

Roll No .....

**MVCT/MBCT/MVCP-101(New)****M.E./M.Tech., I Semester**

Examination, November 2018

**Advance Mathematics****Time : Three Hours****Maximum Marks : 70**

- Note:** i) Attempt any five questions.  
ii) All questions carry equal marks.

1. a) What do you mean by operations research? Discuss methodology of operations research.  
b) What are the essential characteristics of operations research? Mention different phases in an operations research study.

2. a) Solve the following L.P.P. by simplex method:

$$\text{Max. } Z = 50x_1 + 80x_2$$

$$\text{S.t. } 10x_1 + 15x_2 \leq 60$$

$$2x_1 + 2x_2 \leq 10$$

$$x_2 \leq 3$$

$$x_1, x_2 \geq 0$$

- b) Define dual of a L.P.P. find the dual of the following L.P.P.:

$$\text{Min. } Z = 2x_2 + 5x_3$$

$$\text{S.t. } x_1 + x_2 \geq 2$$

$$2x_1 + x_2 + 6x_3 \leq 6$$

$$x_1 - x_2 + 3x_3 = 4$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

3. a) Solve the following assignment Problem:

		Job				
		I	II	III	IV	V
Person	A	1	3	5	8	2
	B	7	10	12	5	10
	C	15	2	8	10	7
	D	6	5	3	2	8
	E	9	15	20	6	30

- b) Use Big-M method to solve the following L.P.P.:

$$\text{Max. } Z = 5x_1 + 8x_2$$

$$\text{S.t. } 3x_1 + 2x_2 \geq 3$$

$$x_1 + 4x_2 \geq 4$$

$$x_1 + x_2 \leq 5$$

$$\text{and } x_1, x_2 \geq 0$$

4. a) Solve the following transportation problem and obtain an optimal transportation cost:

Ware houses →		W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	Factory capacity
Factory ↓	F <sub>1</sub>	19	30	50	10	7
	F <sub>2</sub>	70	30	40	60	9
	F <sub>3</sub>	40	8	70	20	18
Ware house requirement		5	8	7	14	34

- b) Use dynamic programming, find

$$\text{Min. } Z = x_1 + x_2 + \dots + x_n$$

$$\text{When } x_1 \cdot x_2 \cdot x_3 \cdot \dots \cdot x_n = d$$

$$\text{and } x_1, x_2, x_3, \dots, x_n \geq 0$$

5. a) Using the fibonacci search method. Locate the positions of maxima or minima for the function  $x^2 - 5x + 2$ ,  $n = 6$ ;  $[0, 5]$  is the interval given.
- b) Solve the game, whose pay-off matrix is given by

		B			
		I	II	III	IV
A	I	3	2	4	0
	II	2	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

6. a) Write short note on :

- i) Genetic algorithm  
ii) CPM and PERT

- b) Suppose that three boxes A, B and C contains white, Red and black balls as given below:

Box	White	Red	Black
A	10	5	10
B	8	8	4
C	5	5	5

Two balls are drawn at random and found to be white and black. What is the probability that they came from box C?

7. a) Fit Poisson's distribution to the following and calculate theoretical frequencies ( $e^{-0.61} = 0.61$ ):

Deaths :	0	1	2	3	4
Frequency:	122	60	15	2	1

- b) From a random sample of 10 pigs fed on diet A, the increases in weight in a certain period were 10.6, 16.17, 13.12, 8.14, 15.9 lbs. For another sample of 12 pigs fed on diet B, the increases in the same period were 7.13, 22.15, 12.14, 18.8, 21.23, 10.17 lbs. Test whether diets A and B differ significantly as regards their effect on increases in weight. (Given that  $v = 20$ ,  $t_{0.05} = 2.09$ )
8. a) Define Gamma model and find time to failure  $f(t)$ , probability of failure  $F(t)$ , probability of working reliability  $R(t)$  and mean time to failure MTTF.
- b) The time to failure density function (PDF) for a system is  $f(t) = 0.01$ ;  $0 \leq t \leq 1 \infty$  days  
Find
- $R(t)$
  - The hazard rate function
  - The MTTF
  - The median time to failure

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