

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.

M.Com. - END SEMESTER EXAMINATIONS - APRIL 2025

SEMESTER - II

**23PCOET2002 - Operations Research**

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

**Section B**

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

1. The ABC manufacturing company can make two products  $P_1$  and  $P_2$ . Each of the product requires time on a cutting machine and finishing machine. Relevant data are:

	Product	
	$P_1$	$P_2$
Cutting Hours (Per Unit)	2	1
Finishing Hours (Per Unit)	3	3
Profit (Per Unit)	Rs.6	Rs.4
Maximum Sales (Units Per Week)	-	200

The number of cutting hours available per week is 390 and number of finishing hours available per week is 810. How much should be produced of each product in order to achieve maximum profit for the company?

2. Consider the following TP using Least Cost Entry Method.

	$S_1$	$S_2$	$S_3$	Availabilities
$W_1$	5	4	3	6
$W_2$	4	7	6	8
$W_3$	2	5	8	12
$W_4$	8	6	7	4
Requirements	8	10	12	30

3. Solve the following unbalanced assignment problem of minimising total time for doing all the jobs.

Operator	Job				
	1	2	3	4	5
1	6	2	5	2	6
2	2	5	8	7	7
3	7	8	6	9	8
4	6	2	3	4	5
5	9	3	8	9	7
6	4	7	4	6	8

Contd...

4. Explain the Critical Path Method (CPM) and Programme Evaluation Review Technique (PERT) with respect to project management.
5. Using the Principle of Dominance solve the following game.

8	10	9	14
10	11	8	12
13	12	14	13

6. Five jobs 1, 2, 3, 4 and 5 are to be assigned to five persons A, B, C, D, and E. The time taken (in minutes) by each of them on each job is given below:

	1	2	3	4	5
A	16	13	17	19	20
B	14	12	13	16	17
C	14	11	12	17	18
D	5	5	8	8	11
E	5	3	8	8	10

Work out the optimal assignment and the total minimum time taken.

7. Explain the maximum principle with the following pay-off matrix for player A.

<b>Player A</b>	<b>Player B</b>		
	20	12	15
	11	10	12
	15	11	10

8. Diagnose the reasons behind project delays by analyzing the float values in a network diagram.

### Section C

I - Answer any **TWO** questions ( $2 \times 10 = 20$  Marks)

9. Solve the following LPP using Simplex method.

$$\begin{aligned} \text{Max } z &= 45x_1 + 80x_2 \\ \text{subject to } 5x_1 + 20x_2 &\leq 400 \\ 10x_1 + 15x_2 &\leq 450 \\ x_1, x_2 &\geq 0. \end{aligned}$$

10. A Company has four factories from which it ships its product units to four warehouses  $W_1, W_2, W_3$  and  $W_4$  which are the distribution centres. Transportation costs per unit between various combinations of factories ( $F_1, F_2, F_3$  and  $F_4$ ) and warehouses are:

	$W_1$	$W_2$	$W_3$	$W_4$	Availabilities
$F_1$	48	60	56	58	140
$F_2$	45	55	53	60	260
$F_3$	50	65	60	62	360
$F_4$	52	64	55	61	220
Requirements	200	320	250	210	

Contd...

11. Solve the following game:

<b>Player A</b>	<b>Player B</b>			
	3	-1	1	2
	-2	3	2	3
	2	-2	-1	1

12. The activities of a project have the following PERT time estimates.

Job	Optimistic Time	Most Likely Time	Pessimistic Time
1-2	3	6	115
7-8	4	19	28
2-3	6	12	30
3-5	5	11	17
5-8	1	4	7
6-7	3	9	27
4-5	3	6	15
2-4	2	5	8
1-6	2	5	14

- (i) Draw the network diagram and determine the critical path.
- (ii) Find the project completion time and its variance.

II - Compulsory question (1 × 10 = 10 Marks)

13. Five lathes are to be allotted to five operators (one for each). The following table gives weekly output figures (in pieces):

<b>Operator</b>	<b>Weekly Output in lathe</b>				
	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>
P	20	22	27	32	36
Q	19	23	29	34	40
R	23	28	35	39	34
S	21	24	31	37	42
T	24	28	31	36	41

Profit per price is Rs.25. Find the maximum profit per week.

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