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B04-403

Fourth Semester Online Examination, May-June, 2022

M. Sc. MATHEMATICS

Paper - IV

OPERATIONS RESEARCH - II

Time : Three Hours] [Maximum Marks : 80

Note : *(i) Part A and B of each question in each Unit consist of very short answer type questions which are to be answered in one or two sentences.*

(ii) Part C (Short answer type) (Word limit ***200-250****) and Part D (Long answer type) of each question should be answered within the word limit (****400-450*** *words) mentioned.*

UNIT-I

1. (A) Explain dynamic programming problem. 2

(B) Explain pure and mixed integer programming problem. 2

(C) Describe recursive equation approach to solve dynamic programming problems. 4

P. T. O.

Or

Describe the branch and bound method for the solution of integer programming problem.

(D) Use dynamic programming to solve the L.P.P. :

Maximize $z = x_1 + 9x_2$

Subject to the constraints :

$$2x_1 + x_2 \leq 25, \quad x_2 \leq 11$$

$$x_1, x_2 \geq 0$$ 12

Or

Find the optimum integer solution to the following L.P.P. :

Maximize $z = x_1 + 4x_2$

Subject to the constraints :

$2x_1 + 4x_2 \leq 7$, $5x_1 + 3x_2 \leq 15$

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

UNIT-II

2. (A) Explain the terms : 2

(i) Pure strategy

(ii) Payoff matrix

(B) Explain the maximin and minimax principle used in Game Theory. 2

(C) Consider the game G with the following payoff matrix and show that G is strictly determinable whatever μ may be. Also determine the value of G.

Player B

$$\text{Player } A \quad \begin{array}{c} \\ A_1 \\ A_2 \end{array} \begin{array}{c} \begin{matrix} B_1 & B_2 \end{matrix} \\ \begin{bmatrix} 2 & 6 \\ -2 & \mu \end{bmatrix} \end{array}$$

4

Or

Use matrix oddment method to solve the following 3×3 game :

$$\begin{bmatrix} 0 & 1 & 2 \\ 2 & 0 & 1 \\ 1 & 2 & 0 \end{bmatrix}$$

(D) Use graphical method in solving the following game :

Player A

$$\text{Player } B \begin{bmatrix} 2 & 2 & 3 & -2 \\ 4 & 3 & 2 & 6 \end{bmatrix}$$

12

Or

Solve the following game by linear programming technique :

Player B

$$\text{Player } A \begin{bmatrix} 3 & -2 & 4 \\ -1 & 4 & 2 \\ 2 & 2 & 6 \end{bmatrix}$$

UNIT-III

3. (A) Explain the important characteristics of queueing system. 2

(B) Explain Anticipation inventories. 2

(C) An oil engine manufacturer purchases lubricants at the rate of ₹ 42 per piece from a Vendor. The requirement of these lubricants is 1800 per year. What should be the order quantity per order, if the cost per placement of an order is ₹ 16 and inventory carrying charge per rupee per year is only 20 paise. 4

Or

A T.V. repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately poisson with an average rate of 10 per 8 hour day, what is repairman's expected idle time each day ? How many jobs are ahead of the average set just brought in ?

(D) Neon lights in an industrial park are replaced at the rate of 100 units per day. The physical plant orders the neon lights periodically. It costs ₹ 100 to initiate a purchase order. A neon light kept in storage is estimated to cost about ₹ 0.02 per day. The lead time between placing and receiving an order is 12 days. Determine the optimum inventory policy for ordering the neon lights. 12

Or

For a {M/M/I) : (N/FIFO)} queueing model :

(i) Find the expression for $E(n)$.

(ii) Derive the formula for P_n and $E(n)$ when $P=1$.

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UNIT-IV

4. (A) State the Kuhn-Tucker sufficient conditions in non-linear programming problem. 2

(B) Define quadratic programming problem. 2

(C) Obtain the set of necessary conditions for the non-linear programming problem : 4

Max. $z = x_1^2 + 3x_2^2 + 5x_3^2$

Subject to the constraints :

$x_1 + x_2 + 3x_3 = 2,\ 5x_1 + 2x_2 + x_3 = 5,\ x_1,\ x_2,\ x_3 \geq 0.$

Or

Explain sufficient conditions for a general non linear programming problem with one constraint.

(D) Use the Kuhn-Tucker conditions to solve the following non-linear programming problem. 12

Max. $z = 2x_1 - x_1^2 + x_2$

Subject to the constraints :

$2x_1 + 3x_2 \leq 6,\ 2x_1 + x_2 \leq 4$ and $x_1, x_2 \geq 0$

Or

Use Wolfe's method in solving the following quadratic programming problems :

Max. $z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$

Subject to the constraints :

$$x_1 + 2x_2 \leq 2,\ x_1, x_2 \geq 0.$$

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