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.Com. BIM - END SEMESTER EXAMINATIONS - NOV'2024
SEMESTER - II
21UBBAT2002 - Elements of Operations Research

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

Section B

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

1. Describe the characteristics of operations research.
2. Illustrate the need and scope of operations research.
3. A firm manufactures two types of products, A and B, and sells them at a profit of Rs.2 on type A and Rs.3 on type B. Each product is processed on two machines M_1 and M_2. Type A requires 1 minute of processing time on M_1 and 2 minutes on M_2. Type B requires 1 minute on M_1 and 1 minute on M_2. Machine M_1 is available for not more than 6 hours 40 minutes while machine M_2 is available for 10 hours during any working day. Formulate the problem as an LPP to maximize the profit.
4. Express the following LPP in the canonical form.
   Maximize $= 2X_1 + 3X_2 + X_3$
   Subject to constraints $4X_1 - 3X_2 + X_3 \leq 6$
   $X_1 + 5X_2 - 7X_3 \geq -4$
   And $X_1, X_3 \geq 0$, X_2 is unrestricted.
5. Determine the basic feasible solution to the following transportation problem using Northwest Corner Rule:

		Sink					**Supply**
		A	**B**	**C**	**D**	**E**	
Origin	**P**	2	11	10	3	7	4
	Q	1	4	7	2	1	8
	R	3	9	4	8	12	9
Demand		3	3	4	5	6	

6. Find the initial basic feasible solution for the following transportation problem by Least cost method

	To				**Supply**
From	1	2	1	4	30
	3	3	2	1	50
	4	2	5	9	20
Demand	20	40	30	10	

Contd...

7. Draw the event-oriented network for the following data:

Event No.	1	2	3	4	5	6	7
Immediate predecessors	-	1	1	2,3	3	4,5	5,6

8. Construct the network for the project whose activities and their relationships are as given below:

Activities	A, D, E can start simultaneously
Activities	B,C>A; G,F>D,C; H>E,F.

Section C

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

9. Describe the applications and the advantages of operations research.

10. A firm produces three products. These products are processed on three different machines. The time required to manufacture one unit of each of the three products and the daily capacity of the three machines are given in the table below:

Machine	**Time per unit (minutes)**			**Machine capacity (Minutes/day)**
	Product 1	**Product 2**	**Product 3**	
M_1	2	3	2	440
M_2	4	-	3	470
M_3	2	5	-	430

It is required to determine the number of units to be manufactured for each product daily. The profit per unit for product 1,2 and 3 is Rs.4, Rs.3 and Rs.6 respectively. It is assumed that all the amounts produced are consumed in the market. Formulate the mathematical model for the problem.

11. Solve the following LLP by simplex method:
Minimize Z = $8X_1$ - $2X_2$
Subject to -$4X_1 + 2X_2 \leq 1$
$5X_1$ - $4X_2 \leq 3$
and $X_1, X_2 \geq 0$.

12. Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows:

		Jobs				
		1	**2**	**3**	**4**	**5**
Person	**A**	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

Determine the optimum assignment schedule.

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13. Calculate the earliest start, earliest finish, latest start and latest finish of each activity of the project given below and determine the critical path of the project.

Activity	1-2	1-3	1-5	2-3	2-4
Duration (in weeks)	8	7	12	4	10
Activity	3-4	3-5	3-6	4-6	5-6
Duration (in weeks)	3	5	10	7	4

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