Code: 9F00205

MCA II Semester Regular & Supplementary Examinations, October/November 2013

OPERATIONS RESEARCH

Time: 3 hours Max Marks: 60

Answer any FIVE questions

All questions carry equal marks

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1 (a) Define operations research. Explain various phases of problem solving using operation research.

(b) A farmer has 1000 acres of land on which he can grow corn, wheat or soyabeans. Each acre of corn costs Rs 100 for preparation, requires 7 man-days of work and yields a profit of Rs 30. An acre of wheat costs Rs 120 to prepare requires 10 man-days of work and yields a profit of Rs 40. An acre of soyabeans costs Rs 70 to prepare requires 8 man days of work and yields a profit of Rs 20. If the former has Rs 1,00,000 for preparation and count on 8,000 man-days of work, how many acres should be allocated to each crop to maximize profit.

2 (a) Explain the significance of duality in L.P.P.

(b) Use duality to obtain an optimum solution to the following L.P.P.

$$\text{Max } z = 2x_1 + 3x_2$$

$$\text{Subjected to } -x_1 + 2x_2 \leq 4$$

$$x_1 + x_2 \leq 6$$

$$x_1 + 3x_2 \leq 9$$

$$x_1,\ x_2 \geq 0.$$

3 (a) A company has three plants A, B and C and three warehouses X, Y and Z. Number of units available at the plants is 60, 70 and 80 respectively. Demands at X, Y and Z are 50, 80 and 80 respectively. Unit costs at transportation are as follows.

	X	Y	Z
A	8	7	3
B	3	8	9
C	11	3	5

(b) An automobile dealer wishes to put four repairmen to four different jobs. The repairmen have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The dealer has estimated the number of man hours that would be required for each job-man combination. This is given in the matrix form in the table below.

Man \ Job	A	B	C	D
1	5	3	2	8
2	7	9	2	6
3	6	4	5	7
4	5	7	7	8

Find the optimum assignment that will result in minimum man hours needed.

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4 (a) Give Johnson's procedure for determining an optimal sequence for processing 'n' items on two machines.

(b) Find the sequence, for the following eight jobs, that will minimize the total elapsed time for the completion of all the jobs. Each job is processed in the same order CAB.

		Jobs							
		1	2	3	4	5	6	7	8
Machines	A	4	6	3	4	5	3	6	2
	B	8	10	7	8	11	8	9	13
	C	5	6	2	3	4	9	15	11

5 (a) What is the significance of time value of money in replacement problems?

(b) The following failure rates have been observed for a certain type of light bulbs.

Week :	1	2	3	4	5
% fail for end of week :	10	25	50	80	100

There are 1000 bulbs in use, and it costs Rs 10 to replace an individual bulb which has burn out. If all bulbs were replaced simultaneously it would cost Rs 4 per bulb. It is proposed to replace all bulbs at fixed intervals of time whether or not they have burnt out, and to continue replacing burnt out bulbs as and when they fail. At what intervals all the bulbs should be replaced? At what group replacement price per bulb would a policy of strictly individual replacement become preferable to the adopted policy?

6 (a) Explain Bellman's principle of optimality.

(b) Use dynamic programming technique to solve the following problem.

$$\text{Maximize } z = x_1\, x_2\, x_3\, x_4$$
$$\text{Subjected to } x_1 + x_2 + x_3 + x_4 = 12$$
$$x_1,\ x_2,\ x_3,\ x_4 \geq 0.$$

7 (a) State the general rules of dominance for two-person zero-sum games.

(b) In a small town there are two discount stores ABC and XYZ. They are only stores handle sundry goods. The total number of customers in equally divided between the two, because the price and quality of goods sold are equal. Both stores have good reputations in the community, and they render equally good customer services. Assume that a gain of customers by ABC is a loss to XYZ and vice-versa.

Both stores plan to run annual pre-diwali sales during the first week of November. Sales are advertised through the local news paper, radio and television media. With the aid of an advertising firm, ABC store constructed the same matrix given below.

		Strategies of XYZ		
		Press	Radio	T.V
Strategies of ABC	Press	30	40	-80
	Radio	0	15	-20
	T.V	90	20	50

Find the optimal strategies for both stores and the value of the game.

8 (a) Classify inventory model.

(b) A manufacturing company purchases 9,000 parts of machine for its annual requirements, ordering one month wage at a time. Each part costs Rs 20. The ordering cost per order is Rs 15, and the carrying charges are 15 % of the average inventory per year. You have been asked to suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year?

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