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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Seventh Semester, B.E. - Industrial and Production Engineering
Semester End Examination; Dec - 2016/Jan - 2017
Operations Research

Time: 3 hrs   Max. Marks: 100

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

UNIT - I

1 a. Describe the main phases of OR study.   6

   b. A firm can produce three types of cloth, Say A, B and C. Three kinds of wool are required for it; say; red, green and blue wool. One unit length of type A cloth needs 2 meters of red wool and 3 meters of blue wool; and one unit type of B needs 3 meters of red wool; 2 meters of green wool, and 2 meters of green blue wool; and one unit type of C cloth needs 5 meters of green wool, 4 meters of blue wool. The firm has only a stock of 8 meters of red wool, 10 meters of green wool and 15 meters of blue wool. It is assumed that the income obtained from one unit of length of type A cloth is ` 3.00 of type B cloth is ` 5.00 and of Type C is ` 4.00. Determine how the firm should use the available material so as to minimize the income from the finished cloth?   14

2 a. Explain briefly the scope of Operations Research.   4

   b. The standard weight of a special purpose brick 5 kg and it contains two basic ingredients B_1 and B_2. B_1 costs ` 5 per kg and $B_2$ costs ` 8 per kg. Strength considerations state that the brick contains not more than 4 kg of B_1 and minimum of 2 kg of B_2. Since the demand for the product is likely to be related to the price of the brick, find out graphically minimum cost of the brick satisfying the above conditions.   16

UNIT - II

3 a. Explain :   6

   (i) Slack variable   (ii) Surplus variable   (iii) Artificial variables.

   b. Solve by simplex method:

   $Max\ z = 3x_1 + 2x_2$

   Subjected to

   $x_1 + x_2 \le 4$

   $x_1 - x_2 \le 2,$

   $\&\ x_1, x_2 \ge 0$ 14

4 a. How do you recognize degeneracy in simplex method?   4

b. Solve by Big-M method :

$$Max\ z = 3x_1 - x_2$$
$$S.T.\quad 2x_1 + x_2 \geq 2$$
$$x_1 + 3x_2 \leq 3$$
$$x_2 \leq 4$$
$$x_1, x_2 \geq 0$$

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UNIT - III

5 a. Describe unbalanced transportation problem.

4

b. Solve the transportation problem using North-West corner method and then optimize the solution using U-V method.

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Destination

		A	B	C	Supply
	1	3	7	4	300
Source	2	2	5	9	400
	3	8	3	2	500
Requirement		250	350	200	

6 a. What are the difference between transportation and assignment problem?

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b. A company has 5 jobs to be done. The following matrix shows the return in rupees on assigning machines 1, 2, 3, 4, 5 to the jobs A, B, C, D, E. Assign the five jobs to 5 machines so as to maximize the total expected profit.

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Jobs

		A	B	C	D	E
	1	5	11	10	12	4
	2	2	4	6	3	5
Machines	3	3	12	5	14	6
	4	6	14	4	11	7
	5	7	9	8	12	5

UNIT - IV

7 a. Explain the situation which makes the replacement of items necessary.

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b. A computer contains 10,000 resistors. When any one resistor fails it is replaced. The cost of replacing a single resistor is ` 10 only. If all the bulbs are replaced at the same time, the cost per resistor would be reduced to ` 3.50. The percentage surviving by the end of month 't' is as follows:

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Month 't'	0	1	2	3	4	5	6
% surviving by the end of the month	100	97	90	70	30	15	0

What is the optimum plan?

8 a.   Mention the difference between PERT and CPM.   4

b.   A project has the following time schedule :

Activity	Time in Months	Activity	Time in months
1 - 2	2	4 - 6	3
1 - 3	2	5 - 8	1
1 - 4	1	6 - 9	5
2 - 5	4	7 - 8	4
3 - 6	8	8 - 9	3
3 - 7	5		

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Construct PERT network and compute :

(i) Total that float for each activity   (ii) Critical path and its duration.

UNIT - V

9 a.   Explain Queuing system and their characteristics.   8

b.   An Airlines organization has one reservation clerk on duty in its local branch at any given time. The clerk handles in its local branch at any given time. The clerk handles informations regarding passenger reservation and flight during any period is poissons-distributed with an arrival rate of eight per hour and that the reservation clerk can serve a customer in six minutes on an average, with a exponentially distributed service time.   12

(i) What is the probability that the system is busy?

(ii) What is the average time a customer spends in the system?

(iii) What is the average length of the queue and what is the number of customer in the system?

10 a.   Solve the game whose payoff matrix to the player's 'A' is given below:

B

		I	II	III
	I	1	7	2
A	II	6	2	7
	III	5	2	6

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b.   Solve the following 2x4 game graphically

Player B

		B_1	B_2	B_3	B_4
Player A	A_1	2	1	0	-2
	A_2	1	0	3	3

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