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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)
Eighth Semester, B.E. - Electronics and Communication Engineering
Semester End Examination; June - 2016
Operations Research

Time: 3 hrs

Max. Marks: 100

Note: Answer any FIVE full questions, selecting atleast TWO full questions from each part.

PART - A

1. a. OR can be associated “an art of winning the war without a actually fighting it”. Explain the meaning of this statement. 4
- b. Name the main phases of the operations Research (OR) study. 6
- c. The manufacturer of patent medicines is proposed to prepare a production plan for medicines A and B. There is sufficient ingredient available to make 20,000 bottles of medicines A and 40,000 bottles of medicine B, but there are only 45,000 bottles into which either of the medicines can be filled. Further, it takes three hours to prepare enough material to fill 1,000 bottles of medicine A and one hour to prepare enough material to fill, 1,000 bottles of medicine B, and there are 66 hours available for this operation. The profit is Rs.8 per bottle for medicine A and Rs. 7 per bottle for medicine B. Formulate it is problem as a LPP. 10
- 2 a. What is simplex method of solving linear programming problems? Explain. 8
- b. Solve the LP problems :
- $Max Z = 3x_1 + 5x_2 + 4x_3$ subject to the constraints :
- $2x_1 + 3x_2 \leq 8$
- $2x_2 + 5x_3 \leq 10$ 12
- $3x_1 + 2x_2 + 4x_3 \leq 15$ and
- $x_1, x_2, x_3 \geq 0$. Use simplex method.
- 3 a. Define sensitivity analysis. What are the changes in the Linear programming problem which are usually studied by sensitivity analysis? 10
- b. Write the dual of the following LP problem :
- $Min Z = 3x_1 - 2x_2 + 4x_3$ subject to the constraints
- $3x_1 + 5x_2 + 4x_3 \geq 7$
- $6x_1 + x_2 + 3x_3 \geq 4$
- $7x_1 - 2x_2 - x_3 \leq 10$ 10
- $x_1 - 2x_2 + 5x_3 \geq 3$
- $4x_1 + 7x_2 - 2x_3 \geq 2$ and
- $x_1, x_2, x_3 \geq 0$

- 4 a. Narrate the various steps for obtaining an optimum assignment in an assignment problem. 8
- b. Solve the following transportation problem in which cell entries represent unit costs :

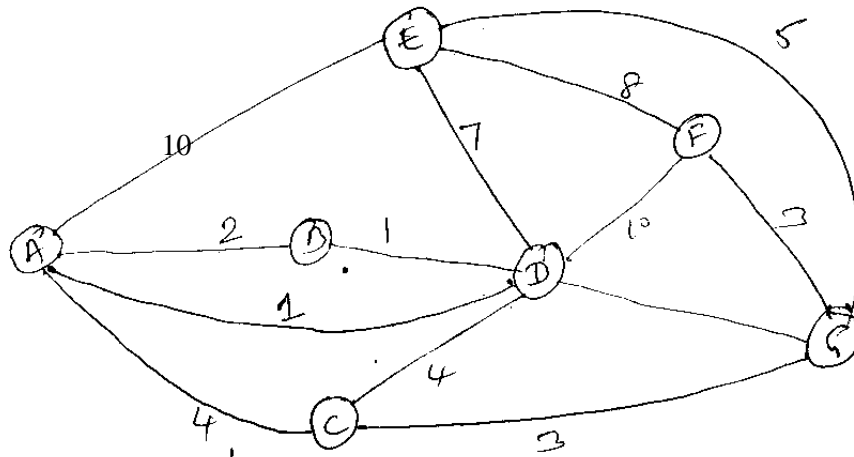
		To		Available
	2	7	4	5
	3	3	1	8
From	5	4	7	7
	1	6	2	14
Required	7	9	18	34

12

Determine the initial basic feasible solution by Vogle's approximation method and also obtain optimal solution.

PART - B

- 5 a. Explain the following terms with reference to the Network : 8
- (i) Spanning tree (ii) Path (iii) Loop (cycle) (iv) Maximum flow problem.
- b. Find the minimum spanning tree and system path between A and G in the Fig 1. Shown.



12

Fig 1. Q5b

6. a. With a neat diagram explain basic queuing process. 8
- b. In a railway Marshaling Yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival at a rate of 30 trains per day. Assuming that the arrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average 36 minutes. Calculate the following : 12
- i) The average number of trains in the queue.
- ii) The probability that the queue size exceeds 10 33 per day,
- What will be the change in i) and ii)?

7 a. What do you mean by Dynamic programming? State its concept.

8

b. A student has to take examination in three courses X , Y and Z. He has three days available for study. He feels it would be best to devote whole day to the study of the same course so that he may study a course for one day, two days or three days or not at all. His estimates of grades he may get by study are as follows.

Study days \ Course	X	Y	Z
0	1	2	1
1	2	2	2
2	2	4	4
3	4	5	4

12

How should he plan to study so that he recognises the sum of his grade?

8 a. Write short note on following :

i) Competitive game

ii) Pay off matrix

iii) Saddle point.

12

b. Use the relation of dominance to solve the rectangular game whose payoff matrix to A is given in the following Table.

		B					
		I	II	III	IV	V	VI
A	I	0	0	0	0	0	0
	II	4	2	0	2	1	1
	III	4	3	1	3	2	2
	IV	4	3	7	-5	1	2
	V	4	3	4	-1	2	2
	VI	4	3	3	-2	2	2

8

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