

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. A&F - END SEMESTER EXAMINATIONS - NOV'2024

SEMESTER - II

**23UAFAT2002 - Operations Research**

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

**Section B**

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

1. Explain the various phases of Operations Research and its role in decision-making.
2. A manufacturer produces two products, A and B. The profit per unit of A is Rs. 20, and the profit per unit of B is Rs. 15. The company has a constraint on labour and materials, which are limited to 40 hours of labour and 80 units of material per day. Product A requires 2 hours of labour and 4 units of material per unit, while Product B requires 1 hour of labour and 2 units of material per unit. solve this problem using the Simplex method to maximize the profit.
3. Consider the following transportation problem with 3 suppliers and 3 destinations. Apply the North-West Corner Method to find an initial feasible solution.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Supply
S <sub>1</sub>	10	20	30	15
S <sub>2</sub>	40	50	60	25
S <sub>3</sub>	70	80	90	20
Demand	5	15	40	

4. Predict the steps of the North-West Corner Method used to solve a Transportation Problem.
5. Illustrate the different types of strategies followed by players in a game under Game Theory.
6. Consider the following 2x2 payoff matrix for Player A. Predict the optimal strategy for Player A using the maxi-min criterion.

	B <sub>1</sub>	B <sub>2</sub>
A <sub>1</sub>	3	4
A <sub>2</sub>	2	1

**Contd...**

7. A company wants to estimate the probability of their machine breaking down on a particular day. Based on historical data, the following probabilities have been observed for the number of breakdowns per day:

- 0 breakdowns: 30%
- 1 breakdown: 40%
- 2 breakdowns: 20%
- 3 breakdowns: 10%

Using the Monte Carlo simulation method, interpret 5 random numbers and simulate the number of breakdowns for 5 days. Use the following random numbers:

0.34, 0.82, 0.55, 0.12, 0.75

8. Differentiate between CPM (Critical Path Method) and PERT (Program Evaluation and Review Technique) in network analysis?

### Section C

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

9. A factory makes two products, P1 and P2. Each unit of P1 requires 1 hour of labour and 1 kg of raw material, and each unit of P2 requires 2 hours of labour and 1 kg of raw material. The factory has 40 hours of labour and 20 kg of raw material available. The profit on each unit of P1 is Rs. 50, and on P2, it is Rs.40.  
Solve the problem graphically to maximize the profit.
10. A company needs to transport products from three warehouses (W1, W2, W3) to four destinations (D1, D2, D3, D4). The supply from each warehouse and the demand at each destination, along with the transportation cost per unit, are given below. Solve this transportation problem using the North-West Corner Method and compute the total transportation cost.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
W <sub>1</sub>	2	3	1	4	30
W <sub>2</sub>	3	2	4	2	40
W <sub>3</sub>	4	3	2	5	20
Demand	20	30	30	10	

11. Examine the following 2x3 zero-sum game using the Dominance Property and find the optimal strategy for both players.

	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>
A <sub>1</sub>	2	3	4
A <sub>2</sub>	1	2	3

Contd...

12. A small workshop has one machine to process jobs, and the job arrival times and service times are as follows:

Job Inter-arrival times (in minutes)	4	2	8	5	3
Job Service times (in minutes)	5	3	7	4	6

The first job arrives at time 0. Simulate the job processing for 5 jobs using the following assumptions:

The machine can only handle one job at a time (first-come, first-served basis).

If a job arrives and the machine is busy, it has to wait until the current job is finished.

Compute the waiting time and completion time for each job.

13. Evaluate the steps involved in Critical Path Method (CPM) and how the critical path is determined in a project.

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