8. a) Explain the importance of reliability. What are the basic elements of reliability?

   b) It is desired to have a reliability of at least 0.975 for a specified service period of 7500 hours on the assumption of a uniform failure rate. What will be the least value of $\theta$, that yield the desired reliability?

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*Total No. of Questions : 8]* *[Total No. of Printed Pages : 4*

**Roll No .....**

# MVCT/MBCT/MVCP-101 (New)

## M.E./M.Tech., I Semester

Examination, December 2016

## Advance Mathematics

***Time : Three Hours***

***Maximum Marks : 70***

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

1. a) Write down the various classifications of optimization algorithms.

   b) What are the essential characteristics of O.R.? Mention different phases in an operation research study.

2. a) Use simplex method, solve the following L.P.P.:

   Min $Z = 3x_1 - x_2$

   Subject to the constraints

   $$2x_1 + x_2 \leq 12$$
   $$x_1 + 3x_2 \leq 3$$
   $$\text{and } x_1, x_2 \geq 0$$

   b) What is duality? Find the dual of the following L.P.P.:

   Max $Z = 4x_1 + x_3$

   Subject to constraints

   $$6x_1 + 2x_2 - x_3 = 5$$
   $$2x_1 + 3x_2 + 4x_3 = 1$$
   $$x_1, x_2, x_3 \geq 0$$

3. a) Use Big-m method to solve the following L.P.P.:

Max $Z = -2x_1 - x_3$

Subject to constraints

$x_1 + x_2 - x_3 \geq 5$

$x_1 - 2x_2 + 4x_3 \geq 8$

$x_1, x_2, x_3 \geq 0$

b) Solve the following Assignment problem:

| | | Jobs | | | | |
|---|---|---|---|---|---|---|
| | | I | II | III | IV | V |
| Persons | 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 |

4. a) Solve the following transportation problem and find the optimal solution:

| | | Destinations | | | | |
|---|---|---|---|---|---|---|
| | | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Availability |
| Origins | $O_1$ | 5 | 2 | 4 | 3 | 22 |
| | $O_2$ | 4 | 8 | 1 | 6 | 15 |
| | $O_3$ | 4 | 6 | 7 | 5 | 8 |
| Requirements | | 7 | 12 | 17 | 9 | |

b) What is Bellman's principle of optimality? Apply this principle to divide a given quantity C into n parts so as to maximize their product.









5. a) Explain PERT and its importance in network analysis. What are the requirements for applications of PERT techniques?

b) Write short notes on :

i) Game theory

ii) Queuing system

6. a) The odds that a book will be reviewed favorably by three independent critics are 5 to 2, 4 to 3 and 3 to 4. What is the probability that of three of the reviews, a majority will be favorable?

b) Fit Poisson's distribution to the following and calculate theoretical frequencies ($e^{-0.05} = 0.61$):

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

7. a) Explain the following:

i) Testing of Hypothesis

ii) Tests of significance

b) Two random samples drawn from two normal populations are:

Sample I : 20, 16, 26, 27, 23, 22, 18, 24, 25 and 19

Sample II : 27, 33, 42, 42, 35, 32, 34, 38, 28, 41, 43, 30, and 37.

Obtain the estimates of the variance of the population and test whether the two populations have the same variants.