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.Mathematics - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - VI
22UMACT6015 - Operations Research

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

Section B

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

1. Solve the following LPP graphically:

   Maximize $Z = 5x_1 + 7x_2$

   subject to the Constraints

   $2x_1 + x_2 \leq 10,$

   $3x_1 + 4x_2 \leq 24,$

   where $x_1, x_2 \geq 0.$

2. A carpenter makes two types of furniture: chairs and tables.Each chair requires 2 hours of cutting and 3 hours of assembling.Each table requires 4 hours of cutting and 2 hours of assembling.The carpenter has 40 hours available for cutting and 30 hours available for assembling.The profit is ₹50 per chair and ₹80 per table. Formulate this as a Linear Programming Problem (LPP) to maximize the carpenter's profit.

3. Solve the LPP using Simplex Method:

   Maximize $Z = 6x_1 + 4x_2,$

   subject to the Constraints

   $x_1 + 2x_2 \leq 8,$

   $3x_1 + x_2 \leq 6,$

   where $x_1, x_2 \geq 0.$

4. Find the initial basic feasible solution (IBFS) of the following Transportation Problem using North-West Corner Rule:

	D_1	D_2	D_3	Supply
S_1	4	3	2	30
S_2	2	5	7	40
S_3	3	6	4	50
Demand	20	50	50	

Contd...

5. Solve the Assignment Problem using Hungarian Method.

Job/Worker	W_1	W_2	W_3	W_4
J_1	9	2	7	8
J_2	6	4	3	7
J_3	5	8	1	8
J_4	7	6	9	4

6. Solve the following Sequencing Problem for n jobs and 2 Machines:

Job	**Machine A**	**Machine B**
1	3	5
2	2	8
3	6	4
4	5	7

7. A factory processes two jobs through 4 machines in the order $M_1 \rightarrow M_2 \rightarrow M_3 \rightarrow M_4$. The processing times (in hours) are:

Job	M_1	M_2	M_3	M_4
J_1	4	6	7	5
J_2	5	3	8	6

   Determine the Optimal Sequence.

8. Construct the network diagram for the following activities:

Activity	A	B	C	D	E	F
Predecessor	-	A	A	B, C	C	D, E

Section C

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

9. A factory produces two products, A and B. Each unit of A requires 3 hours of labor and 5 kg of raw material, while each unit of B requires 2 hours of labor and 4 kg of raw material. The total available labor is 60 hours, and the total raw material available is 80 kg. The profit per unit is ₹40 for A and ₹50 for B. Formulate this as an LPP and solve it graphically.

10. Solve the following LPP using Two - Phase Method:

    Minimize $Z = x_1 + 2x_2$,

    subject to the constraints

    $$x_1 + x_2 = 3,$$
    $$2x_1 - x_2 \geq 2,$$

    where $x_1, x_2 \geq 0$.

Contd...

11. Solve the following Transportation Problem using the Vogel's Approximation Method (VAM) and find the optimal solution:

	W_1	W_2	W_3	**Supply**
F_1	6	4	3	20
F_2	3	8	5	30
F_3	7	6	4	50
Demand	30	40	30	

12. Solve the following sequencing problem for 'n jobs through 2 machines'. Find the optimal sequence and total processing time.

Job	**Machine A**	**Machine B**
1	8	5
2	6	7
3	4	9
4	3	6
5	7	8

13. A project follows the PERT method with the following time estimates (Optimistic, Most Likely, Pessimistic).
    - Compute the Expected Time (TE) for each activity.
    - Construct the network diagram.
    - Find the Critical Path.

Activity	**Predecessor**	**Optimistic (a)**	**Most Likely (m)**	**Pessimistic (b)**
A	-	3	6	9
B	A	2	5	8
C	A	4	6	10
D	B,C	5	7	11
E	D	3	4	6

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