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D-5343

M.A./M.Sc. (IVth Semester) Examination, 2020

MATHEMATICS

(Operation Research - II)

Time Allowed : Three Hours

Maximum Marks : 70

Minimum Pass Marks : 25

SECTION - A

Note : Attempt all ten questions. Each question carries one mark. **1×10=10**

Q. 1. Objective type :

Fill in the blanks :

(i) _____ is used for project involving activities of repetitive nature.

(ii) The games with saddle points are _____ in nature.

(iii) If the coefficient of each squared term in a quadratic function is positive, the function is _____.

(iv) A symmetric procedure for solving an all integer programming problem was first developed by _____.

(v) Dynamic programming was developed by _____.

Multiple choice type questions :

(vi) A convex function is :

(a) Bowl-shaped up

(b) Bowl-shaped down

(c) Elliptical in shape

(d) Sinusoidal in shape

(vii) Each activity is represented by a directed :

(a) Arc

(b) Line

(c) Path

(d) None of these

(viii) The critical path identifies all the critical activities of the :

(a) Project

(b) Event

(c) Activity

(d) None of these

(ix) When the game is not having a saddle point, then the following method is used to solve the game :

(a) Linear programming method

(b) Minimax and maximin criteria

(c) Algebraic method

(d) Graphical method

(x) Branch & bound technique was developed by :

(a) George Dantzig

(b) John Von Neumann & Morgenstern

(c) A.L. Lang & A.P. Doig

(d) None of these

SECTION - B

Note : Attempt any five questions. Each question carries 2 marks. **5×2=10**

Q. 2. Very short answer type (25-30 words) :

(i) Define pay-off matrix.

(ii) Write the limitations of PERT.

(iii) Write notes on Total float.

(iv) Write dominance rule in game theory.

(v) Define all integer & mixed integer programming problem.

(vi) Define convex & concave in terms of Hessian.

(vii) Define multistage decision problem.

SECTION - C

Note : Attempt any five questions. Each question carries 4 marks. **5×4=20**

Q. 3. Short answer type (250 words) :

(i) Solve the following 2 × 4 games by graphical method :

$$\begin{array}{cc} & \text{Player B} \\ \text{Player A} & \begin{array}{c|cccc} & 1 & 2 & 3 & 4 \\ \hline 1 & 3 & 3 & 4 & 0 \\ 2 & 5 & 4 & 4 & 7 \end{array} \end{array}$$

(ii) Prepare a network diagram for the following information :

Activity	A	B	C	D	E	F	G	H
Immediate Predecessor	–	–	A	A,B	A,B	C	D,F	E,G

(iii) Draw algorithm of Branch & Bound technique.

(iv) Obtain the set of necessary conditions for the NLPP :

Minimize $Z = 3x_1^2 + x_2^2 + 2x_1x_2 + 6x_1 + 2x_2$

subject to the constraints

$2x_1 - x_2 = 4$, $x_1, x_2 \geq 0$

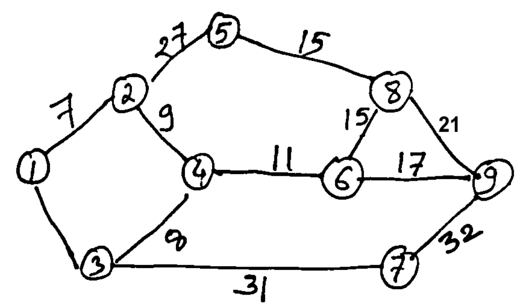
(v) Use Beale's method for solving the following quadratic programming problem :

Max $Z = 10x_1 + 25x_2 - 10x_1^2 - x_2^2 - 4x_1x_2$

subject to

$x_1 + 2x_2 + x_3 = 10$, $x_1 + x_2 + x_4 = 9$ and $x_1, x_2, x_3, x_4 \geq 0$

(vi) Find the shortest path from node 1 to 9 of the distance network using Dijkstra's algorithm :



(vii) Calculate the value of game and probability of playing each strategy in following game theory matrix :

$$\begin{array}{cc} & \text{A} \\ \text{B} & \begin{array}{|ccc|} \hline 30 & 40 & 60 \\ 35 & 42 & 11 \\ \hline \end{array} \end{array}$$

SECTION - D

Note : Attempt any three questions. Each question carries 10 marks. **3×10=30**

Q. 4. Essay type questions (more than 500 words) :

(i) Solve the following L.P.P. by Gomory technique :

Maximize $Z = 3x_2$

subject to the constraints

$3x_1 + 2x_2 \leq 7$

$x_1 - x_2 \geq -2$

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

(ii) 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 $p_1 + p_2 + ... + p_n = \frac{1}{n}$.

(iii) A project schedule has the following characteristic :

Activity	1 – 2	1 – 3	2 – 4	3 – 4	3 – 5	4 – 9	5 – 6	5 – 7	6 – 8	7 – 8	8 – 10	9 – 10
Time (days)	4	1	1	1	6	6	4	8	1	2	5	7

By this information :

(1) Construct a network diagram.

(2) Compute earliest event time & latest event time.

(3) Determine the critical path & total projection duration.

(4) Compute total, free and independent float for each activity.

(iv) Solve the following NLPP :

Maximize

$Z = f(x) = (200\, x_1 - 2x_1^2) + (500x_2 - 3x_2^2)$

subject to the constraints

$2x_1 + x_2 \leq 140,\ 2x_1 + 3x_2 \leq 180\ \&\ x_1, x_2 \geq 0$