Code: 14E00205

MBA II Semester Regular & Supplementary Examinations May 2016

OPERATIONS RESEARCH

(For students admitted in 2014 and 2015 only)

Time: 3 hours Max. Marks: 60

All questions carry equal marks

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SECTION – A

Answer the following: (05 X 10 = 50 Marks)

1 Use two-phase simplex method to solve:

Maximize $Z = 5x_1 + 8x_2$

Subjected to the constraints $3x_1 + 2x_2 \geq 3$

$x_1 + 4x_2 \geq 4$

$x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0$

OR

2 Solve the following problem Big-M method:

Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

Subjected to $x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20$

$x_1 + 2x_2 + x_3 + x_4 = 10$ and

$x_1, x_2, x_3, x_4 \geq 0$

3 Find the starting solution of the following transportation model:

1	2	6	7
0	4	2	12
3	1	5	11
10	10	10	

Using (i) North West Corner rule. (ii) Least cost method. (iii) Vogel's approximation method.

OR

4 Four different jobs can be on four different machines. The set up and take down time costs are assumed to be prohibitively high for change over's. The matrix below gives the cost in rupees of processing jobs I on machine j.

		Machines			
		M_1	M_2	M_3	M_4
Jobs	J_1	5	7	11	6
	J_2	8	5	9	6
	J_3	4	7	10	7
	J_4	10	4	8	3

How would the jobs be assigned to the various machines so that the total cost is minimized?

5 In a game of matching coins with two players, suppose A wins one unit value when there are two tails and losses ½ unit value when there are one head and one tail. Determine the payoff matrix, the best strategy for each player and the value of the game.

OR

6 Five jobs are performed first on machine M1 and then on machine M2. The time taken in hours by each job on machine is given below:

Jobs	A	B	C	D	E
Time on M_1	6	2	10	4	11
Time on M_2	3	7	8	9	5

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

OR

8 Let there be an automobile inspection situation with three inspection stalls. Assume that cars wait in such a way that when a stall becomes vacant; the car at the head of the line pulls up to it. The arrival pattern is Poisson with a mean of one car every minute during peak hours. The service time is exponential with mean 6 minutes. Find the average number of customers in the system during peak hours, the average waiting time and the average number per hour that cannot enter the station because of full capacity.

9 The following table lists the jobs of a network along with their time estimates:

Job	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
4-5	6	6	12
3-5	8	17	20

(i) Draw the project network.
(ii) Calculate the length and variance of the critical path.
(iii) Find the probability that the project will be completed within 30 days.

OR

10 The following time-cost table (time in days, cost in rupees) applies to a project. Use it to arrive at the network associated with completing the project in minimum time at minimum cost.

Activity	Normal		Crash	
	Time	Cost	Time	Cost
1-2	2	800	1	1400
1-3	5	1000	2	2000
1-4	5	1000	3	1800
2-4	1	500	1	500
2-5	5	1500	3	2100
3-4	4	2000	3	3000
3-5	6	1200	4	1600
4-5	3	900	2	1600

SECTION – B

(Compulsory Question) 01 X 10 = 10 Marks

11 **Case study/Problem:**

Use two-phase method to:

Maximize $Z = 2x_1 + x_2 + \frac{1}{4}x_3$

Subjected to the constraints $4x_1 + 6x_2 + 3x_3 \leq 8$

$3x_1 - 6x_2 - 4x_3 \leq 1$

$2x_1 + 3x_2 - 5x_3 \geq 4$

$x_1, x_{2,} x_3 \geq 0$

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