equations (proof of theorem 5 on condition for integrability is excluded), Solution of Pfaffian differential equations in three variables (By inspection, Variables separable, One variable separable and homogeneous equations only). Origin of first order partial differential equations, Linear equations of the first order (proof of theorem 2 and theorem 3 are excluded)

Text 2. Chapter 1 (Section 3,5 (no proof of theorem-5) and section 6 (a,b,c and d only)
Chapter 2 (Section 1, 2 and section 4 (no proof of theorem 2 and theorem 3)

Reference:

6. **Shepley L. Ross - Differential Equations, 3rd ed., (Wiley India).**
7. **A.H.Siddiqi& P. Manchanda – A First Course in Differential Equation with Applications (Macmillian)**
8. **G.F. Simmons – Differential equation with applications and historical notes 2ndEdn (Tata McGraw Hill)**
9. **E.A. Coddington- An Introduction to Ordinary Differential Equation, PHI.**
10. **Zafar Ahsan - Differential Equations and their Applications, 2nd edition, PHI**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

BSc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FIFTH SEMESTER
MM5CRT07 : ABSTRACT ALGEBRA

5 hours/week (Total Hrs: 90) 4 credits

Syllabus

Text book :
A First Course in Abstract Algebra (7th Edition) John B. Fraleigh (Pearson)

Module I(25 hrs)/

Groups and subgroups-Binary operations, Isomorphic binary structures, Groups-definition and examples, elementary properties of groups, finite groups and group tables, subgroups, cyclic subgroups, cyclic groups, elementary properties of cyclic groups.

Part I Sections 2, 3, 4, 5 and 6

Module II (20 hrs)

Permutations, cosets, and direct products-groups of permutations, Cayley's theorem, orbits, cycles and the alternating groups, cosets and the theorem of Lagrange, direct products.

Part II Sections 8, 9, 10, 11.1and 11.2

Module III (25 hrs)

Homomorphisms and Factor groups- Homomorphisms, properties ofhomomorphisms, factor groups, The Fundamental Homomorphism theorem, normal subgroups and inner automorphisms, simple groups.

Part III Sections 13, 14, 15.14 to 15.18

Module IV (20 hrs)

Rings and fields-definitions and basic properties, homomorphisms and isomorphisms, Integral domains- divisors of zero and cancellation, integral domains ,The characteristic of a ring.
Ideals and factor rings-Homomorphisms and factor rings.

Part IV Sections 18 and 19 Part V Section 26

References :

4. **I.N Herstein - Topics in Algebra**
5. **Joseph A Gullian - A Contemporary Abstract Algebra,NarosaPub.House .**
6. **Artin – Algebra , PHI**

QUESTON PAPER PATTERN

Module	Part A	Part B	Part C	Part D	Total
I	3	3	2	1	**9**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

BSc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
FIFTH SEMESTER
MM5CRT08 : FUZZY MATHEMATICS AND INTEGRAL TRANSFORMS

5 hours/week (Total Hrs : 90) **4 credits**

Syllabus

Text Books:

1.George J. Klir / BoYuan, *Fuzzy Sets and Fuzzy Logic, Theory and Applications'*, Prentice Hall of India Private Limited, New Delhi, 2009.

2.Erwin Kreyszig, Advanced Engineering Mathematics, Tenth Edition Wiley New Delhi, 2015.

Module I Fuzzy Sets (20 Hrs)

Introduction, Crisp Sets: An Overview, Fuzzy Sets: Basic Types, Fuzzy Sets: Basic concepts , Additional properties of α cuts, Representations of fuzzy sets

Text 1: Chapter 1 (Sections 1.1, 1.2, 1.3 and 1.4) and Chapter 2 (Sections 2.1, 2.2, 2.3)

Module II Operations on Fuzzy Sets (30 Hrs)

Types of Operations , Fuzzy complements , Fuzzy intersections: t – norms , Fuzzy Unions: t – conorms , Combinations of operations.

(Theorems 3.1 to 3.6 , 3.9 to 3.10, 3.12, 3.14 to 3.15, 3.17 and 3.19 to 3. 24 with proof & Statements Only of Theorems 3.7 ,3.8 ,3.11 ,3.13, 3.16 and 3.18)

Text 1: Chapter 3 (Sections 3.1, 3.2, 3.3, 3.4, 3.5)

Module III Laplace Transforms (20 Hrs)

Laplace Transform, Linearityof Laplace Transform, , First- shifting Theorem(s- Shifting), Transforms of derivative and integral of a function, solutions of ordinary differential equations & initial value problems, Convolution, convolution theorem, integral equations, Differentiation & integration of transforms, Special linear ODE's with variable coefficients

Text 2 Chapter 6 (Sections 6.1, 6.2, 6.5, 6.6)

Module - IV Fourier Transforms (20 Hrs)

Fourier Integral, Fourier cosine integral, Fourier sine integral, Fourier cosine transform , Fourier sine transform and their Linearity, transforms of derivatives, Complex form of the Fourier Integral, Fourier transform, inverse Fourier transform, condition for the existence of Fourier transform, Linearity of the Fourier transforms, Fourier transform of the derivative of f(x),convolution, convolution theorem.

Text 2 Chapter 11(Sections 11.7, 11.8, 11.9 (upto convolution theorem)

References:

1.Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley &

Sons, 2013

2.Klir, G. J and T. Folger, *Fuzzy Sets, Uncertainty and Information*, Prentice Hall of India

Private Limited New Delhi, (1988)

3.H.J Zimmermann, *Fuzzy Set Theory and its Applications,* Allied Publishers, 1996

4.A.C. Srivastava, P.K. Srivasthava, Engineering MathematicsVol II PHI Learning Private Limited Delhi 2015

5.Merle C. Potter, J. L. Goldberg, E. F. Aboufadel – Advanced Engineering Mathematics Third edition (Oxford)

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	3	1	1	**8**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
SIXTH SEMESTER
MM6CRT09 : REAL ANALYSIS (II)

6 Hrs/Week (Total Hours : 108) **4 Credits**

SYLLABUS

Text Book :

S.C.Malik , Savita Arora:Mathematical Analysis (2nd Edition), New Age Internationa l (P) Limited, Publishers

Module I : Infinite Series (33 hrs)

Sequence of partial sums, Caushy's Principle ,Geometric series , Comparison series , Comparisn Test, (All forms) , Root Test , Ratio Test and Raabe's Test , Alternating series , Leibnitz Test, Absolute convergence and Conditional Convergence .

Chapter 4 : Sections 1.1 to 6 , 10.1 and 10.2 are included . (Sections 7 , 8 , 8.1 , 9 and Sections from 10.3 to 11.2 are excluded)

Module II : Differentiability of Real functions(20 hrs)

Derivability, Increasing Decreasing functions , Sign of the derivative, Darboux's Theorem, Rolles Theorem , Lagrange's Mean value Theorem .

Chapter 6 Sections from 1.1 to 3.1 , from Sections 5 to 6.2 (Section 7 onwards excluded)

Module III: Riemann Integration (30 hrs)

Definition , Darboux's Theorem , Integrability of sum , difference , product, quotient , and modulus of integrable functions , Riemann Sum , Some Integrable functions, Integration and Differentiation, Fundamental Theorem of Calculus .

Chapter 9 Sections from 1 to 9 (Sections 10 onwards are excluded)

Module IV: Uniform Convergence And Fourier Series (25 hrs)

Pointwise convergence , Uniform Convergence ,Cauchy's Criterion for uniform convergence, Test for uniform convergence of sequence , Weierstrass M – Test , Abel's Test (statement only) ,Dirichlet's Test (statement only) . Fourier Series (Proofs of all the theorems in Fourier Series are excluded)

Chapter 12 Sections from 1 to 3.2 and Chapter 14 (Proofs of all theorems in this chapter are excluded)

References

1 . Principles of Real Analysis – S.L.Gupta and N.R.Gupta (2nd Edition) Pearson Education

2. Elements of Real Analysis – Shanti Narayan and M.D. Raisinghania (Revised Edition) S Chand and Company Ltd .

3. A First Course in Mathematical Analysis – D Somasundaram and B Choudhary (Corrected Edition) Narosa Publishing House

4 . Introduction to Real Analysis – Robert G Bartle and Donald R Sherbert (3rd Edition) John Wiley & Sons, In

5. Real Analysis A First Course – Russel A Gordon (2nd Edition) Pearson Education

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	**8**
II	3	2	1	1	**7**
III	3	3	1	1	**8**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME(UGCBCS2016)
SIXTH SEMESTER
MATHEMATICS (CORE COURSE 10)

MM6CRT10 : DISCRETE MATHEMATICS

6 hours/week (Total Hrs : 108) 4 credits

Text books:

1.John Clark Derek Allen Holton - A first look at graph theory, Allied Publishers
2.David M Burton - Elementary Number Theory, 7th Edition ,McGraw Hill Education(India) Private Ltd.

Module I : Graph Theory (36 Hrs)

An introduction to graph. Definition of a Graph,More definitions, Vertex Degrees, Sub graphs, Paths and cycles The matrix representation of graphs (definition & example only)
Trees.Definitions and Simple properties, Bridges, Spanning trees.

Text 1 (Sections 1.1,1.3 to 1.7, 2.1, 2.2 & 2.3)

Module II : Graph Theory (22 Hrs)

Cut vertices and Connectivity. Euler's Tours, The Chinese postman problem.Hamiltonian graphs&The travelling salesman problem.
Text 1 (Sections2.6, 3.1(algorithm deleted), 3.2(algorithm deleted) 3.3, and 3.4 (algorithm deleted))

Module III : Number Theory (20 Hrs)

The Division Algorithm, The Greatest Common Divisor,The Euclidean Algorithm,
The Fundamental Theorem of Arithmetic and Basic Properties of Congruence
Text 2 (Sections 2.2, 2.3, 2.4, 3.1 and 4.2)

Module IV : Number Theory (30 Hrs)

Fermat's Theorem, Wilson's Theorem, Number Theoretic Functions, Euler's Phi-Function, Euler's Theorem and Perfect Numbers.
Text 2 (Sections 5.2(pseudoprimes is excluded), 5.3, 6.1(upto theorem 6.3),7.2 ,7.3,(Second proof onwards excluded), 11.2 (upto theorem 11.1))

Reference:

1.Douglas B West Peter Grossman - Introduction to Graph Theory

2.R. Balakrishnan, K. Ranganathan - A textbook of Graph Theory, Springer International Edition

3.S.Arumugham, S. Ramachandran - Invitation to Graph Theory, Scitech. Peter Grossman,

4.S. Bernard and J.M Child: Higher Algebra, AITBS Publishers, India,2009

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	**8**
II	3	2	1	1	**7**
III	2	2	1	1	**6**
IV	4	3	1	1	**9**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)
SIXTH SEMESTER
MM6CRT11 COMPLEX ANALYSIS

5 hours/week (Total Hrs: 90) 4 credits

Syllabus

Text book:
James Ward Brown& Ruel. V. Churchill- Complex variables and applications (8^{th} edition)

Module I : Analytic functions (30 hours)

Functions of a complex variable-limits-theorems on limits-continuity-derivatives-differentiation formulas-Cauchy-Riemann equations-sufficient condition for differentiability-analytic functions examples-harmonic functions.Elementary functions, Exponential function –logarithmic function –complex exponents –trigonometric functions- hyperbolic functions- inverse trigonometric and hyperbolic functions.
Chapter 2 (Sections 12, 15, 16, 18 to 22, 24, 25, 26) Chapter 3 (Sections 29, 30, 33 to 36)

Module II : Integrals (25 hours)

Derivatives of functions –definite integrals of functions –contours –contour integrals –some examples –upper bounds for moduli of contour integrals –ant derivates –Cauchy-Goursat theorem (without proof)- simply and multiply connected domains- Cauchy's integral formula- an extension of Cauchy's integral formula- Liouville's theorem and fundamental theorem of algebra- maximum modulus principle.
Chapter 4 (Sections 37 to 41, 43, 44, 46, 48 to 54) Chapter 5 (Sections 55 to 60 and 62)

Module III : Series (15 hours)

Convergence of sequences and series -Taylor's series -proof of Taylor's theorem-examples-Laurent's series(without proof)-examples.
Chapter 6 (Sections 68 to 70 and 72 to 74)

Module IV: Residues and poles (20 hours)

Isolated singular points –residues –Cauchy's residue theorem –three types of isolated singular points-residues at poles-examples –evaluation of improper integrals-example –improper integrals from Fourier analysis –Jordan's lemma (statement only) –definite integrals involving sines and cosines.

Chapter 7 (Sections 78 to 81 and 85)

Reference:

1. **Lars V.Ahlfors - Complex Analysis – An Introduction to the Theory of Analytic Functions of one Complex Variables (4th edition), (McGRAW-HILL)**
2. **Shanti Narayan - Theory of functions of a complex variable**
3. **Kasana - Complex Variables: Theory and Applications , 2nd edition**
4. **B. Choudhary - The Elements of Complex Variables.**
5. **A. David Wunsch – Complex Analysis with Applications (Pearson)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	2	1	**9**
II	3	3	1	1	**8**
III	2	2	1	1	**6**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS2016)

SIXTH SEMESTER
MM6CRT12 : LINEAR ALGEBRA AND METRIC SPACES

5 hours/week (Total Hrs: 90) 4 credits

Syllabus

Text Book :

1.Richard Bronson, Gabriel B. Costa - Linear Algebra An Introduction (Second Edition), Academic Press 2009, an imprint of Elsevier.
2.G. F. Simmons -- Introduction to Topology and Modern analysis (Tata Mc Graw Hill)

Module I (25 hours)

Vector spaces: Vectors, Subspace, Linear Independence, Basis and Dimension, Row Space of a Matrix.

Text 1 Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4 and 2.5)

Module II (30 hours)

Linear Transformations: Functions, Linear Transformations, Matrix Representations, Change of Basis, Properties of Linear Transformations.

Text 1 Chapter 3 (Sections 3.1, 3.2, 3.3, 3.4 and 3.5)

Module III (15 hours)

Metric Spaces – Definition and Examples, Open sets, Closed Sets. , Cantor set

Text 2 Chapters 2 (Sections 9, 10 and 11)

Module IV (20 hours)

Convergence, Completeness, Continuous Mapping (Baire's Theorem included)

Text 2 Chapter 2 (Sections 12 and 13)

Reference:

1.I. N. Herstein – Topics in Algebra , Wiley India

2.Harvey E. Rose - Linear Algebra, A Pure Mathematical Approach, Springer

3.Devi Prasad, - Elementary Linear Algebra, Narosa Publishing House

4. K. P. Gupta – Linear Algebra, Pragathi Prakashan

5.Promode Kumar Saikia – Linear Algebra, Pearson

6.Derek J. S. Robinson – A Course in Linear Algebra with Applications, Allied.

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	3	1	1	**9**
II	3	2	2	1	**8**
III	3	2	1	1	**7**
IV	2	2	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

MAHATHMA GANDHI UNIVERSITY

B.Sc. DEGREE PROGRAMME(UGCBCS2016)

MATHEMATICS (GENERIC ELECTIVE COURSES)

(DURING THE FIFTH SEMESTER)

SYLLABUS

(Effective from 2016 admission onwards)

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
FIFTH SEMESTER
MM5GET01 : HISTORY OF INDIAN MATHEMATICS

3 hours/week (Total Hrs: 54) 3 credits

Syllabus

Objectives:

1. **To introduce the students the history of ancient Indian Mathematics.**
2. **To make aware of the students about the Indian contributions to Mathematics.**

Text Book: The Crest of the Peacock - 3rd Edition, George Gheverghese Joseph. Princeton University Press, Princeton & Oxford.

Module I Ancient Indian Mathematics (12 hrs.)

Chapter 8 Sections: A restatement of intent and a brief historical sketch, Maths from bricks: Evidence from the Harappan culture, Mathematics from the Vedas

Module II Ancient Indian Mathematics (12 hrs.)

Chapter 8 Sections: Early Indian Numerals and their development, Jaina Mathematics, Mathematics on the eve of the classical period.

Module III Indian Mathematics: The Classical Period and After (18 hrs.)

Chapter 9 Sections: Major Indian mathematician-astronomers, Indian algebra, Indian trigonometry, Other notable contributions.

Module IV A Passage to Infinity: The Kerala Episode (12 hrs.)

Chapter 10 Sections: The actors, Transmission of Kerala Mathematics

References:

1. **Kim Plofker ; Mathematics In India ; Hndustan Book Agency**

2. **History of Science and Technology in ancient India: the beginnings, D. Chattopadhyaya. Firma KLM Pvt Calcutta 1986.**
3. **History of Hindu Mathematics, B. Datta and A.N. Singh, Bharatiya Kala Prakashan N.Delhi 2001(reprint)**
4. **Studies in the History of Indian Mathematics (Culture and History of Indian Mathematics) C. S. Seshadri (Editor), Hindustan Book Agency (15 August 2010)**
5. **An introduction to the history of Mathematics 5th Edn, H. Eves. Saunders Philadelphia 1983.**
6. **A history of Mathematics, C.B. Boyer. Princeton University Press, NJ, 1985.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	2	2	1	1	**6**
II	3	2	1	1	**7**
III	4	3	2	1	**10**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
FIFTH SEMESTER
MM5GET02 : MATHEMATICS FOR ECONOMICS ANALYSIS

3 hours/week(Total Hrs: 54) 3 credits

Syllabus

Text books:

1. **Sydsaeter, Knut, Peter Hammond, and Arne Strom, *Essential Mathematics for Economic Analysis* (Dorling Kindersley, 2014)**
2. **Henderson, James M. and Richard E. Quandt, *Microeconomic Theory: A Mathematical Approach* (McGraw Hill, 1980)**
3. **Baldani, Jeffrey, James Bradfield, and Robert W. Turner, *An Introduction to Mathematical Economics* (South-Western, 2007)**

Module I: Financial Mathematics(14 hours)

Annual (nominal) rate of interest – Compounding and the effective rate of interest – Continuous compounding – Present value (PV) and the discount factor – Nominal and effective rates of discount – Continuous discounting – Geometric series and the summation formula – Annuities and the present value of an ordinary annuity – Present value of an annuity (continuous discounting) – Perpetual annuities – *Amortization of loans*: finding the periodic payment – Finding the loan balance amount after 'k' installments – Finding the number of periods needed to pay off a loan – *Investment appraisal*: Net Present Value (NPV) Criterion – Internal Rate of Return (IRR) Criterion.

Text 1 (Relevent Sections Of Chapter 10)

Module II: Theory of Consumer Behaviour(14 hours)

Ordinal approach to consumer behavior – Utility function – marginal utility of a good – Indifference curves – Slope of an indifference curve and Marginal rate of Substitution (MRS) – Diminishing MRS – Budget constraint and budget line – Constrained utility maximization – First and second order conditions – Graphical interpretation of consumer's equilibrium choice – Cobb- Douglas utility function – Demand curve for a good – Slutsky equation – Substitution and income effects – Numerical problems.

Text 2 (Relevant Chapters And Sections)

Module III: Consumer's Choice under Risky Conditions(12 hours)

St. Petersburg paradox – Lotteries – Expected utility property – Axioms necessary for the expected utility property – Risk aversion, risk neutrality, risk loving and the graph of the expected utility function – Arrow-Pratt measure of absolute risk aversion – Functional form: $U(W) = -e^{-rW}$ (U: utility, W: wealth) – Demand for insurance – Allais paradox – Ellsberg paradox – Numerical problems.

Text 2 (Relevant Chapters And Sections)

Module IV: Strategic Choice and Game Theory (Only Static Games with Complete Information) (14 hours)

Strategic interactions and description of a game – Static games vs. dynamic games – Games of complete information vs. games of incomplete information – Normal form (or strategic form or matrix form) of a static game – Dominant strategy and strictly dominated strategies – Prisoner's dilemma – Solution concept: Iterated elimination of strictly dominated strategies – Solution concept: Nash equilibrium – Pure strategy vs. mixed strategy – Best-response functions and Nash equilibria – Numerical problems.

Text 3 (Relevant Sections Of Chapter 17)

Reference

1.Soni, R. S. and Avneet Kaur Soni, *Mathematics for Business, Economics and Finance* (Ane Books Pvt. Ltd., 2011)

2. Edward T. Dowling - Introduction to Mathematical Economics, Third edition, Schaum's Outline Series, TMH.

3. R.G.D. Allen - Mathematical Analysis for Economists, Macmillan, ELBS

4. Taro Yamane - Mathematics for Economists: An elementary survey. Second Edition, PHI.

5. Singh, Parashar, Singh --*Econometrics & Mathematical Economics*, S. Chand & Co. 1997

6. Srinath Baruah - Basic Mathematics and its Application in Economics, Macmillan.

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMM MATHEMATICS E(UGCBCS 2016)

FIFTH SEMESTER

MM5GET03 : BASIC PYTHON PROGRAMMING AND TYPESETTING IN LATEX

3 hours/week (Total Hrs: 54) 3 credits

Syllabus

Text Books

1. **The online Wiki book "Non-Programmer's Tutorial for Python 3" which can be downloaded as a free PDF book from the URL https://en.wikibooks.org/wiki/Non-Programmer's_Tutorial_for_Python_3**

2. **The free to download book "Formatting information : A beginner's introduction to typesetting with LaTeX" by Peter Flynn. This can be downloaded free from the URL https://www.ctan.org/pkg/beginlatex**

The course is meant for students with very little or no computer programming background. They should be introduced to how to use the operating system Ubuntu/or a friendly Linux OS for day today activities like preparing a basic office document, using multimedia files, creating, renaming and deleting files and folders etc. Therefore, an introduction to these things should be given before starting the actual course content. It is not necessary to make them experts in using "Terminals" or such highly powerful tools. The course should start with how to start an Ubuntu OS, how to login to the system giving the username and password, how to start an office typesetting document in Libre Office Writer, how to use multimedia players like VLC media player, etc.

(4 hours can be given to these topics, though this need not be considered for the examination part)

Module I : Beginning Python Programming (12 hours)

Python 3.x version with IDLE support should be used for introducing the concepts in Python programming. How to use the command line and invoke Python shell also should be discussed. Displaying output and showing output to user should be discussed as in chapters 3 & 4. Conditional statement if, else etc should be discussed as in Chapter 6. Looping using while, for should be discussed as in chapters 5 and 11.

Text 1 Chapters 2, 3, 4, 5, 6 and 11

Module II: Advanced features (12 hours)

Defining functions and using modules should be discussed as in chapters 8 and 14. Topics like lists, string operations should be discussed based on 10, 15, and 16. To end the programming part, file input/output operatios should be discussed as in chapter 17.

Text 1 Chapters 8, 10, 15, 16 and 17

Module III: Beginning typesetting with using LaTeX (13 hours)

Using the editor TeXniccenter to create a file, LaTeX commands, Quotation marks, Dimensions, hyphenation, justification, and breaking (Section 2.3.4, section 2.4, 2.6, 2.7, 2.8), The Document Class Declaration, The document environment, Titling, Abstracts and summaries, sections, Ordinary paragraphs, Table of contents (Chapter 3 complete), Typesetting and generating the PDF file, how to understand errors and warnings while compiling, preview the output as PDF (Chapter 4 sections 4.1, 4.2, 4.3.3)

Text 2

Module IV: Advanced features (13 hours)

Using packages (Chapter 5 section 5.1.1), Generating varius lists, including figures/images (Chapter 6 sections 6.2, 6.3, 6.4), Quotations, footnotes, margin notes, references (Chapter 7 sections 7.1, 7.2, 7.3, 7.4), Changing page layout, and experimenting with fonts (Chapter 8 section 8.1, 8.2)

Text 2

References:

3. **Dive Into Python by Mark Pilgrim, Free to download from the URL http://www.diveintopython.net/**

4. **The Not So Short Introduction to LaTeX2e by Tobias Oetiker Hubert Partl, Irene Hyna and Elisabeth Schlegl. Free to download from https://www.ctan.org/pkg/lshort-english**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	3	1	1	**8**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

MAHATHMA GANDHI UNIVERSITY

B.Sc. DEGREE PROGRAMME(UGCBCS2016)

MATHEMATICS (CHOICE BASED COURSE)

(DURING THE SIXTH SEMESTER)

SYLLABUS

(effective from 2016 admission onwards)

B.Sc. DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
SIXTH SEMESTER
MM6CBT01 : OPERATIONS RESEARCH

3 hours/week (Total Hrs : 54) 3 credits

Syllabus

Text Books:

1.K. V Mital and C. Mohan - Optimization Methods in Operations Research and System Analysis (3rd edition) (New Age International)
2.Operation Research by Kanti Swarup, P. K. Gupta and Man Mohan - (Sultan Chand and Sons)

Module I : Mathematical Preliminaries (10 hrs)

Vectors and vector spaces , Linear Dependence, Dimension of a vector space, basis; Euclidean Space, Open and closed sets in E_n, Convex linear combination, convex sets; Vertices or extreme points of a convex set; Convex polyhedron, Hyperplanes, half spaces and polytopes, Seperating and Supporting Hyperplanes; Vertices of a closed bounded convex set.**(Definitions and examples only . Proofs of all theorems are excluded)**
Text 1 Chapter 1 (Section 1 to 5 and 11 to 18)

Module II :Linear Programming(8 Hrs)

General LPP, Feasible solution, Basic and basic feasible solution, optimal solution.
Text 1 Chapter 3 (section 3 to 7) (All Theorems without proof)

Module III: Linear Programming Contd. (18 hrs)

Simplex method (numerical example) Simplex tableau, Finding the first b.f.s., artificial variables, Degeneracy, Duality in LPP, Application of duality, Dual simplex method.
Text 1 Chapter 3 (Section 9 to 14, 17, 19 and 20)

Module IV: Transportation and Assignment Problems(18 hrs)

Introduction, transportation problem, Different methods for finding an initial basic feasible solution**(Chapter 10 section 8 of Text 2)** Transportation matrix, triangular basis (excluding the theorem), finding a basic feasible solution, testing of optimality, loop in a transportation array (definition only), changing the basis, Degeneracy, Unbalanced problem, Assignment problem.
Text 1 Chapter 4 (Section 1 to 11 and 14) Text 2 Chapter 10 (Section 8 only)

References:

1.Gupta P.K.and Hira D.S. , S Chand Problems in Operations Research

2.Ravindran A, Philip D.T. and Solberg J.J. , John Wiley and Sons

3.B.K.Mishra , B. Sharma , Optimizastion Linear Programming (Ane Books)

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	0	**6**
II	3	2	1	0	**6**
III	3	2	2	2	**9**
IV	3	3	1	2	**9**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)
SIXTH SEMESTER
MM6CBT02 : COMBINATORICS

3 hours/week (Total Hrs : 54) 3 credits

Syllabus

Text Book:

1.Chen Chuan -Chong, Koh Khee Meng, Principles and Techniques in Combinatorics, World Scientific,1999.

Module I: Permutations and Combinations (18 hrs)

Two basic counting principles, Permutations, Circular permutations, Combinations,The injection and bijection principles, Arrangements and selection with repetitions, Distribution problems

Text 1 : Chapter 1

Module II: The Piegeonhole Principle (12 hrs)

Introduction, The piegeonhole principle, More examples.

Text 1 : Chapter 3 (Section 3.1 to 3.3)

Module III: Principle of Inclusion and Exclusion (12 hrs)

Introduction, The principle, A generalization, Integer solutions and shortest routes, The Sieve of Eratosathenes and Euler φ -function.

Text 1 : Chapter 4 (Section 4.1 to 4.4 and 4.7)

Module IV: Generating Functions (12 hrs)

Ordinary generating functions, Some modeling problems, Partitions of integer, Exponential generating functions

Text 1 : Chapter 5

References:-

1. V Krishnamoorthy, Combinatorics theory and applications, E. Hoewood, 1986
2. Hall,Jr, Combinatorial Theory, Wiley- Interscinice, 1998.
3. Brualdi, R A, Introductory Combinatorics, Prentice Hall,1992

Question Paper Pattern

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	2	1	**9**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc DEGREE PROGRAMME MATHEMATICS (UGCBCS 2016)

SIXTH SEMESTER

MM6CBT03 : NUMERICAL ANALYSIS

3 hours/week (Total Hrs : 54) 3 Credits

Syllabus

Use of Non Programmable Scientific Calculator is Permitted

Text Book :

S.S.Sastry, Introductory Methods of Numerical Analysis , PHI LearningPrivate Limited Fourth Edition

Module I : Solution of Equations (17 hrs)

Bisection Method, Method of False Position,m Iteration Method, Aitken's Δ^2 process, Newton – RaphsonMethod, Generalised Newton's Method and Ramanujan's Method

Chapter 2 (Sections 2.2, 2.3, 2.4, 2.5 and 2.6)

Module II : Interpolation (17 hrs)

Errors in Polynomial Interpolation , Forward Differences, Backward Differences, Central Differences Symbolic Relations, Difference of a Polynomial and Newton's Formulae for Interpolation .

Chapter 3 (Sections 3.2, 3.3, 3.5 and 3.6)

Module III : Numerical Differentiation (10 hrs)

Introduction, Numerical Differentiation, Errors in Numerical Differentiation and The Cubic Spline Method

Chapter 5 (Sections 5.1, 5.2, 5.2.1 and 5.2.2)

Module IV: Numerical Integration (10 hrs)

Numerical Integration, Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Boole's and Weddle's Rules, Use of Cubic Spines.

Chapter 5 (Sections 5.4, 5.4.1, 5.4.2, 5.4.3, 5.4.4 and 5.4.5)

References

1.Scarborough , Numerical Mathematical Analysis
2.Francis Shield (Schaum's Series) Numerical Analysis
3.Hilderbrand , Introduction to Numerical Analysis

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	2	1	**9**
II	4	3	1	1	**9**
III	2	2	1	1	**6**
IV	2	2	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
COMPLEMENTARY COURSE - OPERATIONS RESEARCH –
B.Sc MATHEMATICS (MODEL II)
FIRST SEMESTER
LINEAR PROGRAMMING

3 hrs/week (Total Hrs : 54) 3 Credits

Syllabus

Text Book

1. K.V.Mital and C.Mohan, Optimization methods in Operations Research and system Analysis (New Age International publishers)

Module I : Mathematical Preliminaries (15 hrs)

Text 1 Chapter 1 (Sections 1.1 to 1.19)
Vectors and vector spaces (Definition 1,2 and examples only) , Linear Dependence (Definition 2,4 and examples only. Theorm 1 excluded), Dimension of a vector space), basis (Definition 5 and statement of Theorem 2 only; Euclidean Space (Definition 6,7,8 and Example Only), Norm of a Vector (Definition 9, 10 and Theorem 3 without proof)

Linear Algebraic Equatons (General form only). Open and closed sets in E_n, convex sets (Definition 12,13,14,15,16,17 and statement of Theorem 7). Convex linear combination (Definition 18,19,20,21 and examples. Theorem 8 excluded); Intersection of convex sets, Convex Hull of a set (Definition 22, statements of Theorem 9 and 10 and example only. Theorem 11 excluded), Vertices or extreme points of a convex set(Definition 23 and Statement of Theorem 13 Only); Convex polyhedron (Definition 24 and Statement of Theorem 14 Only. Theorem 15 excluded), Hyperplanes, half spaces and polytopes (Definition 25,26,27 and statements of Theorem 17 and statement of Corollary only. Theorem 16 Excluded), Seperating and Supporting Hyperplanes (Definition 29, Statement of Theorems 18 and 20 Only. Theorem 17 Excluded); Vertices of a closed bounded convex set(Statements of Theorem 21 and Theorem 22 Only**).** Summary

Problems 3,4,6,8, and 11. All other problems in Problems I of Chapter 1 are excluded.
Proofs of all Theorems excluded.

Module II- General Problem of Mathematical Programming (12 hours)

Text 1 Chapter 1 (Section 1.20 only) and Chapter 2 (Sections 2.5, 2.11 and 2.12 only)

Quadratic Forms (Definition 30, Examples, Statements of Theorem 24,25,26 and 27 only).

Local and Global Extrema (Definitions 6 and 7 only), Saddle point (Definition 8 only). Convex Functions (Definition 10, Statements of Theorem 3 and 4 only. Theorems 5 and 6 are excluded), General Problem of Mathematical Programming.

Problems 44,45,46,47 and 48 of Chapter 1. All other problems in Problems I of Chapter 1 and Problems II of Chapter 2 are excluded.

Proofs of all Theorems excluded.

Module III - Linear programming (10 hours)

Text 1 Chapter 3 (Sections 3.1 to 3.8)

Linear programming:-

Introduction, L.P in two dimension . General LP problem, Feasible solutions (Definition 1 and statement of Theorem 1), Basic solutions, Basic feasible solutions (Definition 2 and Statements of Theorems 2 and 3 only), Optimal solutions (Statements of Theorems 4 and 5 only), Summary, L P P using Graphical Method.

Problems 1 and 2 of Chapter 3. All other problems in Problems III of Chapter 3 are excluded.

Proofs of all Theorems excluded.

Module IV - Linear programming (Cont.) (17 hours)

Text 1 Chapter 3 (Sections 3.9 to 3.12)

Linear programming: Simplex method, Canonical forms, Simplex method (Numerical Example), Simplex table finding the first basic feasible solution, Artificial variables, Degeneracy.

Text 1 Chapter 2 (Section 2.12) and Chapter 3 (Sections 3.8 to 3.14)

Problems 3 ,4 and 5 of Chapter 3. All other problems in Problems III of Chapter 3 are excluded

Reference Texts

1. Frank Ayres Jr, Matrices (Schaum's Outline Series, TMH Edition);
2. Linear Algebra , Seymour Lipschutz and Mark Lipson (Schaum's Outline Series, TMH Edition)
3. Operations Research Theory and Applications,. J.K.Sharma (Macmillan India Ltd.)

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	6	4	1	0	**11**
II	2	1	1	1	**5**
III	3	3	1	1	**8**
IV	1	1	2	2	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
COMPLEMENTARY COURSE - OPERATIONS RESEARCH –
B.Sc MATHEMATICS (MODEL II)
SECOND SEMESTER
DUALITY,TRANSPORTATION AND ASSIGNMENT PROBLEM

3 hrs/week (Total Hrs : 54) 3 Credits

Syllabus

Text Book

K.V.Mital&C.Mohan: Optimization Methods in Operations Research and System Analysis(New Age International Publishers)
Chapter 3 (Sections 17 to 20 and 22) Chapter 4 (Sections 1 to 4 ,6 to 11 , 14 to 16)

Module I Linear Programming (15 hours)

Duality in L.P.Problems, Duality Theorems(statements only), Application of duality, Dual Simplex Method, Applications of L.P.

Module II Transportation Problems (10 hours)

Introduction, Transportation Problems, Transportation Arrays, Transportation matrix, Finding a basis feasible solution. Testing for Optimality.

Module IIILoopin Transportation (15 hours)

(Theorem 2 in sec 8– statement only), Array changing the basis, Degeneracy, Unbalanced Problem

Module IV Assignment Problems(14 hours)

Assignment Problems, Generalized transportation problem, Summary of Transportation Algorithms.

Reference:

J.K.Sharma :Operations Research Theory and Applications (Macmillan Indian Ltd)

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
COMPLEMENTARY COURSE - OPERATIONS RESEARCH –
B.Sc MATHEMATICS (MODEL II)
THIRD SEMESTER
QUEUEING THEORY

3 hrs/week (Total Hrs : 54) 3 Credits

Syllabus

Text Book:

1. **K.V.Mital & C.Mohan :Optimization Methods in Operations Research and System Analysis (New Age International Private Limited)**
   Chapter 12
2. **J.K.Sharma :Operations Research Theory and Applications (Third Edition) (Macmillan)**
   Chapter 13 (Section 1 to 6) Chapter 16 (Sections 1 to 6)

Module I Theory of Games (16 hours)

Introduction, Matrix games, problem of game theory, Minimax theorem (Theorem 1 ,Theorem 2 , Corollary 1 and Corollary 2 without proof), Saddle Point, Strategies and Pay off. Theorems of Matrix Games (Theorem 3, Theorem 4, Theorem 5 and Theorem 6 without Proof), graphical solutions, Notion of Dominance, Rectangular game as an LP problem.

Text 1 Chapter 12
All Theorems without Proof.

Module II Project Management PERT & CPM (10 hours)

Introduction, Basic Difference between PERT & CPM, Significance of using PERT/CPM phases of Project Management, Project Planning Phase, Scheduling Phase, Project control Phase PERT/CPM, Network Components and Precedence Relationships, Rules of AOA Network Construction, Errors and Dummies in Network

Text 2 Chapter 13- Sections 13.1 to13.4

Module III Project Management PERT & CPM (Cont.)(14 hours)

Critical path analysis, Forward Pass Method, Backward pass method, Float(slack) of an activity and Event Critical Path, Project Scheduling with Uncertain Activity Times, Estimation of Project Completion Time.

Text 2 Chapter 13- Sections 13.5 to13.6
All Questions related to Probability Distributions are excluded

Module IV Queuing Theory: (14 hours)

Introduction, Essential features of a Queueing system, Calling Populations Characteristics (pdf of Poisson Distribution and Exponential Distribution Only), Queueing Process, Queue Discipline, Service Process, Performance Measures of a Queueing system, Transient – state and steady – state, Relationships among performance Measures(Formulae Only), Probability distributions Queueing systems, Distributions of Arrivals (Exponential Process), Distribution of Departure (pure Death Process), Distribution of Service Times Classification of Queueing Models, Solution of Queueing Models, Single serves Queueing Models(Derivations for Differential Difference Equations, System of Steady-State Equations, Sysytem of Difference Equations, Probability Density Functions of Waiting Time and Busy Period Distributions are excluded) , Performance Measures for Model I (Formulae Only)

Model I; {(M/M/1): (∞/ FCFS)}

Model II; {(M/M/1): (∞ / SIRO)}

Text 2 Chapter 16- Sections 16.1 to 16.5 Except Model III

All Questions related to Probability Distributions except pdf of Poisson Distribution and Exponential Distribution are excluded

Reference:

1. **Operations Research – Kanti Swarup – P.K.Gupta and Man Mohan (Sultan Chand & Sons)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	3	2	1	**9**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
COMPLEMENTARY COURSE - OPERATIONS RESEARCH –
B.Sc MATHEMATICS (MODEL II)
FOURTH SEMESTER
NON LINEAR PROGRAMMING

3 hrs/week (Total Hrs : 54) 3 Credits

Syllabus

Text Book:

K.V.Mital & C.Mohan :Optimization Methods in Operations Research and System Analysis ,3rd Edition, New Age International Private Limited
Chapters 6 and 8.

Module I Integer Programming (13 hours)

Introduction, ILP in two-dimensional space, General ILP and MILP problems, (Statements of Theorems 1, 2 and 3 only), Examples of section 2 continued, Cutting planes, Examples, Remarks on Cutting plane methods

Text 1 Chapter 6- Section 1 to 7 and all Theorems without Proof

Module II (14 hours)

Branch and Bound Method – Examples, Branch and bound method – General Description (Two variables Problems Only), The 0 – 1 variable Problems (Knapsack Problems excluded).

Text 1 Chapter 6- Section 8 to 10. Problems 8,11,12 and 14 in Problems VI are excluded.

Module III Kuhn-Tucker Theory and Non Linear Programming (15 hours)

Introduction, Lagrangian Function, Saddle Point, Relation Between saddle point of F(X,Y) and Minimal point of F(X) (Theorm1,2,3 and 4 Statement Only), Kuhn-Tucker conditions (Conditions Only- Derivations excluded), Graphical Method Problems.

Text 1 Chapter 8- Section 1 to 4 and all Theorems without Proof.

Module IV - Kuhn-Tucker Theory and Non Linear Programming(Cont.) (12 hours)

Quadratic Programming, Separable programming (Definition1 and 2. Derivation of this method is excluded), Problems of Quadratic Programming and Separable programming

Text 1 Chapter 8- Section 6 and 7

Reference:

1. **Operations Research Theory and Applications – J.K.Sharma (Macmillan)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	4	3	2	1	**10**
IV	2	1	1	1	**5**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
FIRST SEMESTER
COMPUTER FUNDAMENTALS

4 hrs/week / Theory **80 Marks 4 Credits**

Syllabus

Module I (20hours)

Fundamentals of Computers:

Definition of computer and Characteristics, Generations of computers, Types of Computer- Desktop, Laptop, Mainframe, Super Computer, work stations.

Number systems- Binary, Octal and Hexadecimal, Converting from one number system to another,decimal to a new base, converting to decimal from another bases, converting from base other than ten to base other than ten, short cut method for converting from binary to octal, octal to binary, binary to hexadecimal and hexadecimal to binary, Computer Codes (BCD, EBCDIC, ASCII)

Book of Study 1 chapters 1&3

Module II (15hours)

Hardware Components:

Logical Organization of a Digital Computer, Bit/Byte/Word, input unit ,Output unit ,Storage unit ,Arithmetic logic unit,Control unit ,CPU. Input devices – keyboard,point and draw devices, data scanning devices ,output devices-monitors ,printers,plotters.

(Chapter 4 & 9 of the text)

Module III (20hours)

Software Components:

Definition of software ,Types of software-system software -Application software,Logical system architecture,Software development steps. Machine language ,Assembly language,Highlevel language.Define Program,purpose of program,algorithms,flowcharts,flowchart symbols,flowcharting rules,advantages ang limitations of flowcharts.

Book of Study 1- chapters - 10,11,12

Module IV (15hours)

Boolean Algebra and Gates Networks

fundamental concepts of Boolean Algebra,Postulates of Boolean algebra, Theorems of Boolean algebra, Logic Gates- AND, OR, NOT, NAND, NOR, XOR and XNOR, logic circuits, converting expression to logic circuit, The universal NAND gate, universal NOR gate. Exclusive OR and equivalence functions, Simplification of Expressions.

Book of Study 1- chapter 5 Book of Study 2- chapters 2.1-2.8, 3.1

Module V (20hours)

Introduction to Computer Networks:

Uses – Physical Communication Media – Network Types – Network Topologies – Communication Protocols. Basic internet services- email,FTP,TELNET ,WWW

(Chapter 17 & 18 of the text)

Book of Study

1. Computer Fundamentals by P.K Sinha
2. M. Morris Mano and Michael D. Ciletti, Digital Design, 5th Edition, Pearson.

Reference

1. Introduction to Computer Science 2nd Edition, Rohit Khorana, Pearson Publishers
2. An introduction to Digital Computer design by V. Rajaraman and T. Radhakrishnan
3. Computer fundamentals by B. Ram
4. A First Course in Computers 2003, Saxena, VIKAS

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
FIRST SEMESTER

Software Lab:I Introduction to WEB Technologies

4 hrs/week/ Practical **80 Marks 3 Credits**

Syllabus

Getting Started With HTML:-
Basics of HTML- Document Body Text, Hyperlink, Adding more formatting, LISTS, Tables,, Frames, forms- MARQUEE. Cascading style sheets, Attributes specified to the style tag, CLASS, <SPAN> tag, <DIV> tag, LAYERS.
Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking Text as well as marquee Text.
2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal and External linking
3. Create HTML document with Table:
Some image here
4. Create Form with Input Type, Select and Text Area in HTML.
5. Create an HTML containing Roll No., student's name and Grades in a tabular form.
6. Create an HTML document (having two frames) which will appear as follows:
About
Department 1
Department 2
Department 3
This frame would show the
contents according to the link
clicked by the user on the left
frame.
7. Create an HTML document containing horizontal frames as follows:
Department Names (could be along with Logos)
Contents according to the Link clicked
8. Create a website of 6 – 7 pages with different effects as mentioned in above problems.
9. Create HTML documents (having multiple frames) in the following three formats:
Frame1
Frame2
Frame1
Frame2 Frame3
10. Create a form using HTML which has the following types of controls:
I. Text Box
II. Option/radio buttons
III. Check boxes
IV. Reset and Submit buttons

How PHP scripts work:-

The building blocks of PHP: variables, data types, arrays-basic array, associative array , multidimensional array; array functions, program control, type casting, regular expression. User-defined functions, built-in functions, Using files. Forms in PHP: Creating a simple input form, combining HTML & PHP code on a single page.

References:

1. Luke welling & Laura Thomson,"PHP and MySQL web Development", fourth edition, Pearson.
2. Chris Bates, Web Programming, 3 rd Edition; Pub: John Wiley & Sons
3. HTML Black Book, Steven Holzner, Dreamtech Publishers
4. PHP and MySQL for Dynamic Web Sites, Fourth Edition: Visual QuickPro Guide Kindle Edition by Larry Ullman.
5. PHP & MySQL in easy steps, Kindle Edition by Mike McGrath.

20 Experiments using HTML and PHP .

Scheme of Evaluation for Software Lab-I external is as follows

Division of Marks (Practical - 3 hours External)

First program - 25marks

Second program - 30 marks

Viva Voce -05marks

Lab Record (minimum of 20 Programs from each section) - 20 marks

Total Marks - 80 marks

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
SECOND SEMESTER

Object Oriented Programming with C++

4 hrs/week/ Theory **80 Marks 4 Credits**

Syllabus

Module I (15 hours)

Algorithms, Flow Charts - Symbols, Rules for making Flow chart, the object oriented technology, Key concept of object oriented programming, Advantages of OOP, structure of C++ program, Tokens, variables, data types, operators in C++, memory management operators, comments ,simple C++ programme, header files and libraries, unformatted console I/O operations, setw() manipulator.

Chapters 1,2,3&4

Module II (23 hours)

Decision statements, control loop structure, arrays

Functions : introduction, parts of a function, passing arguments, return by reference, returning more values, default arguments, const arguments, inline functions, function overloading, recursion

Chapter 7&8

Module III (18 hours)

Classes and Objects

Constructers and Destructors , Constructors- parameterized constructors-multiple constructors-constructors with default argument- copy constructor-dynamic constructorDestructors- calling Constructers and Destructors, Constructers and Destructors with static members.

Chapter 9

Module IV (16 hours)

Operator and overloading:

introduction, the keyword operator, overloading unary operator, operator return type, overloading binary operator, overloading with friend function, overloading assignment operator

Chapters 10

Module V (18hours)

Inheritance, Pointers-Virtual Functions a and Polymorphism

Files and Exception handling

Chapters 11,15,16&19

Book of Study:

1. Object Oriented Programming with C++ - E. Balagurusamy

Reference :

1. Programming with C++, Second edition by D Ravichandran, Tata McGraw- Hill.
2. Object Oriented Programming with C++- Mahesh Bhave and Sunil Pateker, Second edition, Pearson

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
SECOND SEMESTER

Software Lab:II Using C++

4 hrs/week/Practical **80 Marks 3 Credits**

Syllabus

1. Programs based on class, objects and manipulation of objects using member functions
2. Programs based on friend functions, passing objects as arguments to function.
3. Programs based on array of objects.
4. Programs based on function overloading, Default arguments.
5. Programs based on operator overloading (binary, unary) using member functions and friend functions.
6. Programs based on constructors, different types of constructors.
7. Programs based on Inheritance, different types of inheritance.

Scheme of Evaluation for Software Lab-II external is as follows
Division of Marks (Practical - 3 hours External)
First program - based on 1 to 5 - 25marks
Second program- based on 6 to 7 - 30 marks
Viva Voce -05marks
Lab Record (minimum of 20 Programs from each section) - 20 marks
Total Marks - 80 marks

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
THIRD SEMESTER

Database Management Systems

6hrs/week/Theory **80 Marks 4 Credits**

Syllabus

Module I (15 hours)

Basic concepts :

Database, need for DBMS, users, architecture of DBMS, data models, views of data, data Independence, , attributes, relationship attributes, relationship set, generalization, aggregation, structure of relations

Chapter 1

Module II (15 hours)

Data model :

conventional data models & systems, ER model, structure of relational Database and different types of keys;Data base languages.

Chapter 6

Module III(20 hours)

The relational algebra modification of database – Views. SQL – Basic structures , Data definition in SQL, Views and Queries in SQL, – Programming using SQL (Chapter 2 & 3 of the text)

Module IV (25 hours)

Object – Oriented data base, Object – Oriented data model, Object – oriented languages.
File structures – File organization – Organization of records in files – Data dictionary storage – Storage structure for object – Oriented database – Indexing & Hashing – Basic concepts – B+ - Tree Index file – Hashing functions

(Chapter 9 & 11 & 12 of the text)

Module V (15 hours)

Query processing – Overview – Section of operation – Sorting
Database architecture – Different type of systems – Network types.

(Chapter 13 & 20 of the text)

Text Books:

Abraham Silberschatz, Henry K. Korth, S, Sudarshan - Data Base System Concepts , McGraw Hill.

Reference:

1. R. Elmarsi, S. B. Navathe : Fundamentals of database system , Addison Wesley
2. Ullman : Principles of database systems

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
THIRD SEMESTER

Software Lab:III Using SQL

6hrs/week/Practical **80 Marks 4 Credits**

Syllabus

1. Data definition commands - CREATE, ALTER, DROP, Adding Constraints Primary key, foreign key, unique key, check, not null.
2. Basic SQL queries INSERT, SELECT, DELETE, UPDATE, Using multiple tables, ordering of rows using ORDER BY option, Set operations using UNION, EXCEPT, INTERSECT, Substring Comparison using LIKE operator, BETWEEN operator.
3. Complex Queries Nested Queries, EXISTS and UNIQUE/DISTINCT functions, NULL values, Renaming of attributes and Joining of tables, Aggregate functions and grouping.

Scheme of Evaluation for Software Lab-III external is as follows
Division of Marks (Practical - 3 hours External)
First program - based on 1 & 2 - 25marks
Second program- based on 3 - 30 marks
Viva Voce -05marks
Lab Record (minimum of 20 Programs from each section) - 20 marks
Total Marks - 80 marks

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
FOURTH SEMESTER

Operating System

6hrs/week/Theory **80 Marks 4 Credits**

Syllabus

Module I: (15 hrs.) INTRODUCTION TO OPERATING SYSTEM:

Operating System: Objectives and functions; Different views of an operating system; Types of operating systems-batch os, mainframe os, server os, multiprocessor os, personal computer os, handheld computer os, embedded os, sensor node os, real-time os, smart card os; Operating system services .

(Book of study 1 -Chapter 1)

Module II (25 hours)

PROCESSES MANAGEMENT & CPU SCHEDULING:

Process Management: Process concept- The process, Process states, Process Control Block; Process Scheduling- Scheduling Queues, Schedulers; CPU scheduling: Scheduling concepts- Process behaviour, When to schedule, Dispatcher; Scheduling Criteria; Scheduling algorithms-FCFS, SJFS, Priority scheduling, Round-robin scheduling

(Book of study 1 –Chapter2, 4)

Module III (15 hours)

Dealing with deadlocks:

introduction; deadlock characterization-deadlock conditions, resource allocation graph; deadlock prevention.

(Book of study 1 –Chapter 6)

Module IV(25 hours)

MEMORY MANAGEMENT BASICS:

Introduction- Address binding, Logical and physical address space, Program relocation; Storage allocation and management techniques-Contiguous storage allocation-fixed partition, variable partition; Non-contiguous storage allocation-paging, segmentation.

(Book of study 2 -Chapter 8)

Module V (15 hours)

FILE SYSTEMS:

Files: Basic concept- file attributes, file operations, file types, file structures, file access; directories-single-level directory system, two-level directory system, hierarchical directory system, directory operations.

(Book of study -Chapter11)

Book of study: 1. Rohit Khurana, Operating System, 2nd edition,Vikas Publishing house pvt ltd.
2. Ekta Walia, Operating Systems Concepts, Khanna Book Publishing

References:

1. Silberschatz, galvin, gagne, Operating System Concepts, 6th edition.
2. Gary Nutt, Nabendu Chaki, Sarmishtha Neogy,Operating Systems, 3rd edition, Pearson.

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
B.Sc MATHEMATICS (MODEL II)
VOCATIONAL COURSE- COMPUTER SCIENCE
FOURTH SEMESTER

Software Lab:IV Project

6hrs/week/ Practical **80 Marks 4 Credits**

Syllabus

Scheme of Evaluation for Software Lab – IV Project external is as follows:

Project demonstration or Presentation - 40 marks
Viva related to project - 20 marks
Project report with proper content and binding - 20 marks
Total Marks -80.

MATHEMATICS COMPLEMENTARY COURSES

TO B.Sc MODEL II PROGRAMMES

Semester	Title of the paper	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	**Partial Differentiation, Matrices, Trigonometry and Numerical Methods**	4	3	72	3 hrs	20	80
2	**Integral Calculus and Differential Equations**	4	3	72	3 hrs	20	80
3	**Vectors, Analytic Geometry and Abstract Algebra**	5	4	90	3 hrs	20	80
4	**Fourier Series , Integral Transforms, and Linear Algebra**	5	4	90	3 hrs	20	80

B.Sc. DEGREE PROGRAMME(UGCBCS 2016)

MATHEMATICS
COMPLEMENTARY COURSE TO B.Sc MODEL II
FIRST SEMESTER
MM1CMT01:Partial Differentiation, Matrices, Trigonometry and Numerical Methods

4 hours/week(Total Hrs : 72) 3 credits

Syllabus

Use of Non Programmable Scientific Calculator is Permitted

Text Books: -

1. **George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.**
2. **Frank Ayres Jr : Matrices, Schaum's Outline Series, TMH Edition.**
3. **S.L. Loney – Plane Trigonometry Part – II, AITBS Publishers India, 2009.**
4. **S.S . Sastry : Introductory methods of Numerical Analysis ,4th edition (Prentice Hall)**

Module I: Partial Differentiation (12 hrs)

Functions of several variables (Definitions only), Partial derivatives, The Chain Rule

Text 1 Chapter 14 (Sections 14.1(Definitions only) , 14.3 and 14.4)

Module II: Matrices (23hrs)

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skew-Hermitian matrices, Rank of Matrix , Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non homogenous equations using Augmented matrix and by Cramers Rule , Homogenous Equations, Characteristic Equation , Characteristic roots and Characteristic vectors of matices, Cayley Hamilton theorem and applications.

Text 2 Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module II are Excluded)

Module III: Trigonometry (23hrs)

Expansions of $\sin n\theta, \cos n\theta$, $\tan n\theta$, $\sin^n \theta$, $\cos^n \theta, \sin^n \theta \cos^m \theta$ Circular and hyperbolic functions, inverse circular and hyperbolic function. Separation into real and imaginary parts. Summation of infinite series based on C + iS method.

Text 3 (Relevant Sections of Chapters 3 to 5 and 8)

Module 1V: Numerical Methods(14 Hrs)

Bisection Method, Method of False position, Iteration Method, Newton - Raphson Method

Text 4 Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4 and 2.5)

Reference Books :

1. Shanti Narayan : Differential Calculus (S Chand)
2. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.
3. S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.
4. Muray R Spiegel, Advanced Calculus, Schaum's Outline series.
5. Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand.
6. David W. Lewis - Matrix Theory (Allied)

QUESTON PAPER PATTERN

Module	**Part A 2 Mark**	**Part B 4 Marks**	**Part C 6 Marks**	**Part D 10 Marks**	**Total**
I	3	3	1	-	**7**
II	3	2	1	2	**8**
III	4	2	2	1	**9**
IV	2	2	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME(UGCBCS 2016)
MATHEMATICS
COMPLEMENTARY COURSE TO B.Sc MODEL II
SECOND SEMESTER
MM2CMT02:INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

4 hours/week(Total Hrs : 72) 3 credits

Syllabus

Text Books: -

1. **George B. Thomas, Jr: Thomas' Calculus 12th Edition,(Pearson).**
2. **A. H Siddiqi , P Manchanada : A first Course in Differential Equations with Applications (Macmillan India Ltd 2006)**
3. **Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)**

Module I: Integral Calculus (15 hrs.)

Volumes using Cross-sections, Volumes using cylindrical shells, Arc lengths, Areas of surfaces of Revolution.

Text `1: Chapter 6 (Sections 6.1 to 6.4)

Module II: Multiple Integrals (17 hrs)

Double and iterated integrals over rectangles, Double integrals over general regions, area by double integration,Triple integrals in rectangular co-ordinates.

Text `1: Chapter 15 (Sections 15.1, 15.2, 15.3, 15.5)

Module III:Ordinary differential equations (20 Hrs)

Separable Variables , Exact Differential Equation, Equations reducible to exact form, Linear Equations , Solutions by Substitutions, Homogeneous equations and Bernoulli's Equations

Text 2: Chapter 2

Module IV:Partial Differential Equations (20 Hrs)

Surfaces and Curves in three dimensions, solution of equation of the form $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$. Origin of first order and second order partial differential equations, Linear equations of the first order, Lagrange's method

Text `3: Chapter 1 (Sections 1 and 3) Chapter 2 (Sections 1, 2 and 4)

Reference Books :

1. Shanti Narayan , P .K . Mittal :Integral Calculus (S. Chand & Company)
2. Differential Equations E. Rukmangadachari; Pearson
5. R. K. Ghosh, K. C. Maity – An Introduction to Differential Equations, New Central Books

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	2	1	1	**7**
III	3	2	2	1	**8**
IV	3	3	1	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
COMPLEMENTARY COURSE TO B.Sc MODEL II
THIRD SEMESTER
MM3CMT03:VECTORS, ANALYTIC GEOMETRY AND ABSTRACT ALGEBRA

5 hours/week(Total Hrs : 90) 4 credits

Syllabus

Text Books: -

1 George B. Thomas, Jr: Thomas' Calculus Twelth Edition, Pearson,
2 John B Fraleigh – A First course in Abstract Algebra (Seventh Edition)

Module I: Vector valued Functions (15 hrs)

Curves in space and their tangents, Arc length in space, Curvature and Normal Vectors of a curve , Directional Derivatives and Gradient Vectors**.**

Text `1: Chapter 13 (Sections 13.1, 13.3 and 13.4), Chapter 14 (Section 14.5 only)

Module II: Integration in Vector Fields (20hrs)

Line Integrals, Vector fields and line integrals: Work, Circulation and Flux. Path independence, Conservation Fields and Potential Functions , Green's theorem in Plane (Statement and problems only), Surface area and Surface integral, Stoke's theorem(Statement and Problems only), the Divergence theorem and a Unified theory (Statement and simple problems only).

Text `1: Chapter 16 (Sections 16.1 to 16.8)

Module III :Analytic Geometry (25 hrs)

Polar coordinates , Conic sections, Conics in Polar coordinates.

Text `1: Chapter 11 (Sections 11.3, 11.6, 11.7)

Module IV: Abstract algebra (30 hrs)

Groups, Subgroups, Cyclic groups, Groups of Permutations, Homomorphism, Rings and Fields

Text `2: Chapter 1 Sections 4, 5 and 6 (Proofs of theorems 5.17, 6.3, 6.6, 6.7, 6.10, 6.14 are excluded)
Chapter 2. Section 8 (Proofs of theorems 8.5, 8.15 and 8.16 are excluded)
Chapter 3. Sections 13.1, 13.2 and 13.3 only
Chapter 4. Section 18.1 to 18.8 and 18.14 to 18.18 only

Reference Books :

1 Harry F. Davis & Arthur David Snider: Introduction to Vector Analysis, 6th ed.,
2 Universal Book Stall, New Delhi.
3 Murray R. Spiegel: Vector Analysis, Schaum's Outline Series, Asian Student edition.
4 I.N Herstein - Topics in Algebra
5 Joseph A Gullian - A Contemporary Abstract Algebra,Narosa Pub.House.

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	3	2	1	**9**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME(UGCBCS2016)
MATHEMATICS
COMPLEMENTARY COURSE TO B.Sc MODEL II
FOURTH SEMESTER
MM4CMT04: FOURIER SERIES, INTEGRAL TRANSFORM AND LINEAR ALGEBRA

5 hours/week (Total Hrs: 90) 4 credits

Syllabus

1 **Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.**

2 **Richard Bronson, Gabriel B. Costa - Linear Algebra An Introduction (2nd Edition), Academic Press 2009, an imprint of Elsevier**

Module I: Fourier Series and Legendre Polynomials (25 hrs)

Periodic Functions, Trigonometric Series, Fourier Series, Functions of any period p = 2L, Even and Odd functions-Half-range Expansions.

A brief introduction to power series and power series method solving Differential equations. Legendre equation and Legendre Polynomials $P_n(x)$.

Text 1 (Sections 10.1, 10.2, 10.3, 10.4 and 4.1, 4.3)

Module II:Laplace Transforms (25 hrs)

Laplace Transform - Inverse Laplace Transform – Linearity - Shifting, Transforms of Derivatives and Integrals - Differential equations, Differentiation and Integration of Transforms, Laplace Transform: General formula (relevant formulae only), Table of Laplace Transforms (relevant part only). (proofs of all theorems in this module are excluded)

Text 1 (Sections 5.1, 5.2, 5.4, 5.8 and 5.9)

Module III:Vector Spaces (20 hrs)

Vectors, Subspace, Linear Independence, Basis and Dimension (proofs of theorem 1 in page 123 and theorem 4 in page 125 are excluded), Row Space of a Matrix (proofs of all theorems in this section are excluded), Rank of a Matrix (proofs of all lemmas and theorems in this section are excluded) **Text 2 Chapter 2 (Sections 2.1 to 2.6)**

Module IV: Linear Transformation (20 hrs)

Functions, Linear Transformations, Matrix Representations, Change of Basis (proofs of all theorems in this section are excluded), Properties of Linear Transformations (proofs of theorem 4 in page 206 and corollary 1 in page 209 are excluded).

Text 2 Chapter 3 (Sections 3.1 to 3.5)

Reference :

1 B.S. Grewal - Higher Engineering Mathematics

2 S. Kumaresan - Linear Algebra, A Geometric Approach, Prentice Hall of India, New Delhi,1999

3 Stephen Andrilli, David Hecker - Elementary Linear Algebra, Academic Press.

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	**8**
II	2	2	1	1	**6**
III	4	3	1	1	**9**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

~~~~~~

MAHATHMA GANDHI UNIVERSITY

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)

MATHEMATICS

(COMPLEMENTARY COURSES)

SYLLABUS

(effective from 2016 admission onwards)

COMPLEMENTARY COURSES

1. **Mathematics for B.Sc Physics / Chemistry / Petro chemicals / Geology/ Food Science and Quality Control / Electronics and Computer Maintenance (For Model I / Model II / Model III)**

Semester	Title of the paper	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	MM1CMT01: Partial Differentiation, Matrices, Trigonometry and	4	3	72	3 hrs	20	80
2	MM2CMT02: Integral Calculus and Differential	4	3	72	3 hrs	20	80
3	MM3CMT03: Vectors, Analytic Geometry and Abstract Algebra	5	4	90	3 hrs	20	80
4	MM4CMT04:Fourier Series , Integral Transforms, and Linear Algebra	5	4	90	3 hrs	20	80

B.Sc. DEGREE PROGRAMME(UGCBCS 2016)

MATHEMATICS
COMPLEMENTARY COURSE TO
PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCE AND QUALITY CONTROL/ELECTRONICS AND COMPUTER MAINTENANCE
(For Model I / Model II / Model III)
FIRST SEMESTER
MM1CMT01 : PARTIAL DIFFERENTIATION, MATRICES, TRIGONOMETRY AND NUMERICAL METHODS

4 hours/week(Total Hrs : 72) 3 credits

Syllabus

Use of Non Programmable Scientific Calculator is Permitted

Text Books: -

1. **George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.**
2. **Frank Ayres Jr : Matrices, Schaum's Outline Series, TMH Edition.**
3. **S.L. Loney – Plane Trigonometry Part – II, AITBS Publishers India, 2009.**
4. **S.S . Sastry : Introductory methods of Numerical Analysis ,4th edition (Prentice Hall)**

Module I: Partial Differentiation (12 hrs)

Functions of several variables (Definitions only), Partial derivatives, The Chain Rule

Text 1 Chapter 14 (Sections 14.1(Definitions only) , 14.3 and 14.4)

Module II: Matrices (23hrs)

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skew-Hermitian matrices, Rank of Matrix , Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non homogenous equations using Augmented matrix and by Cramers Rule , Homogenous Equations, Characteristic Equation , Characteristic roots and Characteristic vectors of matices, Cayley Hamilton theorem and applications.

Text 2 Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module II are Excluded)

Module III: Trigonometry (23hrs)

Expansions of $\sin n\theta, \cos n\theta$, $\tan n\theta$, $\sin^n \theta$, $\cos^n \theta, \sin^n \theta \cos^m \theta$ Circular and hyperbolic functions, inverse circular and hyperbolic function. Separation into real and imaginary parts. Summation of infinite series based on C + iS method.

Text 3 (Relevant Sections of Chapters 3 to 5 and 8)

Module 1V: Numerical Methods(14 Hrs)

Bisection Method, Method of False position, Iteration Method, Newton - Raphson Method

Text 4 Chapter 2 (Sections 2.1, 2.2, 2.3, 2.4 and 2.5)

Reference Books :

1. **Shanti Narayan : Differential Calculus (S Chand)**
2. **George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education.**
3. **S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.**
4. **Muray R Spiegel, Advanced Calculus, Schaum's Outline series.**
5. **Shanthi Narayanan & P.K. Mittal, A Text Book of Matrices, S. Chand.**
6. **David W. Lewis - Matrix Theory (Allied)**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	-	**7**
II	3	2	1	2	**8**
III	4	2	2	1	**9**
IV	2	2	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

Model Question Paper

Q.PCode:

Reg.No……

Name……..

B.Sc DEGREE (UGCBCS2016) EXAMINATION NOVEMBER……..

First Semester

MM1CMT01: PARTIAL DIFFERENTIATION, MATRICES, TRIGONOMETRY AND NUMERICAL METHODS

Common for B.Sc Physics / Chemistry / Petrochemicals / Geology / Food Science and Quality Control / Electronics and Computer Maintenance

(For Model I / Model II / Model III)

Time : 3 hours **Maximum Marks : 80**

(Use of Non Programmable Scientific Calculator is Permitted)

Part A: Short Answer Questions (Answer Any 9 Questions)

(2 Marks For Each Question)

1 What is a level surface. Provide an example of a level surface
2 Define the partial derivative of f(x,y) with respect to x at the point (x_0,y_0).
3 Write a formula for implicit differentiation using partial derivatives.
4 Check whether the matrix $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ is idempotent
5 Explain elementary Raw transformations
6 Define Rank of a matrix with example
7 Find the period of Sinh(x+iy)
8 Prove that $\sinh^{-1}x = \log(x+\sqrt{x^2+1})$
9 What is the imaginary part of cos (x - iy)
10 What is the real part of log(-3)
11 State the theorem behind the bisection method for finding solution of an equation
12 Find a real root of the equation $x^3 - x - 1 = 0$ using bisection method correct to two decimal places. **(9 x 2 = 18)**

Part B: Paragraph Answer Questions (Answer Any 6 Questions)

(4 Marks For Each Question)

13 Show that w = sin(x + ct) + cos (2x + 2ct) satisfies the wave equation.

14 Using chain rule to find $\frac{dw}{dt}$ where $w = x^2y - y^2$, $x = \sin t$, $y = e^t$.

15 Find $\frac{\partial^2 w}{\partial x \partial y}$ if $w = xy + \frac{e^y}{y^2+1}$

16 Obtain the row equivalent canonical matrix C of the matrix $\begin{bmatrix} 0 & 1 & 3 & -2 \\ 1 & 2 & 6 & 0 \\ 2 & 3 & 9 & 2 \\ 1 & 1 & 3 & 2 \end{bmatrix}$

17 Using Cramers rule solve the system of equations

$3x - 2y + z - 4 = 0$, $x + y - 2z = 2$, $3y - z + 1 = 0$

18 Express Cos4A in terms of powers of SinA.

19 Separate tan(x-iy) into real and imaginary parts

20 Find a real root (correct to 3 decimal places) of the equation $x^3 - 3x + 4 = 0$ by the method of False position.

21 Use Newton Raphson method to obtain a root (correct to 3 decimal places) of the equation $x^3 - 3x - 5 = 0$. **(6 x 4 = 24)**

Part C: Short Essay Type Questions (Answer Any 3 Questions)

(6 Marks For Each Question)

22(a) Verify that $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$ where $f(x,y) = x^y$

(b) If $f(x,y) = xy^2 + x^3y^3 + x^3y^4$, find f_{xx} , f_{xy} , f_{yx} and f_{yy} at the point (1,2)

23Reduce the matrix $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$ to normal form , hence find it's rank

24 If $\tan(A + iB) = x + iy$ prove that (i) $x^2 + y^2 - 2y\cot h2B + 1 = 0$

(ii) $x^2 + y^2 + 2x\cot 2A = 1$

25Find the sum of the series $\cos x \cos x + \cos^2 x \cos 2x + \cos^3 x \cos 3x + \ldots\ldots\ldots\ldots$

26 Use the method of iteration to find a positive root , between 0 and 1 , of $xe^x = 1$

(3 x 6 = 18)

Part D: Long Essay TypeQuestions(Answer any 2 Questions)

(10 Marks For Each Question)

27 (a) Explain system of homogenous equations. Write the conditions for which a homogenous system has trivial and nontrivial solutions

(b) Solve the System $x_1 + x_2 - 2x_3 + 3x_5 = 1$, $2x_1 - x_2 + 2x_3 + 2x_4 + 6x_5 = 2$

$3x_1 + 2x_2 - 4x_3 - 3x_4 - 9x_5 = 3$ using Matrix method

28 State Cayley-Hamilton theorem. Verify the theorem for the matrix A = $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

Hence find the inverse of the matrix A

29 (a) If u = log (tan($\frac{\pi}{4} + \frac{\theta}{2}$)) , prove that tanh$\frac{u}{2} = \tan\frac{\theta}{2}$

(b) Find the sum of $1 + \frac{1}{2}cos\theta + \frac{1.3}{2.4}cos2\theta + \frac{1.3.5}{2.4.6}cos3\theta + \cdots$

30 (a) Find the root of the equation $2x = \cos x + 3$, using iteration method correct to 3 decimal places.

(b) Find a double root of the equation f(x) = $x^3 - x^2 - x + 1 = 0$, choosing $x_0 = 0.8$ using generalized Newton's method. (2 x 10 = 20)

B.Sc. DEGREE PROGRAMME(UGCBCS 2016)

MATHEMATICS
COMPLEMENTARY COURSE TO
PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCE AND QUALITY CONTROL/ELECTRONICS AND COMPUTER MAINTENANCE
(For Model I / Model II / Model III)

SECOND SEMESTER
MM2CMT02 : INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

4 hours/week(Total Hrs : 72) **3 credits**

Syllabus

Text Books: -

1. **George B. Thomas, Jr: Thomas' Calculus 12th Edition,(Pearson).**
2. **A. H Siddiqi , P Manchanada : A first Course in Differential Equations with Applications (Macmillan India Ltd 2006)**
3. **Ian Sneddon – Elements of Partial Differential Equation (Tata Mc Graw Hill)**

Module I: Integral Calculus (15 hrs.)

Volumes using Cross-sections, Volumes using cylindrical shells, Arc lengths, Areas of surfaces of Revolution.

Text `1: Chapter 6 (Sections 6.1 to 6.4)

Module II: Multiple Integrals (17 hrs)

Double and iterated integrals over rectangles, Double integrals over general regions, area by double integration,Triple integrals in rectangular co-ordinates.

Text `1: Chapter 15 (Sections 15.1, 15.2, 15.3, 15.5)

Module III:Ordinary differential equations (20 Hrs)

Separable Variables , Exact Differential Equation, Equations reducible to exact form, Linear Equations , Solutions by Substitutions, Homogeneous equations and Bernoulli's Equations

Text 2: Chapter 2

Module IV:Partial Differential Equations (20 Hrs)

Surfaces and Curves in three dimensions, solution of equation of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$. Origin of first order and second order partial differential equations, Linear equations of the first order, Lagrange's method

Text `3: Chapter 1 (Sections 1 and 3) Chapter 2 (Sections 1, 2 and 4)

Reference Books :

1. **Shanti Narayan , P .K . Mittal :Integral Calculus (S. Chand & Company)**
2. **Differential Equations E. Rukmangadachari; Pearson**
3. **R. K. Ghosh, K. C. Maity – An Introduction to Differential Equations, New Central Books**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	2	1	1	**7**
III	3	2	2	1	**8**
IV	3	3	1	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)

MATHEMATICS
COMPLEMENTARY COURSE TO
PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCE AND QUALITY CONTROL/ELECTRONICS AND COMPUTER MAINTENANCE
(For Model I / Model II / Model III)
THIRD SEMESTER
MM3CMT03 : VECTORS, ANALYTIC GEOMETRY AND ABSTRACT ALGEBRA

5 hours/week(Total Hrs : 90) 4 credits

Syllabus

Text Books: -

1. **George B. Thomas, Jr: Thomas' Calculus Twelth Edition, Pearson,**
2. **John B Fraleigh – A First course in Abstract Algebra (Seventh Edition)**

Module I: Vector valued Functions (15 hrs)

Curves in space and their tangents, Arc length in space, Curvature and Normal Vectors of a curve , Directional Derivatives and Gradient Vectors**.**
Text `1: Chapter 13 (Sections 13.1, 13.3 and 13.4), Chapter 14 (Section 14.5 only)

Module II: Integration in Vector Fields (20hrs)

Line Integrals, Vector fields and line integrals: Work, Circulation and Flux. Path independence, Conservation Fields and Potential Functions , Green's theorem in Plane (Statement and problems only), Surface area and Surface integral, Stoke's theorem(Statement and Problems only), the Divergence theorem and a Unified theory (Statement and simple problems only).
Text `1: Chapter 16 (Sections 16.1 to 16.8)

Module III :Analytic Geometry (25 hrs)

Polar coordinates , Conic sections, Conics in Polar coordinates.
Text `1: Chapter 11 (Sections 11.3, 11.6, 11.7)

Module IV: Abstract algebra (30 hrs)

Groups, Subgroups, Cyclic groups, Groups of Permutations, Homomorphism, Rings and Fields
Text `2: Chapter 1 Sections 4, 5 and 6 (Proofs of theorems 5.17, 6.3, 6.6, 6.7, 6.10, 6.14 are excluded)
Chapter 2. Section 8 (Proofs of theorems 8.5, 8.15 and 8.16 are excluded)
Chapter 3. Sections 13.1, 13.2 and 13.3 only
Chapter 4. Section 18.1 to 18.8 and 18.14 to 18.18 only

Reference Books :

1. **Harry F. Davis & Arthur David Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.**
2. **Murray R. Spiegel: Vector Analysis, Schaum's Outline Series, Asian Student edition.**
3. **I.N Herstein - Topics in Algebra**
4. **Joseph A Gullian - A Contemporary Abstract Algebra,Narosa Pub.House.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	3	2	1	**9**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME(UGCBCS2016)

MATHEMATICS
COMPLEMENTARY COURSE TO
PHYSICS/CHEMISTRY/PETROCHEMICALS/GEOLOGY/FOOD SCIENCE AND QUALITY CONTROL/ELECTRONICS AND COMPUTER MAINTENANCE
(For Model I / Model II / Model III)

FOURTH SEMESTER
MM4CMT04 : FOURIER SERIES, INTEGRAL TRANSFORM AND LINEAR ALGEBRA

5 hours/week (Total 90 hours) 4 credits

Syllabus

1. **Erwin Kreyszig : Advanced Engineering Mathematics, Eighth Edition, Wiley, India.**
2. **Richard Bronson, Gabriel B. Costa - Linear Algebra An Introduction (2nd Edition), Academic Press 2009, an imprint of Elsevier**

Module I: Fourier Series and Legendre Polynomials (25 hrs)

Periodic Functions, Trigonometric Series, Fourier Series, Functions of any period p = 2L, Even and Odd functions-Half-range Expansions.

A brief introduction to power series and power series method solving Differential equations. Legendre equation and Legendre Polynomials $P_n(x)$.

Text 1 (Sections 10.1, 10.2, 10.3, 10.4 and 4.1, 4.3)

Module II:Laplace Transforms (25 hrs)

Laplace Transform - Inverse Laplace Transform – Linearity - Shifting, Transforms of Derivatives and Integrals - Differential equations, Differentiation and Integration of Transforms, Laplace Transform: General formula (relevant formulae only), Table of Laplace Transforms (relevant part only). (proofs of all theorems in this module are excluded)

Text 1 (Sections 5.1, 5.2, 5.4, 5.8 and 5.9)

Module III:Vector Spaces (20 hrs)

Vectors, Subspace, Linear Independence, Basis and Dimension (proofs of theorem 1 in page 123 and theorem 4 in page 125 are excluded), Row Space of a Matrix (proofs of all theorems in this section are excluded), Rank of a Matrix (proofs of all lemmas and theorems in this section are excluded)

Text 2 Chapter 2 (Sections 2.1 to 2.6)

Module IV: Linear transformation (20 hrs)

Functions, Linear Transformations, Matrix Representations, Change of Basis (proofs of all theorems in this section are excluded), Properties of Linear Transformations (proofs of theorem 4 in page 206 and corollary 1 in page 209 are excluded).

Text 2 Chapter 3 (Sections 3.1 to 3.5)

Reference :

1. **B.S. Grewal - Higher Engineering Mathematics**
2. **S. Kumaresan - Linear Algebra, A Geometric Approach, Prentice Hall of India, New Delhi,1999**
3. **Stephen Andrilli, David Hecker - Elementary Linear Algebra, Academic Press.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	2	1	**8**
II	2	2	1	1	**6**
III	4	3	1	1	**9**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

2. Mathematics for B.C.A

Semester	Title of the paper	Number of hours per week	Total Credits	Total hours/ semeste	University Exam Duration	Marks	
						Internal	External
1	Discrete Mathematics (I)	4	4	72	3 hrs	20	80
2	Discrete Mathematics (II)	4	4	72	3 hrs	20	80
4	Operations Research	4	4	72	3 hrs	20	80

3. Mathematics for B.Sc Computer Science

Semester	Title of the paper	Number of hours	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Discrete Mathematics (I)	4	4	72	3 hrs	20	80
2	Discrete Mathematics (II)	4	4	72	3 hrs	20	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc COMPUTER SCIENCE/ BCA)
FIRST SEMESTER
DISCRETE MATHEMATICS (I)

4 hrs/week (Total Hrs : 72) 4 Credits

Syllabus

Text Books

Kenneth H Rosen ; Discrete Mathematics And Its Applications ; 6th Edition ;

Tata Mc Graw-Hill Publishing Company Limited

Module I Logic (18 hrs)

Propositional Logic, Propositional Equivalence, Predicates And Quantifiers and Rules of Inference

Chapter 1 (Sections 1.1, 1.2, 1.3 and 1.5 only)

Module II Basic Structures (15 hrs)

Sets, Set Operations, Functions, Sequences And Summations

Chapter 2 (Sections 2.1, 2.2, 2.3 and 2.4)

Module III Number Theory And Cryptosystem (20 hrs)

The Integers And Division, Primes And Greatest Common Divisors , Applications of Number Theory.

Chapter 3 (Sections 3.4, 3.5 and 3.7 Only)

Module IV Relations (19 hrs)

Relations And Their Properties, Representing Relations, Equivalence Relations, Partial Orderings.

Chapter 7 (Sections 7.1, 7.3, 7.5 and 7.6)

References

1. **Clifford Stien, Robert L Drysdale, KennethBogart ; Discrete Mathematics for Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd**
2. **Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
3. **Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson Education; Dorling Kindersley India Pvt. Ltd**
4. **Richard Johnsonbaugh; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
5. **Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc COMPUTER SCIENCE/ BCA)
SECOND SEMESTER
DISCRETE MATHEMATICS (II)

4 hrs/week (Total Hrs : 72) 4 credits

Syllabus

Text Books

1. **Kenneth H Rosen ; Discrete Mathematics And Its Applications ; 6th Edition ;**

   Tata Mc Graw-Hill Publishing Company Limited

2. **Frank Ayres Jr : Matrices , Schaum's Outline Series , TMH Edition.**

Module I Graphs (18 hrs)

Graphs and Graph Models, Graph Terminology and SpecialTypes of Graphs,Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths.

Text 1 Chapter 8 (Sections 8.1, 8.2, 8.3, 8.4 and 8.5 only)

Module II Trees (17 hrs)

Introduction to Trees, Application of Trees, Tree Traversal, and Spanning Trees.

Text 1 Chapter 9 (Sections 9.1, 9.2, 9.3 and 9.4 only)

Module III Boolean Algebra (17 hrs)

Boolean Function, Representing Boolean Functions and Logic Gates

Text 1 Chapter 10 (Sections 10.1, 10.2 and 10.3 only)

Module IV Matrices (20 hrs)

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skew-hermitian matrices. Rank of Matrix , Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non homogenous equations using Augmented matrix and by Cramers Rule , Homogenous Equations, Characteristic Equation , Characteristic roots and Characteristic vectors of matix , Cayley Hamilton theorem and applications.

Text 2. Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module IV are Excluded)

References

1. **Clifford Stien, Robert L Drysdale, KennethBogart ; Discrete Mathematics for Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd**
2. **Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
3. **Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson Education; Dorling Kindersley India Pvt. Ltd**
4. **Richard Johnsonbaugh; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt. Ltd**
5. **Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	3	2	1	**9**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO BCA)
FOURTH SEMESTER

OPERATIONS RESEARCH

4 hrs/week **4 credits**

Syllabus

Text Book:

Belly E Gillet – Introduction to Operations Research (A Computer Oriented Arithmetic Approach) (Tata Mc. Graw Hill)

MODULE I : Basics of O.R. (10hrs)

The nature and uses of O.R- mach concepts and approaches of O.R- models in O.R.

MODULE II : Linear programming problems(25 hrs)

Mathematical formulation of a L.P.P. General linear programming problems, solution of a L.P.P, graphical method for solving a L.P.P.

Simplex Method: Stack and surplus variables- reduction of any feasible solution to a basic feasible solution. Unbounded solution. Optimality conditions- artificial variable techniques- Big M method.

MODULE III : Transportation & assignment Problems (20 hrs)

Transportation model- solution by simplex method- north west corner rule, lowest cost entry method, vogel method, MODI method, degeneracy, assignment problems.

MODULE IV: Game Theory(17 hrs)

Two persons zero sum games, pure and mixed strategy with saddle point, solution of pure strategy games, solution of mixed strategy problems by arithmetic method. Principle of dominance.

Reference Books:

1. **V.K Kapoor – Operations Research**
2. **Kanti Swarup , P.K Gupta and Man Mohan – Operations Research, Sultan Chand & Sons**
3. **K.V Mital and C. Mohan – Optimization Methods in Operations Research and System Analysis**
4. **J. K Sharma – Operations Research Theory and Applications , Macmillan**
5. **B. N. Mishra, B. K. Mishra – Optimization Linear Programming Ane Books**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	2	1	1	1	**5**
II	4	3	2	1	**10**
III	3	3	1	1	**8**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

4. Mathematics for B.Sc Electronics

Semester	Title of the paper	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Partial Differentiation, Differential Equations and Vector Calculus	4	4	72	3	20	80
2	Graph Theory, Fourier Series and Integral Transform	4	4	72	3	20	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc ELECTRONICS)
FIRST SEMESTER

PARTIAL DIFFERENTIATION, DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

4 hrs/week (Total Hrs : 72) **3 Credits**

Syllabus

Aim of the course

To achieve a deep knowledge in partial differentiation, solutions of ordinary and partial differential equations and vector calculus.

Text Books

1. **B . S Grewal – Higher Engineering Mathematics, Khanna publishers**
2. **Erwin Kreyszig : Advanced Engineering Mathematics – Eighth edition, Wiley, India**

Module I Partial differentiation (20 hrs)

Functions of two or more variables, Partial derivatives, Homogeneous functions, Total derivatives, Geometrical interpretation, Tangent plane and normal to a surface, Change of variables, Taylor's theorem for functions of two variables.

Text 1 (Sections 5.1 to 5.7 and 5.9)

Module II Ordinary differential equations (15 hrs)

Linear and Bernoulli's equations, Exact differential equation, Linear differential equations with constant coefficients, simultaneous equations with constant coefficients.

Text 1 (Relevant sections)

Module III Partial differential equations (12 hrs)

Formulation of partial differential equations by elimination of arbitrary constants and by elimination of arbitrary function, Solution of first order equations using Lagrange's method.

Text 1 (Relevant sections)

Module IV Vector calculus (25 hrs)

Basic concepts of vector differentiation, Gradient of a scalar field, Divergence of a vector point function, Curl of a vector point function, A quick review of line integrals, surface integrals and triple integrals.

Text 1 and 2 (Relevant sections)

References

1. **G.F Simmons – Differential equation with applications and historical notes (Tata McGraw Hill)**
2. **C. P Janardananpillai and V. G Vijayalakshmi – ABC Series in main mathematics, Kalyani publishers.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	2	1	1	1	**5**
IV	4	3	2	**1**	**10**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc ELECTRONICS)
SECOND SEMESTER

GRAPH THEORY, FOURIER SERIES AND INTEGRAL TRANSFORMS

4 hrs/week (Total Hrs : 72) **3 Credits**

Syllabus

Aim of the course

To achieve a deep knowledge in Graph theory, Fourier series and Integral transform.

Text Book

1. **K. B Datta – Matrix and linear algebra**
2. **NarasinghDeo – Graph theory with applications to engineering and computer science, Narosa publishing house.**
3. **B . S Grewal – Higher Engineering Mathematics, Khanna publishers.**

Module I Matrices (18 hrs)

Rank of a matrix, normal and canonical form, System of linear equations, Consistency and solution of system of linear equations, Eigen values, Eigen vectors, Cayley Hamilton theorems, Hermitian, Skew – Hermitian, unitary matrices.

Text 1 (Relevant sections)

Module 2 Graph Theory (18 hrs)

Graph theory terminology, Paths and circuits, Types of graphs, Representation of graphs using matrices, Hamiltanion paths and circuits, Trees and spanning trees, Minimal spanning trees and Prim's algorithm

Text 2 (Relevant sections)

Module 3 Fourier Series (18 hrs)

Periodic function, Odd and even functions, Fourier series, Half range Fourier series

Text 3 (Relevant sections)

Module 4 Integral Transforms Series (18 hrs)

Laplace transform, Shifting properties, Transform of derivatives and integrals, Inverse Laplace transforms, Solutions of differential equations by Laplace transform, Convolution theorem.

Text 3 (Relevant sections)

References

1. **Erwin Kreyszig : Advanced Engineering Mathematics**
2. **C. R Foulds – Graph theory Applications, Narosa publishing House**
3. **Frank Ayres JR, Matrices – Schaum's outline series, TMH Edition.**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	2	1	**8**
III	3	2	1	1	**7**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

5. Mathematics for B.A Economics

Semesters	Title of the paper	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Graphing functions, Equations and Differential Calculus	6	4	108	3 hrs	20	80
2	Matrix,Exponential- Logarithmic Functions And Integral Calculus	6	4	108	3 hrs	20	80

B.A DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.A. ECONOMICS)
FIRST SEMESTER
GRAPHING FUNCTIONS, EQUATIONS AND DIFFERENTIAL CALCULUSTIONS

6 hrs/week (Total Hrs :108) 4 Credits

Syllabus

Text Book

Edward T Dowling : Theory and Problems of Mathematical Methods for Business and Economics, Schaum's Outline Series ,McGraw Hill (1993)

Module I Equations and Graphs Equations (20 hrs)

Review - (Exponents, polynomials, factoring, fractions, radicals, order of mathematical operations.) Cartesian Co-ordinate system, linear equations and graphs slopes intercepts. The slope intercept form. Determining the equation of a straight line. Applications of line equations in business and economics.

Module II Functions Concepts (23 hrs)

Functions Concepts and definitions- graphing functions. The algebra of functions. Applications of linear functions for business and economics. Solving quadratic equations Facilitating non linear graphing. Application of non linear functions in business and economics. System of equations Introduction, graphical solutions. Supply-demand analysis. Break-even analysis. Elimination and substitution methods. IS-LM analysis. Economic and mathematical modeling. Implicit functions and inverse functions.

Module III Differential calculus (40 hrs)

Limits and continuity. Evaluation of limit of a function. Algebraic limit. The derivative and the rules of differentiation: The slope of curvilinear function. Derivative notation. Rules of differentiation. Higher order derivatives. Derivative of Implicit functions. Applications of derivatives. Increasing and decreasing functions. Concavity and convexity. Relative extrema. Inflection points. Curve sketching. Optimisation of functions. The successive derivative test. Marginal concepts in economics. Optimising economic functions of business. Relation among total, marginal and average functions.

Module IV Linear programming (25 hrs)

Linear programming problem (LPP), Mathematical Formulation of LPP. Basic solution, Feasible solution and Region of feasible solution of an LPP. The extreme point theorem. Solving Maximisation and Minimisation problems using graphical method.

Reference Book :

1. Taro Yaman : Mathematical Economics

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	1	1	**8**
II	3	2	1	0.5	**6.5**
III	3	3	1	1.5	**8.5**
IV	2	2	2	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.A DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.A. ECONOMICS)
SECOND SEMESTER
MATRIX, EXPONENTIAL-LOGARITHMIC FUNCTIONS AND INTEGRAL CALCULUS

6 hrs/week (Total Hrs :108) 4 Credits

Syllabus

Text Book

Edward T Dowling : Theory and Problems of Mathematical Methods for Business and Economics, Schaum's Outline Series ,McGraw Hill (1993)

Module I: Matrix Algebra (30 hrs)

Introduction. Definition and terms. Addition and subtraction of matrices. Scalar multiplication. Vector multiplication. Multiplication of matrices. Matrix expression of a system of linear equations. Augmented matrix. Row operation. Gaussian method of solving linear equations. Solving linear equations with. Matrix algebra Determinants and linear independence. Third order determinants. Cramer's rule for solving linear equations. Inverse matrices. Gaussian method of finding an inverse matrix. Solving linear equations with an inverse matrix. Business and Economic applications. Special determinants.

Module II Exponential and logarithmic functions (20 hrs)

Exponential functions. Logarithmic functions properties of exponents and logarithms. Natural exponential and logarithmic functions. Solving natural exponential and logarithmic functions. Logarithmic transformation of non linear functions. Derivatives of natural exponential and logarithmic functions. Interest compounding. Estimating growth rates from data points.

Module III Integral calculus (35 hrs)

Integration rules for indefinite integrals. Integration by substitution. Integration by parts. The definite integral. The fundamental theorems of calculus. Properties of definite integrals. Area under a curve. Area between curves. Present value of cash flow consumer's and producers surplus.

Module IV Calculus of Multivariable functions (23 hrs)

Functions of several independent variables. Partial derivatives. Rules of partial differentiation. Second – order partial derivatives. Optimization of multivariable functions. Constrained optimization with Lagrange Multipliers. Income determination Multipliers. Optimization of multivariable functions in

business and economics constrained optimization of multivariable economic functions. Constrained optimization of Cobb Douglas production functions.

Reference Book

1. Taro Yaman : Mathematical Economics

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	5	3	1	1	**10**
II	2	2	1	0	**5**
III	3	2	2	2	**9**
IV	2	2	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

6. Mathematics for B.Sc Statistics

Semester	Title of the paper	Number of hours per week	Total Credits	Total hours/ semester	University Exam Duration	Marks	
						Internal	External
1	Differential Calculus, Logic And Boolean algebra	4	3	72	3 hrs	20	80
2	Integral Calculus And Trignometry	4	3	72	3 hrs	20	80
3	Vector Calculus, Differential equations And Laplace Transform	5	4	90	3 hrs	20	80
4	Abstract algebra, Linear Algebra, Theory of Equations, Special functions	5	4	90	3 hrs	20	80

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc STATISTICS)
FIRST SEMESTER

DIFFERENTIAL CALCULUS, LOGIC AND BOOLEAN ALGEBRA

4 hrs/week (Total Hrs : 72) **3 credits**

Syllabus

Text Books

1. Thomas and Finney: Calculus and Analytic Geometry, 9th Edition (Addison –Wesley)

2. Schaum's outline series - Discrete mathematics, second edition

Module I Differential Calculus (22 hrs)

Rates of change and limits, calculating limits using the limit laws, the precise definition of a limit, one sided limits and limits at infinity**,** derivative of a function, differentiation rules, the derivative as a rate of change, derivatives of trigonometric functions, the chain rule and parametric equations, implicit differentiation.

Text 1 Sections 2.1 – 2.4, 3.1 – 3.6

Module II Application of derivatives (15 hrs)

Extreme values of functions, The Mean Value Theorem, Monotonic functions and the first derivative test.

Text 1 Sections 4.1 - 4.3

Module III Partial Derivatives (15 hrs)

Functions of several variables (Definition only), Partial derivatives, The Chain Rule

Text 1 Sections 14.3 - 14.4

Module 1V Logic and Boolean Algebra (20 hrs)

Proposition, compound propositions, basic logical operations, Propositions and truth tables, Logical equivalence, Algebra of propositions, Conditional and biconditional, Arguments, Propositional functions, Quantifiers

Text 2 sections 4.1 to 4.12

Boolean Algebra: Definitions, theorems, duality, switching circuit

Text 2 sections 15.1, 15.2, 15.3, 15.4, 15.10

Reference Books :

1. **Shanty Narayan : Differential Calculus (S Chan)**
2. **George B. Thomas Jr. and Ross L. Finney: Calculus, LPE, Ninth edition, Pearson Education.**
3. **S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.**
4. **Murray R Spiegel, Advanced Calculus, Schaum's Outline series**
5. **Robert.R.Stoll-Set theory And Logic (Eurasia Publishers,N.Delhi)**
6. **B.S.Vatssa-Discrete Mathematics-Third edition**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	1	1	**7**
IV	3	2	2	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc STATISTICS)
SECOND SEMESTER

INTEGRAL CALCULUS AND TRIGONOMETRY

4 hrs/week (Total Hrs : 72) **3 credits**

Syllabus

Text Books: -

1.George B. Thomas, Jr: Thomas' Calculus Eleventh Edition, Pearson, 2008.

2.S.L. Loney – Plane Trigonometry Part – II, AITBS Publishers India, 2009.

Module I : Integral Calculus(15 hrs)

A quick review of indefinite integral as anti derivative. The Definite integral. The fundamental theorem of Calculus
(Section 5.3 and 5.4 of Text -1).

Module II Application of Integrals (20hrs)

Substitution and area between curves, Volumes by slicing and rotation about an axis (disc method only), Lengths of plane curves, Areas of surfaces of revolution
(Section 5.6, 6.1, 6.3, 6.5 of Text - 1),

Module III Multiple Integrals(17 hrs)

Double Integrals, area of bounded region in plane only, Double Integrals in Polar form, Triple integrals in rectangular co-ordinates, (finding volume excluded)
(As in Sections 15.1, 15.2, 15.3, 15.4 of Text - 1)

Module 1V Trigonometry(20hrs)

Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin^n \theta$, $\cos^n \theta$, $\sin^n \theta \cos^m \theta$ Circular and hyperbolic functions, inverse circular and hyperbolic function. Separation into real and imaginary parts. Summation of infinite series based on C + iS method. (Geometric, Binomial, Exponential, Logarithmic and Trigonometric series)
(Relevant Sections in Chapter 3 – 5 and Chapter 8of Text 2)

Reference Books :

1. George B. Thomas Jr. and Ross L. Finney : Calculus, LPE, Ninth edition, Pearson Education

2. Shanti Narayan , P .K . Mittal :Integral Calculus (S. Chand & Company.

3.S.S. Sastry, Engineering Mathematics, Volume 1, 4th Edition PHI.

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	4	2	2	1	**9**
II	2	2	1	1	**6**
III	3	2	1	1	**7**
IV	3	3	1	1	**8**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE TO B.Sc STATISTICS)
THIRD SEMESTER

VECTOR CALCULUS, DIFFERENTIAL EQUATIONS

LAPLACE TRANSFORM

5 hrs/week (Total Hrs : 90) **4 credits**

Syllabus

Text Books

1. **Erwin Kreyszig- Advanced Engineering Mathematics, Eighth Edition, Wiley, India.**
2. **A. H Siddiqi , P Manchanada : A first Course in Differential Equations with Applications (Macmillan India Ltd 2006)**

Module I Vector Differential Calculus (20hrs)

A quick Review of vector algebra, Inner product and vector product in R^2 and R^3. Vector and scalar functions and Fields, Derivatives, Curves, Tangents, Arc Length, Velocity and acceleration, Gradient of a scalar field; Directional Derivative, Divergence of a vector field, Curl of a Vector Field.

Text 1 Sections 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.9, 8.10, 8.11.

Module II Vector Integral Calculus (25 hrs)

Line Integrals, Independence of path, Green's Theorem in the Plane (without proof), Triple Integrals, Divergence theorem of Gauss and Stoke's theorem (without proofs).

Text 1 Sections 9.1, 9.2, 9.4, 9.7, 9.9, 9.10

Module III Ordinary differential equations (35 Hrs)

Introduction to Differential Equations , Exact equations, Homogenous Equations, Non-homogenous Equations, Reduction of Order, Solution of Homogenous Linear Equations with Constant Coefficients.

Text 2: Chapter 1- Sections 1.1,1.2; Chapter 2- Section 2.2;
Chapter 5 – Section 5.2, 5.3, 5.4, 5.5.

Module IV Laplace Transform (10 Hrs)

Definition and Fundamental Properties of the Laplace Transform, The Inverse Laplace Transform, Shifting Theorems and Derivative of Laplace Transform.

Text 2 Chapter 9 – Section 9.1,9.2, 9.3

Reference Books:

1. **Shanti Narayan , P .K . Mittal :Vector Calculus (S. Chand & Company)**
2. **Harry F. Davis & Arthur David Snider: Introduction to Vector Analysis, 6th ed., Universal Book Stall, New Delhi.**
3. **Murray R. Spiegel: Vector Analysis, Schaum's Outline Series, Asian Student edition.**
4. **Murray : Differential Equations (Macmillan)**
5. **N.P.Bali, Dr.N.Ch.Narayana Iyengar-Engineering mathematics - Laxmi Publications**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	3	1	1	**8**
II	3	2	1	1	**7**
III	3	2	2	1	**8**
IV	3	2	1	1	**7**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

B.Sc. DEGREE PROGRAMME (UGCBCS 2016)
MATHEMATICS
(COMPLEMENTARY COURSE B.Sc TO STATISTICS)
FOURTH SEMESTER

ABSTRACT ALGEBRA, LINEAR ALGEBRA, THEORY OF EQUATIONS, SPECIAL FUNCTIONS

5 hrs/week (Total Hrs : 90) **4 credits**

Syllabus

Text Books

1. **John B Fraleigh - A first course in Abstract Algebra(7th Edition)Pearson Education**
2. **Erwin Kreyszig - Advanced Engineering Mathematics, 8th Edition, Wiley, India**
3. **N.P.Bali, Dr.N.Ch.Narayana Iyengar.-Text book on Engineering mathematics,Laxmi publications**

Module I Abstract algebra (20hrs)

Groups, definitions and examples. Elementary properties, finite groups and sub groups. Permutations.

Text 1 Part 1 – Section 4 and 5; Section 8 (8.1 to 8.10)

Module II Linear Algebra (35 hrs)

A quick review of the fundamental concepts of matrices, Matrix Multiplication(excluding by linear transformation) Linear system of equations, Rank of a Matrix, Linear dependence and independence of vectors (exluding vector space, dimension and basis),Solution of linear systems, Determinants, Cramer's rule, Characteristic roots and characteristic vectors. Cayley-Hamilton theorem (statement only), Symmetric ,Skew symmetric and orthogonal matrices, Complex matrices, Hermitian,Skew- Hermitian and unitary matrices,(definitions and examples only)

Text 2 Sections 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 7.1, 7.3, 7.4

Module III Theory of Equations (20 hrs)

Statement of Fundamental theorem of Algebra, Relation between roots and coefficients, Transformation of equations, Reciprocal equations, Cardon's method, Descarte's method.

Text 3 chapter 2

Module IVSpecial functions (15 hrs)

Beta and Gamma functions, Reduction formula for gamma. Relation between beta and gamma functions. Problems related to these functions.

Text 3 Chapter 15

Reference Books:

1. **I.N.Herstien-Topics in Algebra**
2. **K.V.Mittal-Optimisation methods in operations research and system analysis**
3. **Kenneth Hoffman, Ray Kunze-Linear Algebra (second edition) prentice-Hall India**
4. **Thunter – An elementary treatise on the Theory of Equations with examples**

QUESTON PAPER PATTERN

Module	Part A 2 Mark	Part B 4 Marks	Part C 6 Marks	Part D 10 Marks	Total
I	3	2	1	1	**7**
II	3	4	2	1	**10**
III	3	2	1	1	**7**
IV	3	1	1	1	**6**
Total No. of Questions	**12**	**9**	**5**	**4**	**30**
No. Questions to be answered	**9**	**6**	**3**	**2**	**20**
Total Marks	**18**	**24**	**18**	**20**	**80**

~~~~~~