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Subject Code:- AMIBA0507

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MBA (Integrated)

SEM: V - THEORY EXAMINATION (2024- 2025)

Subject: Operations Research

Time: 2.5 Hours Max. Marks: 60

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.

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SECTION-A 15

1. Attempt all parts:-

1-a. The term "Operations Research" originated during which period? (CO1, K2) 1

(a) World War I

(b) World War II

(c) Industrial Revolution

(d) none of the above

1-b. For finding an optimum solution in transportation problem…….....method is used. (CO2, K6) 1

(a) MODI

(b) Hungarian

(c) Johnson

(d) None of the above

1-c. The method used for solving an assignment problem is called(CO3, K2) 1

(a) Reduce matrix method

(b) MODI method

(c) Hungarian method

(d) None of the above

1-d. Which of the following is a method used to minimize idle time in sequencing problems?(CO4, K4) 1

(a) VAM

(b) Johnson's Rule

(c) NWCR

(d) None of the above

1-e. CPM stands for (CO5, K4) 1

(a) Critical Path Method

(b) Control Path Method

(c) Critical Plan Management

(d) None of these

2. Attempt all parts:-

2.a. Who coined the term Operations Research and when?(CO1, K2) 2

2.b. Name the methods to solve the Initial Basic Feasible Solution of a transportation problem. (CO2, K6) 2

2.c. Name the various types of games. (CO3, K2) 2

2.d. Write the condition for Johnson's algorithm to be applicable in finding the optimal sequencing order of *n* jobs through 3 machines. (CO4, K4) 2

2.e. Name the two basic planning and control techniques in a network analysis.(CO5, K4) 2

SECTION-B 15

3. Answer any three of the following:-

3-a. Write down the various phases of operation research. (CO1, K2) 5

3-b. Find initial basic feasible solution by using NWCR method of the following transportation problem. (CO2, K6) 5

	D_1	D_2	D_3	Supply
F_1	2	7	4	5
F_2	3	3	1	8
F_3	5	4	7	7
F_4	1	6	2	14
Demand	7	9	18	34

3.c. Solve the game whose payoff matrix is given below. Also determine the optimal strategies and its value. (CO3, K4) 5

$$\begin{matrix} & B \\ A & \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{matrix}$$

3.d. Seven jobs are to be processed on two machines A and B in the order A B. Each machine can process only one job at a time. The processing times (in hours) are as follows: 5

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Job	1	2	3	4	5	6	7
Machine A	10	12	13	7	14	5	16
Machine B	15	11	8	9	6	7	16

Suggest optimum sequence of processing the jobs and the total elapsed time. Also calculate idle time(in hours) for the two machines A and B. (CO4, K4)

3.e. Write the applications of PERT and CPM.(CO5, K4) 5

SECTION-C 30

4. Answer any one of the following:-

4-a. Write down any six limitations of Operations Research .(CO1, K2) 6

4-b. The objective of a diet problem is to ascertain the quantities of certain foods that should be eaten to meet certain requirements at a minimum cost. The consideration is limited to milk, green vegetables and eggs and to vitamins A, B, C. The number of milligrams of each of vitamins contained within a unit of each food and their daily minimum requirement along with the cost of each food is given in table: 6

Vitamin	Litre of Milk	Kg. of Vegetables	Dozen of Eggs	Minimum Daily Requirement
A	1	1	10	1mg.
B	100	10	10	50mg.
C	10	100	10	10 mg.
Cost in Rs.	20	10	8	

Formulate a linear programming problem for this diet problem.(CO1, K2)

5. Answer any one of the following:-

5-a. Find the initial basic feasible solution to the following Transportation Problem by using Vogel's Approximation Method.-(CO2, K6) 6

	A	B	C	D	*Available*
X	5	3	6	2	19
Y	4	7	9	1	37
Z	3	4	7	5	34
Demand	16	18	31	25	

5-b. Find Initial Basic Feasible Solution using Least Cost Method on the following Transportation problem (CO2, K6) 6

	Destination					
Origin		A	B	C	D	Supply
	I	6	4	1	5	14
	II	8	9	2	7	16
	III	4	3	6	2	5

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	Demand	6	10	15	4	35

6. Answer any <u>one</u> of the following:-

6-a. A plant manager has four subordinates, and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. This estimate of the times each man would take to perform each task is given in the effectiveness matrix below. 6

		Subordinates			
		I	**II**	**III**	**IV**
Tasks	**A**	8	26	17	11
	B	13	28	4	26
	C	38	19	18	15
	D	19	26	24	10

How should the tasks be allocated, one to a man, so as to minimize the total man hours?(CO3, K4)

6-b. Solve the game whose payoff matrix is given below:(CO3, K4) 6

Player B

$$\text{Player A} \begin{bmatrix} 1 & 7 & 2 \\ 6 & 2 & 7 \\ 5 & 1 & 6 \end{bmatrix}$$

7. Answer any <u>one</u> of the following:-

7-a. Suppose that there are five jobs, each of which has to be processed on two machines A and B in the order AB. Processing times are given in the following table: 6

Job	Machine A	Machine B
1	6	3
2	2	7
3	10	8
4	4	9
5	11	5

Determine a sequence in which these jobs should be processed so as to minimize the total processing time. Also calculate the idle time on two machines A and B. (CO4, K4)

7-b. We have seven jobs, each of which must go through machines A, B and C in the order A B C. Processing times (in hours) are given in the following table: 6

Job No.	1	2	3	4	5	6	7
Machine A	5	7	3	4	6	7	12
Machine B	2	6	7	5	9	5	8
Machine C	10	12	11	13	12	10	11

Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information. Also calculate the idle time on machines A, B and C (CO4, K4)

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8. Answer any <u>one</u> of the following:-

8-a. A small maintenance project consists of the following jobs whose precedence relationships are given below. 6

Activity	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration (days)	15	15	3	5	8	12	1	14	3	14

(i) Draw an arrow diagram representing the project..
(ii) Compute the earliest event time and latest event time.
(iii) Find the critical path and the total project duration.(CO5, K4)

8-b. A project has the following activities and other characteristics: 6

Activity(i-j)	**WEEKS**		
	Optimistic	**Most likely**	**Pessimistic**
(1-2)	**1**	**1**	**7**
(1-3)	**1**	**4**	**7**
(2-4)	**2**	**2**	**8**
(2-5)	**1**	**1**	**1**
(3-5)	**2**	**5**	**14**
(4-6)	**2**	**5**	**8**
(5-6)	**3**	**6**	**15**

Find:

1. Draw the project network
2. Find the expected duration and variance of each activity.
3. Find the variance and standard deviation of project length. (CO5, K4**)**

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