OR

Solve the following game using the dominance principle :

Player *B*

		1	2	3	4	5
Player A	1	3	5	4	9	6
	2	5	6	3	7	8
	3	8	7	9	8	7
	4	4	2	8	5	3

Q.3 The storage cost of one item is Rs. 1 per month and the set up cost is Rs 25 per run. If the production is instantaneous and the demand is Rs 200 units per month. Find the optimal size of the batch and best time for replenishment of inventory.

OR

Assume that the goods trains are coming in yard at the rate of 30 trains per day and suppose that the inter-arrival times follows an exponential distribution. The service time for each train is assumed to be the exponential with an average of 36 minutes. If the yard can admit 9 trains at a time (there being 10 lines, one of which is reserved for shunting purpose), calculate the probability that the yard is empty and find the average queue length.

Q.4 Prove Kuhn-Tuckers necessary and sufficient conditions for constrained optimization.

OR

Apply Wolfe's method to solve the quadratic programming problem :

$$\text{Max } Z_x = 2x_1 + x_2 - x_1^2$$

$$\text{Subject to } \quad 2x_1 + 3x_2 \le 6$$

$$2x_1 + x_2 \le 4$$

$$\text{and } \quad x_1 x_2 \ge 0$$

---x---

Roll No......................

Total No. of Sections : 03

Total No. of Printed Pages : 04

Code No. : 04/403(B)

Fourth Semester Examination, May - 2018

M.Sc. MATHEMATICS

Paper - IV

OPERATIONS RESEARCH (II)

Time : 3 Hrs. **Max.Marks : 80**

Note : Section 'A' consists of 10 very short answer type questions, all of which are compulsory and should be attempted first. Section 'B' consists of four short answer type questions with internal options. Section 'C' consists of four long answer type questions with internal choice.

Section - 'A'

Answer the following very short-answer-type questions in one or two sentences : (2x10=20)

Q.1 What is meant by Dynamic programming?

Q.2 Differentiate between optimal solution and feasible solution in integer programming.

Q.3 Write the recursive equation of Dynamic Programming problem.

Q.4 What do you mean by two person zero-sum game?

Q.5 Define Saddle point in a game.

Q.6 Give an example of any Queue discipline.

Q.7 Name elements of a any Queueing System.

Q.8 Give any two types of inventories.

Q.9 Define ordering cost in Inventory control.

Q.10 Give the statement of Kuhn-Tucker condition for constrained optimization.

Section - 'B'

Answer the following questions : **(5x4=20)**

Q.1 Write the steps of Branch and Bound method to solve the integer-programming problems.

OR

Write the algorithm for obtaining solution of Integer programming problem using Gomory's method.

Q.2 Solve the game whose pay-off matrix is given by -

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

OR

Let $\{a_{ij}\}$ be the pay-off matrix for a two person zero sum game. If $\overline{V}$ denote the maxi min value and $\overline{V}$ the mini max value of the game, then prove that $\underline{V} \leq \overline{V}$.

Q.3 Derive Economic lot size model with uniform rate of demand, infinite production rate and having no shortages.

OR

Find the probability distribution of queue length of model $M / M / I : (\alpha / FIFO)$

Q.4 Solve the following non - linear programming problem, using the method of Lagrangian multipliers :

$$\text{Max. } Z = 6x_1 + 8x_2 - x_1^2 - x_2^2$$

$$\text{Subject to } \quad 4x_1 + 3x_2 = 16$$

$$3x_1 + 5x_2 = 15$$

$$x_1 x_2 \geq 0$$

OR

Explain Beale's algorithm for QPP.

Section - 'C'

Answer the following questions : **(10x4=40)**

Q.1 Use Branch and bound technique to solve the following LPP

$$\text{Max. } Z = 7x_1 + 9x_2$$

$$\text{Subject to } \quad -x_1 - 3x_2 \geq 6$$

$$7x_1 - x_2 \geq 35$$

$$0 \leq x_1, x_2 \leq 7$$

OR

Solve the following Dynamic programming problem :

$$\text{Max. } Z = x_1 + 9x_2$$

$$\text{s.t.c.} \quad 2x_1 + x_2 \leq 25$$

$$x_2 \leq 11$$

$$x_1 x_2 \geq 0$$

Q.2 Solve the following $2 \times n$ game graphically

		I	II	III	IV
A	I	1	3	−3	7
	II	2	5	4	−6