24026954

QP CODE: 24026954

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, OCTOBER 2024

Third Semester

B.Sc Mathematics Model II Computer Science

COMPLEMENTARY COURSE - MM3CMT02 - MATHEMATICS - OPERATIONS RESEARCH - QUEUEING THEORY

2017 Admission Onwards

F13C3444

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Define a Play.
2. State Minmax Theorem.
3. Define the term Pure Strategy.
4. Write the necessary and sufficient condition for the existence of Saddle Point in a matrix.
5. Define the term Event.
6. Define Independent Float.
7. What can you understand when total float is Zero?
8. How can you identify a critical path in a network diagram ?
9. Define traffic intensity.
10. Write the formula for expected number of customers in the system.
11. Write the formula for expected number of customers in the queue.
12. Write the formula for Probability that the number of customers n in the system greater than or equal a given number k.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Explain Problem of Game Theory with an example.

14. Solve graphically.

$$\begin{bmatrix} 2 & 7 \\ 3 & 5 \\ 11 & 2 \end{bmatrix}$$

15. Listed in the table are the activities and sequencing required in the computation of a bank branch.Draw the network diagram of activities associated with the project.

Activity	Description	Predecessor Activity
A	Preparation/Deliberations in the department	-
B	Dialogue with the union	A
C	Discussion/Approval/Sanction of local management	A
D	Customer education	B
E	Preparing specifications for the system	C
F	Selection of staff	B
G	Order/Acquisition of system	D,E
H	Alterations in the branch premises	C
I	Training of staff	F
J	Wiring/Power-supply setup of the branch	H
K	Transition	G,I,J
L	Parallel run	K

16. The sales manager of Domestic Products Limited was informed by R\&D department about the completion of the prototype of a particular product.He consulted the production manager on the time taken to produce the first batch of the product,which is needed for demonstration in his sales promotion programme.He also decided to invite a few industrial representatives to the demonstration of the new product and through them to launch in the market.The various activities involved in this new project and through them to launch it in the market.The various activities involved in this marketing project,their descriptions,estimated durations and immediate predecessors are given below.

Activity	Description	Duration(Days)	Predecessors
A	Collect data on specifications and capabilities	4	-
B	Prepare operation manual	4	A
C	Chart out promotion programme	4	B
D	Make copies of manual and promotion material	9	B
E	Produce first batch for demonstration	16	B
F	Prepare list of press representatives	2	C
G	Chief executive's conference with managers	1	C
H	Press representatives reach Bombay	2	F,G
I	Promotional meetings	4	D,H
J	Product demonstration	2	E,I
K	Press representatives return home	2	J

1. Draw the network diagram for the project
2. Identify the critical path,What is the maximum time required to complete the project.
3. Find the total float and free float for all the noncritical activities.

17. Explain Backward Pass Method.

18. A reactor and storage tank are interconnected by a insulated process line that needs periodic replacement.There are values along the lines and at the terminals and these need replacing as well.No pipe and valves are in stock.Accurate,as built,drawings exist and are available.This line is overhead and requires scaffolding.Pipe sections can be shop-fabricated at the plant.Adequate craft labour is available.You are the maintenance and construction superintendent responsible for this project.The works engineer has requested your plan and schedule for a review with the operating supervision.The plant methods and standard section has furnished the following data precedent for each activity have been determined from a familiarity with similar projects.

Activity	Description	Time(Hours)	Precedents
A	Develop required material list	8	-
B	Procure pipe	200	A
C	Erect scaffold	12	-
D	Remove scaffold	4	H,M
E	Deactivate line	8	-
F	Prefabricate sections	40	B
G	Place new pipes	32	F,K
H	Fit up pipe and valves	8	G,J
I	Procure valves	225	A
J	Place valves	8	I,K
K	Remove old pipe and valves	35	C,E
L	Insulate	24	G,J
M	Pressure test	6	H
N	Clean up and start up	4	D,M

1. Sketch the network diagram of the project

2. Make the forward pass method and back word pass calculations on this network,and indicate the critical
path and its length.
3. Calculate total float and free float for each of the non-critical activities.

19. Explain The Structure of a Queuing System.

20. Which distributions are used to approximate arrival time distributions?

21. A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution approximately with an average rate of 10 per 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. Write both the primal and the dual LP problems corresponding to the rectangular games with the following payoff matrices.

Solve the game by the LP problem by simplex method $\begin{bmatrix} 1 & -1 & 3 \\ 3 & 5 & -3 \\ 6 & 2 & -2 \end{bmatrix}$

23. A computer software company has broken down the process of integrating a computer system into its operation into several steps.Some of the steps cannot begin until others are completed,and these relationship are shown in the accompanying table.
In addition,estimates of most likely,optimistic,and pessimistic times are required for each are listed below.

Activity	Predecessor activity	Activity time(weeks)		
		Optimistic	Most likely	Pessimistic
A	-	2	3	4
B	-	3	4	11
C	A	2	5	8
D	A	1.5	3.5	8.5
E	B	5	7	9
F	B	2	5.5	6
G	C	1.5	2.5	6.5
H	C,D	3	4	11
I	G	4	6	8
J	H,E	3	4.5	9
K	F	5	6	7
L	I,J,K	1	3	11

1.Draw a PERT chart for this project,calculate the critical path.

2. By how much time activity F be delayed with out delaying the project as a whole?

3. If labour costs Rs.1,500 per week find the probability that the labour costs for this project will exceed rs.36,000

4. Company wishes to budget an amount for labour costs that will be sufficient with 95 percent probability.How much should they budget?

24. A small project consists of seven activities,the details are given below:

Activity	Predecessor activity	Time estimates in days		
		Most likely	Optimistic	Pessimistic
A	-	3	1	7
B	A	6	2	14
C	A	3	3	3
D	B,C	10	4	22
E	B	7	3	15
F	D,E	5	2	14
G	D	4	4	4

1. Draw the network,number the nodes,find the critical path,the expected completion time and the next most critical path.

2. What project duration will have 95 percent confidence of completion.

25. Customers arrive at a one-window drive-in bank according to a Poisson distribution with mean of 10 per hour. Service time per customer is exponential with mean 5 minutes. The space in front of the window, including that for the serviced car can accommodate a maximum of 3 cars. Other cars can wait outside this space.

1.What is the probability that an arriving customer can drive directly to the space in front of the window?

2.What is the probability that an arriving customer will have to wait outside the indicated space?

3. How long is an arriving customer expected to wait before starting service?

(2×15=30)