Roll No. | | | | | | | | | | | | |  Total No. of Pages : 02

Total No. of Questions : 07

M.Sc. (Mathematics) (Sem.–4)

# ADVANCED OPERATION RESEARCH

Subject Code : MSM-506-18

M.Code : 77876

Date of Examination : 15-07-22

Time : 3 Hrs.  Max. Marks : 70

**INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of FIVE questions carrying TWO marks each.**
2. **SECTION - B & C have THREE questions each.**
3. **Attempt any FOUR questions from SECTION B & C carrying FIFTEEN marks each.**
4. **Select atleast TWO questions from SECTION - B & C each.**

## SECTION-A

**1. Write short notes on :**

a) Write standard form of LGPP.

b) Write dominance property to solve a game.

c) What is Capital Budgeting?

d) Write characteristics of dynamic programming.

e) Differentiate between Deterministic and Probabilistic inventory models.

## SECTION-B

2. Find the optimal solution of the Integer programming problem by Branch and Bound Technique. Draw the diagram showing the solution inside nodes.

Maximize $z = 7x_1 + 9x_2$

Subject to $-x_1 + 3x_2 \le 6$; $7x_1 + x_2 \le 35$; $x_2 < 7$, $x_1, x_2 \ge 0$ and are integers.

3. Solve the linear goal programmmg problem :

$4x_1 + 5x_2 \approx 800 \quad P_1$

$4x_1 + 3x_2 \le 500 \quad P_2$

$2x_1 + 5x_2 \le 600$

$x_1, x_2 \ge 0$

for which weight factors for all deviational variables have been kept at unity level.

4. a) Solve the game graphically

$$\begin{array}{c} \\ \text{Player A} \end{array} \begin{array}{c} \text{Player B} \\ \begin{bmatrix} 2 & 1 & 0 & -2 \\ 1 & 0 & 3 & 2 \end{bmatrix} \end{array}$$

b) Solve the following using dominance property :

$$\begin{array}{c} \\ \text{Player A} \end{array} \begin{array}{c} \text{Player B} \\ \begin{bmatrix} 3 & 2 & 4 & 0 \\ 3 & 4 & 2 & 4 \\ 4 & 2 & 4 & 0 \\ 0 & 4 & 0 & 8 \end{bmatrix} \end{array}$$

## SECTION-C

5. a) Develop EOQ model for n item inventory with limitation on storage limitation,

b) Describe recursive equation approach to solve dynamic programming problems.

6. Use Dynamic Programming to solve the following problem :

Minimize $z = y_1^2 + y_2^2 + y_3^2$

Subject to $y_1 + y_2 + y_3 \geq 15;\ y_1, y_2, y_3 \geq 0$

7. The arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a telephone call is assumed to be distributed exponentially with mean 3 minutes.

What is the probability that a person arriving at the booth will have to wait?

a) What is the average length of the queues that form time to time?

b) The telephone department will install a second booth when convinced that an arrival would expect to have to wait at least three minutes for the phone. By how much must be the flow of arrivals is increased in order to justify the second booth?

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student**.