PD-484-CV-19

M.A./M.Sc. (4th Semester)

Examination, June-2021
MATHEMATICS
Paper-V
OPERATION RESEARCH-II

Time : Three Hours] **[Maximum Marks : 80**
[Minimum Pass Marks : 29

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

Section-A

1. Answer all the questions:- 1x10=10

(a) The technique of dynamic programing was developed by...........in the early 1950.

(b) Define two person zero sum game.

(c) Define saddle point.

(d) Define queue length.

(e) Define waiting time.

(f) Function $f(x)$ is concave if......is convex.

(g) Function $f(x)$ is convex if the Hessian matrix $H(x)$ at $f(x)$ is........

(h) Define term inventory.

(i) Define shortage cost.

(j) Define pure and mined strategies.

2. Answer the following questions:- 2x5=10

(a) Define finite and infinite games.

(b) Define characteristics of dynamic programming problem.

(c) Define General non-linear programming problem.

(d) Define characteristics of queening system.

(e) What are the factors which affecting inventory control.

Section-B

12x5=60

Answer the following questions:-

3. Use dynamic programming, to show that

$$\sum_{i=1}^{n} P_i log P_i$$

Subject to $\sum_{i=1}^{n} P_i = 1$ is maximum when $P_1 = P_2 = - - - - = P_n = \frac{1}{n}$

OR

Solve the following linear programming problem by dynamic technique

Max $Z = 3x_1 + 5x_2$

Subject to $x_1 \leq 4$

$x_2 \leq 6$

$3x_1 + 2x_2 \leq 18$

$x_1 \geq 0, \quad x_2 \geq 0$

4. Solve the game whose pay-off matrix in given by

B

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

OR

Solve the following game by graphical method:

		B I	B II
A	I	2	7
	II	3	5
	III	11	2

5. Solve the following non-linear programming problem, using the method at Lagrangian multipliers.

Minimize $Z = x_1^2 + x_2^2 + x_3^2$

Subject to the constraints

$4x_1 + x_2^2 + 2x_3 = 14, \qquad x_1\ x_2,\ x_3 \geq 0$

OR

Solve the following non-linear programming problem.

Max $Z = f(x_1,\ x_2)$

$= 3.6x_1 - 0.4x_1^2 + 1.6x_2 - 0.2x_2^2$

Subject to the constraints

$2x_1 + x_2 \leq 10 \leq 0 \quad and \quad x_1,\ x_2 \geq 0$

6. Use Branch and Bound technique to solve the following integer programming problem;

Max $Z = 7x_1 + 9x_2$

Subject to constraints

$-x_1 + 3x_2 \leq 6$

$7x_1 + x_2 \leq 35$

$(0 \leq x_1, \quad x_2 \leq 7)$

$and\ x_1,\ x_2\ are\ integers.$

OR

Find the solution for following mined integers programming problem:

Max $Z = x_1 + x_2$

Subject to constraints

$3x_1 + 2x_2 \leq 5$

$x_2 \leq 2$

$x_1,\ x_2 \geq 0 \quad and\ x_1,\ x_2 \quad are\ integers.$

7. Neon light is an industrial park are replaced at the rate of 100 units per day. The physical plant orders the Neo light periodically, it costs Rs. 100 to initiate a purchase order A neon light kept in storage is estimated to cost about Rs. 02 per day. The load time between placing and receiving and order is 12 days. Determine the optimal inventory policy for ordering the neon lights.

OR

(a) In a railway marshaling yard, goods trains arrive at the rate of 30 trains per day. Assuming that the inter arrival time follows as exponential distribution and the service time distribution is also exponential with an average 36 minutes. Calculate the following:

(i) The mean queue size (line length)

(ii) The probability that the queue size exceeds 10.

(b) On average 96 patients per 24 hour day require the service of an emergency clinic. Also on average, a patients requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average serving time of 10 patients, and that each minute of decrease in the average time would cost by Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from one and one third patients to half a patient?