MAHATMA GANDHI UNIVERSITY
MCA DEGREE EXAMINATION
MODEL QUESTION PAPER
(2011 Revised Syllabi)
Fourth Semester

MCA 401 OPERATIONS RESEARCH

Time : Three hours **Maximum : 75 Marks**

Part A

Answer any ten questions.
Each question carries 3 marks.

1. Explain the terms
   a) Feasible solution b) Basis c) Alternative optima
2. Draw a flowchart for the computational procedure for a LPP using simplex method.
3. Explain any three applications of LPP in management.
4. Compare simplex method and dual simplex method.
5. Briefly explain sensitivity analysis.
6. Write short note on traveling salesman problem.
7. Briefly describe the steps for solving a Transportation Problem.
8. Write short note on two person zero sums game.
9. What do you mean by crashing? Write two advantages.
10. What are the basic characteristics of a queuing system.
11. What is the importance of Poisson and Exponential distribution in Queuing theory.
12. Write short note on simulation.

(10 x 3 = 30 marks)

Part B

All questions carry equal marks.

13. A.

(i) A transistor radio company manufactures models A,B and C which have profit contributions of 8, 15 and 25 respectively. The weekly minimum production requirements are 100 for model A, 150 for model B and 75 for model C. Each type of radio requires a certain amount of time for the manufacturing of component parts, for assembling and packing. Specially a dozen units of model A require three hours of manufacturing, four hours of assembling and one hour of packing. The corresponding figures for a dozen units of model B are 3.5, 5 and 1.5 and for a dozen unit of model C are 5, 8 and 3. During the forthcoming week the company has available 150 hours of manufacturing, 200 hours of assembling and 60 hours of packing time. Formulate the production scheduling problem as a linear programming model.

[3]

(ii) Solve graphically: **[6]**

Maximize Z = $2x_1 + 3x_2$

Subject to the constraints

$$x_1 + x_2 \le 30,$$
$$x_2 \ge 3,$$
$$0 \le x_2 \le 12,$$
$$x_1 - x_2 \ge 0,$$
$$0 \le x_1 \le 20.$$

OR

13 B.

a) Write down the steps of the graphical method to obtain an optimal solution to a linear programming problem. **[3]**

b) Solve using simplex method: **[6]**

Maximize Z = $40x_1 + 80x_2$

Subject to the constraints

$$2x_1 + 3x_2 \le 48,$$
$$x_1 \le 15,$$
$$x_2 \le 10,$$
$$x_1 - x_2 \ge 0.$$

14. A.

a) Compare between Assignment problem and Transportation problem. **[3]**

b)Use duality to solve the L.P.P.: **[6]**

Minimize Z = $2x_1 + 2x_2$ subject to

$2x_1 + 4x_2 \ge 1, -x_1 - 2x_2 \le -1, 2x_1 + x_2 \ge 1$ and $x_1, x_2 \ge 0$.

OR

14. B.

i)Briefly describe the steps for solving a transportation problem. **[3]**

ii)Solve the following assignment problem: **[6]**

	I	II	III	IV	V
A	1	3	2	3	6
B	2	4	3	1	5
C	5	6	3	4	6

D	3	1	4	2	2
E	1	5	6	5	4

15. A.

a) What are the steps involved in the solution of (2 x n) and (m x 2) games. **[3]**

b) Solve the following (4 x 2) game. **[6]**

		B_1	2
	1	2	4
A	2	2	3
	3	3	2
	4	-2	6

OR

15. B.

a) Explain the steps involved in critical path method. **[3]**

b) Assuming that the expected time are normally distributed, find the critical path and project duration of: **[6]**

Activity		Days	
	Optimistic time	Most likely time	Pessimistic time
1-2	2	5	14
1-3	9	12	15
2-4	5	14	17
3-4	2	5	8
3-5	8	17	20
4-5	9	9	12

16. A.

a) Give essential characteristics of queuing procedure: **[3]**

b) On an average 96 patients per 24 hours day require the service of an emergency clinic. Also on an average, a patient requires 10 minutes of active attention. Assume that the facility can handle only on emergency at a time, Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average servicing time of 10 minutes and that each minute of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average six of the queue from 1 1/3 patients to ½ patient. **[6]**

OR

16. B.

a) Explain shortly the (M/M/I) : (∞ / FIFO) **[3]**
Mean and variance of the queue length.
Average waiting length.

b) At a railway station, only one train is handled at a time. The railway yard is sufficient only for two trains to wait while other is given signal to leave the station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them on an average of 12 per hour. Assuming Poisson arrivals and exponential service distribution, find the steady-state probabilities for the various number of trains in the system. Also find the average waiting time for a new train coming into the yard. **[6]**

17. A.

a) What are the advantages and disadvantages of simulation? **[3]**

b) Describe Monte Carlo method of stimulation. **[6]**

OR

17. B.

a) What are the basic ideas of Monte-Carlo simulation **[3]**

b) At a service station a study was made over a period of 25 days to determine both the number of automobiles being brought in for service and the number of automobiles serviced. The results are given below. **[6]**

No. of automobiles arriving and serviced :	0	1	2	3	4	5
Frequency of arrivals (days) :	2	4	10	5	3	1
Frequency of daily serviced (days) :	3	2	12	3	4	1

Simulate the arrival/service pattern for a ten day period and estimate the mean number of automobiles that remain in service for more than a day.

(Use the random numbers: 09, 54, 42, 01, 80. 06, 26, 67, 79, 49, 16, 36, 76, 68, 91, 97, 85, 56, 84. Use the first ten for arrivals and the next ten for serviced).

(5 X 9 = 45 marks)