SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
B.Sc.(Maths) - END SEMESTER EXAMINATIONS APRIL-2023
SEMESTER - VI
22UMACT6015 - Operation Research

Total Duration : 2 Hrs 30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Old hens can be bought at Rs.2 each and young ones at Rs.5 each. The old hens lay 3 eggs per week and the young ones lay 5 eggs per week, each egg being worth 30 paise. A hen costs Rs.1 per week to feed. A person has only Rs.80 to spend for hens. How many of each kind should be buy to give a profit of more than Rs.6 per week, assuming that he cannot house more than 20 hens. Formulate this as a L.P.P.

2. Write the advantages and limitations of Linear Programming.

3. Solve by Simplex method,
   Max Z $= x_1 + 2x_2 + 3x_3 - x_4$
   Subject to constraints, $x_1 + 2x_2 + 3x_3 = 15$
   $2x_1 + x_2 + 5x_3 = 20$
   $x_1 + 2x_2 + x_3 + x_4 = 10$,
   $x_1, x_2, x_3, x_4 \geq 0$.

4. The assignment cost of assigning any one operator to any one machine is given in the following table.

		Operators			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	18	3
	C	10	7	3	2
	D	5	11	9	7

   Find the optimal assignment by Hungarian method.

Contd...

5. A batch of 4 jobs can be assigned to 5 different machines. The set up time (in hours) for each job on various machines is given below.

		Machine				
		1	2	3	4	5
Job	1	10	11	4	2	8
	2	7	11	10	14	12
	3	5	6	9	12	14
	4	13	15	11	10	7

Find an optimal assignment of jobs to machines will minimize the total set up time.

6. Draw the network for the project whose activities with their predecessor relationships are given below: A, C, D can start simultaneously;
E>B,C; F,G>D; H,I>E,F; J > I, G ; K > H ; B > A.

7. A project schedule has the following characteristics.

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6
Time	4	1	1	1	6	5	4

Activity	5-7	6-8	7-8	8-10	9-10
Time	8	1	2	5	7

Construct PERT network and find the critical path.

8. Find the sequence that minimizes the total elapsed time required to complete the following tasks on machines M_1 and M_2 in the order M_1, M_2. Also, find the minimum total elapsed time.

Task	A	B	C	D	E	F	G	H	I
M_1	2	5	4	9	6	8	7	5	4
M_2	6	8	7	4	3	9	3	8	11

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. A company produces two different products A and B. The company makes a profit of Rs.40 and Rs.30 per unit on A and B respectively. The production process has a capacity of 30,000 man hours. It takes 3 hours to produce one unit of A and one hour to produce one unit of B. The market survey indicates that the maximum number of units A that can be sold is 8000 and those of B is 12000 units. Formulate the problem and solve it by graphical method to get maximum profit.

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10. Use Penalty Method to Max $Z = 2x_1 + x_2 + x_3$
    Subject to constraints, $4x_1 + 6x_2 + 3x_3 \leq 8$
    $3x_1 - 6x_2 - 4x_3 \leq 1$
    $2x_1 + 3x_2 - 5x_3 \geq 4$ and
    $x_1, x_2, x_3 \geq 0$.

11. Find the Initial basic feasible solution of the following transportation model.

				Demand
	1	2	6	7
	0	4	2	12
	3	1	5	11
Supply	10	10	10	

    Using, (i) North West Corner Rule,
    (ii) Least Cost Method,
    (iii) Vogel's Approximation Method.

12. Construct the network for the project whose activities are given below and compute the total, free and independent float of each activity and hence determine the critical path and the project duration.

Activity	0-1	1-2	1-3	2-4	2-5
Duration (in weeks)	3	8	12	6	3

Activity	3-4	3-6	4-7	5-7	6-7
Duration (in weeks)	3	8	5	3	8

13. Solve the following sequencing problem giving an optimal solution if passing is not allowed.

Machines/ Jobs	M1	M2	M3	M4
A	13	8	7	14
B	12	6	8	19
C	9	7	8	15
D	8	5	6	15

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