Progressive Education Society's

Modern college of Arts, Science & Commerce,
Ganeshkhind, Pune -16 (Autonomous)
EVEN Semester Examination Mar./April. 2024-25
Faculty: Science and Technology

Program: BSc Gen03 **Semester VI** **Set A**
Program(Specific): B.Sc. **Course Type: Core**
Class:T.Y.B.Sc.(Mathematics) **Max. Marks:35**
Name of the Course: Optimization Techniques **Paper No: V**
Course Code: 24-MT-365(A) **Time: 2 Hours**

Instructions To the Candidates:
1. Draw a well labelled diagram wherever necessary.
2. Figures to the right indicate full marks.

SECTION: A

Q 1) Attempt any **FIVE** of the following. [5X2=10 Marks]

A) Define a zero-sum game?

B) Explain when the dummy activity is used in the construction of Network.

C) What are the different types of failure that can occur in replacement and maintenance models?

D) Define the term Fair game.

E) We have a five jobs each of which has to go through the machines M1 and M2 in the order M1-M2. Processing time (in hrs) are given as:

Job	**A**	**B**	**C**	**D**	**E**
M1	5	2	2	3	4
M2	2	3	7	2	1

Find the optimum sequence.

F) What is an event in network models?

H) Consider the function $f(x) = x^2 + x$. Find stationary point of f(x) and determine whether stationary point is maximum or minimum.

SECTION: B

Q 2) Attempt any **Three** of the following. [3X5=15 Marks]

A) Reduce the following game by dominance property and find value of game.

$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 3 & 2 & 7 & 4 \\ 3 & 4 & 1 & 5 & 6 \\ 6 & 5 & 7 & 6 & 5 \\ 2 & 0 & 6 & 3 & 1 \end{bmatrix}$$

B) Draw a network diagram of activities for the project.

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor	-	-	-	A	B	B	C	D	E	H, I	F, G

C) A farm is considering the replacement of a machine whose cost price is Rs.12,000 and scrap value is Rs.500. From experience, the running costs are found to be as follows:

Year	1	2	3	4	5	6	7	8
Running cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced ?

D) We have a five jobs each of which has to go through the machines X and Y in the order X-Y.Processing time (in hrs) are given as:

Job	**A**	**B**	**C**	**D**	**E**
Machine X	12	4	20	14	22
Machine Y	6	14	16	18	10

Determine a sequence of these jobs that will minimize the total elapsed time. Also, find idle time for both machines.

E) Consider a function $f(x) = x_1 + 2x_2 + x_1x_2 - {x_1}^2 - {x_2}^2$. Find stationary point of f(x) and check whether stationary point is maximum or minimum.

SECTION: C

Q 3) Attempt any **One** of the following. [1X 10=10 Marks]

A) A manufacturing company processes 6 different jobs on two machine A and B in the order A-B. Number of units of each job and it's processing time on A and B are given below. Find optimal sequence, total minimum elapsed time and idle time for each machines.

Job	**No. of units of each job**	**Processing time**	
		Machine A	**Machine B**
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14
7	2	5	4

B) i) Obtain the optimal strategies for both person and the value of game for two person zero sum game whose payoff matrix is given as follows.

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{bmatrix}$$

ii) Solve LPP by Lagrange method.

Optimize Z=$2{x_1}^2 + {x_2}^2 + 3{x_3}^2 + 10x_1 + 8x_2 + 6x_3 - 100$

subject to:

$$x_1 + x_2 + x_3 = 20$$

$$x_1, x_2, x_3 \geq 0$$

♠♠♠♠♠