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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2025- 2026)

Subject: Operations Research

Time: 2 Hours

Max. Marks: 50

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

15

1. Attempt all parts:-

- | | | |
|-------|---|---|
| (1.1) | Example of a deterministic model is (CO1,K2) | 1 |
| | (a) Linear programming mode
(b) Queuing theory model
(c) Both
(d) None | |
| (1.2) | If there is no non-negative replacement ratio in solving a Linear Programming Problem then the solution is _____.(CO2,K2) | 1 |
| | (a) Feasible
(b) Bounded
(c) Unbounded
(d) Infinite | |
| (1.3) | The transportation problem is basically a (CO3,K1) | 1 |
| | (a) Maximization model
(b) Minimization model
(c) Transshipment problem
(d) Iconic model | |
| (1.4) | Critical activities in Network analysis have (CO4,K2) | 1 |
| | (a) Zero Float
(b) Minimum float
(c) Maximum float
(d) None of these | |

- (1.5)of the following is a characteristic of Monte Carlo simulation. (CO5,K1) 1
- (a) It uses discrete state changes.
 - (b) It models interactions between agents.
 - (c) It relies on random sampling of inputs.
 - (d) None of the above

2. Attempt all parts:-

- (2.1) "Operations Research is a bunch of mathematical techniques to break industrial problems". Critically comment. (CO1,K2) 2
- (2.2) Write a short note on unbounded region.(CO2,K1) 2
- (2.3) Give two application of the assignment model.(CO3,K2) 2
- (2.4) Give the the common errors in the construction of network. (CO4,K1) 2
- (2.5) Discuss the main advantages of using simulation. (CO5,K1) 2

SECTION-B

15

Answer any one of the following:-

- (3.1) Enumerate six techniques of OR and describe briefly.(CO1,K2) 3
- (3.2) Distinguish the following models with suitable examples: (CO1,K1) 3
- a) Stochastic and deterministic models
 - b) Static and dynamic models

Answer any one of the following:-

- (3.3) A paper mill produces two grades of paper namely X and Y. Owing to raw material restrictions, it cannot produce more than 400 tons of grade X and 300 tons of grade Y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a ton of products X and Y, respectively with corresponding profits of 200 rs. And 500 rs. Per ton. Find the maximum the profit.(CO2,K3) 3
- (3.4) A paper mill produces two grades of paper namely A and B. Owing to raw material restrictions, it cannot produce more than 40 tons of grade A and 30 tons of grade B in a week. There are 80 production hours in a week. It requires 2 and 4 hours to produce a ton of products A and B, respectively with corresponding profits of 20 rs. And 50 rs. Per ton. Formulate the LPP and also maximize the profit.(CO2,K3) 3

Answer any one of the following:-

- (3.5) Solve the following unbalanced assignment problem of minimizing total time for doing all the jobs(CO3,K3): 3

Job		1	2	3	4	5
Operator	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

- (3.6) The owner of a small machine shop has four mechanics available to assign jobs for the day. Five jobs are offered with expected profit for each mechanic on each jobs, which are as follows: (CO3,K3) 3

	A	B	C	D	E
1	62	78	50	111	82
2	71	84	61	73	59
3	87	92	111	71	81
4	48	64	87	77	80

Determine the assignments of mechanics to the job that will result in maximum profit. Also write down the job which should be declined.

Answer any one of the following:-

- (3.7) The table below provides cost and estimates for a seven-activity project. (CO4,K3) 3

Activity	Days		
	a	m	b
1-2	2	5	14
1-3	9	12	15
2-4	5	14	17
3-4	2	5	12
4-5	6	6	12
3-5	8	17	20

- Draw the project network corresponding to normal time.
- Determine the critical path and total project duration.

- (3.8) The annual demand of an item is Rs. 3200 units. The unit cost is Rs. 6 and inventory carrying charges are 25 percent per annum. if the cost of one procurement is Rs. 150, Calculate Economic Order Quantity (EOQ) and no. of orders per year. (CO4,K3) 3

Answer any one of the following:-

- (3.9) A bakery keeps stock of a popular brand of cake. Previous experience shows the demand pattern for the item with associated probabilities, as given below: 3
 Daily demand (number): 0 10 20 30 40 50
 Probability : 0.01 0.2 0.15 0.50 0.12 0.02
 Simulate the demand for next 10 days. Also estimate the daily average demand for the cakes on the basis of simulated data. (CO5,K3)
 Random Numbers: 25,39,65,76,12, 5,73,89,19,49.
- (3.10) A tourist car operator finds that during the past few months, the cars use has varied so much that the cost of maintaining the car varied considerably. During the past 200 days demand for the car fluctuated as below:(CO5,K3) 3

Trips (Per week)	0	1	2	3	4	5
Frequency	16	24	30	60	40	30

Using Monte Carlo simulation, simulate the demand for next 10 days and also calculate average demand.

The two digit random numbers are: 82, 96, 18, 96, 20, 84, 56, 11, 52, 3.

SECTION-C

20

4. Answer any one of the following:-

- (4.1) Explain the role of decision making in Operations Research. (CO1,K1) 4
- (4.2) Define OR and Discuss the various phases in solving an OR problem. (CO1,K1) 4

5. Answer any one of the following:-

- (5.1) A company manufactures two types of boxes, corrugated and ordinary cartons. The boxes undergo two major processes: cutting and pinning operations. The profits per unit are Rs. 8 and Rs. 4 respectively. Each corrugated box requires 3 minutes for cutting and 6 minutes for pinning operation, whereas each carton box requires 4 minutes for cutting and 1 minute for pinning. The available operating time is 80 minutes and 120 minutes for cutting and pinning machines. Formulate the LPP and solve graphically. (CO2,K3) 4
- (5.2) Show that the set $C = \{(x,y) : 2x+3y = 7\} \subset R^2$ is a convex set. (CO2,K2) 4

6. Answer any one of the following:-

- (6.1) Explain the Hungarian method to solve an assignment problem. (CO3,K2) 4
- (6.2) Solve the following transportation problem using the Vogel's Approximation method. (CO3,K3) 4

	A	B	C	Supply
1	2	2	3	10
2	4	1	2	15
3	1	3	1	40
Demand	20	15	30	

7. Answer any one of the following:-

- (7.1) Define critical path method (CPM) and Programme Evaluation and Review Technique (PERT). Distinguish PERT and CPM. Elaborate applications of PERT. (CO4,K1) 4
- (7.2) Define Network scheduling and also give the various phases involved in a project. (CO4,K1) 4

8. Answer any one of the following:-

- (8.1) Describe the applications of simulation and discuss its scope. (CO5,K2) 4
- (8.2) Explain the meaning of Monte-Carlo method of simulation. Discuss its scope. (CO5,K1) 4