

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

24PCOCT2006 - Operations Research

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

Section B

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

1. Define Operations Research and explain its origin.
2. A dietician wishes to mix two types of food in such a way that the Vitamin contents of the mixture contains at least 8 units of Vitamin A and 10 units of Vitamin B. Food I contains 2 units per kg of Vitamin A and 1 unit per kg of vitamin B while the food II contains 1 unit per kg of Vitamin A and 2 units per kg of Vitamin B. It costs Rs.5 per kg to purchase food I and Rs.8 per kg to purchase food II. Prepare a mathematical model of the problem stated above.
3. Find the minimum cost solution for the following transportation problem which has cost structure as

				Availability
From	16	19	12	14
	22	13	19	16
	14	28	8	12
Requirements	10	15	17	

4. Four jobs can be processes on four different machines, one job on one machine. Resulting times in minutes vary with assignments. They are given below:

	Machines				
	A	B	C	D	
Jobs	I	42	35	28	21
	II	30	25	20	15
	III	30	25	20	15
	IV	24	20	16	12

Find the optimum assignment of jobs to machines and the corresponding time.

5. Explain the common assumptions of sequencing of jobs.

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6. A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day.

- (i) how many jobs are ahead of the set just brought in?
- (ii) what is the repairman's expected idle time each day?

7. The cost of a machine is Rs.6,100 and its scrap value is Rs.100. The maintenance costs found from experience are as follows:

Year	1	2	3	4	5	6	7	8
Maintenance costs (Rs.)	100	250	400	600	900	1,200	1,600	2,000

When should the machine be replaced?

8. A distributor of a certain product incurs holding cost of Rs.100 per unit per week and shortage cost of Rs.300 per unit. The data on the sales of the product are given below:

Weekly sales (units)	0	1	2	3	4	5	6	7	8
No. of weeks frequency	0	0	5	10	15	15	5	0	0

How many units should the distributor buy every week? Also find E.V.PI.

Section C

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

- 9. What do you mean by decision tree and explain the rules of drawing a decision theory?
- 10. Six jobs go first over machine I and then over machine II. The order of the completion of jobs has no significance. The following table gives the machine time in hours for six jobs and the two machines:

Jobs No.	1	2	3	4	5	6
Time on machine I(A)	5	9	4	7	8	6
Time on machine II(B)	7	4	8	3	9	5

Find the sequence of jobs that minimises the total elapsed time to complete the jobs. Find the minimum time by using Gantt's chart or by any other method.

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11. Solve the following LPP by Graphical method.

$$\text{Min } z = 3x_1 + 2x_2$$

subject to

$$5x_1 + x_2 \geq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 + 4x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

12. A Bakery store keeps stock of a popular brand of cake. The daily demand based on the past experience is given below:

Daily Demand	0	15	25	35	45	55
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Using the following random numbers 48, 78, 09, 51, 56, 77, 15, 14, 68, 09 simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

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

13. The following table lists the jobs of a network with their times estimates

Job	Optimistic	Duration days Most likely	Pessimistic
1-2	3	6	15
1-6	2	5	14
2-3	6	12	30
2-4	2	5	8
3-5	5	11	17
4-5	3	6	15
6-7	3	9	27
5-8	1	4	7
7-8	4	19	28

Draw the project network and calculate the length and variance of the critical path.
