Printed Page:- 06 **Subject Code**:- **AMBA0205**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

MBA

SEM: II - THEORY EXAMINATION (2022-2023 **)**

Subject: Quantitative Techniques for Managers

Time: 3 Hours **Max. Marks: 100**

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 **20**

1. Attempt all parts:-

1-a. Operations Research study generally involves how many phases? (CO1) 1

(a) Three

(b) Four

(c) Five

(d) None of these

1-b. Slack variable (CO1) 1

(a) Is the difference between the left and right sides of a constraint

(b) Is the amount by which the left side of a is ≤ constraint is smaller than the right side.

(c) Is the amount by which the left side of a is ≤ constraint is larger than the right side.

(d) None of these

1-c. The penalty of a row in a transportation problem is obtained by (CO2) 1

(a) Deducting the smallest element in the row from all other elements of the row

(b) Adding the smallest element in the row to all other elements of the row

(c) Deducting the smallest element in the row from the next highest element of the row

(d) Deducting the smallest element in the row from the highest element in that row

1-d. The northwest corner rule requires that we start allocating units to shipping routes in the: (CO2) 1

(a) Lower right corner of the table.

(b) Upper right corner of the table.

(c) Highest costly cell of the table.

(d) Upper left-hand corner of the table.

1-e. In game theory, the outcome or consequence of a strategy is referred to as the (CO3) 1

(a) Payoff.

(b) Penalty.

(c) Reward.

(d) All these

1-f. An assignment problem is considered as a particular case of a transportation problem, because:(CO3) 1

(a) The number of rows equals the number of columns

(b) All x_{ij}=0 or 1

(c) All rim conditions are 1

(d) All of these

1-g. Utilization factor for the system is denoted by(CO4) 1

(a) λ

(b) ρ

(c) μ

(d) None of these

1-h. The time during which a machine remains waiting or vacant in sequencing problem is called (CO4) 1

(a) Processing time

(b) Idle time

(c) Elapsed time

(d) All of the above

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1-i. In a network diagram an event is denoted by the symbol (CO5) 1

(a) Arrow

(b) Straight line

(c) Square

(d) Circle

1-j. Replacement decision is very much common in this stage (CO5) 1

(a) Infant stage

(b) Old age

(c) Youth

(d) All of the above

2. Attempt all parts:-

2.a. Define LPP. (CO1) 2

2.b. Write the name of methods for finding the optimum solution of a transportation problem. (CO2) 2

2.c. How do we convert a maximization assignment problem into a minimization problem? (CO3) 2

2.d. What is the distribution for service time in Queueing theory? (CO4) 2

2.e. What is a Network? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Write down the difference between Deterministic and Probabilistic Models? (CO1) 6

3-b. 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. Formulate the above as an LPP to maximize the profit. (CO1) 6

3-c. What is Unbalanced transportation problem? How to convert Unbalanced transportation problem into a balanced transportation problem? (CO2) 6

3-d. Write down the steps involved in 'MODI' method of transportation problem. (CO2) 6

3.e. Explain the Hungarian method to solve an assignment problem. (CO3) 6

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3.f. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time(the time taken to hump a train) distribution is also exponential with an average 36minutes.Calculate the following: (CO4) 6

i)The average number of trains in the queue.

ii) The probability that the queue size exceeds 10.

3.g. What are the situations which make the replacement of items necessary? What factors create the replacement problem? (CO5) 6

SECTION C **50**

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

4-a. Define the OR. Discuss historical background of OR and describe the necessity of OR in Industry. (CO1) 10

4-b. Solve the following LPP using simplex method: (CO1) 10

Max $z = 3x + 5y$

Subject to

$x + y \leq 4$,

$3x + 2y \leq 18$,

$x, y \geq 0$

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

5-a. A company has 4 warehouses and 6 stores. The surplus in the warehouse, the requirements of the store and costs (in Rs.) of transportation one unit of the commodity from warehouse i to the store j are given below. How should the commodity be transported so that the total transportation cost is a minimum by VAM method? (CO2) 10

Warehouse	Store						Surplus
	A	B	C	D	E	F	
I	7	5	9	5	10	7	30
II	7	8	24	7	9	13	40
III	4	10	5	6	10	4	20
IV	11	8	12	7	12	11	80
Required	30	30	60	20	10	20	170

5-b. Calculate IBFS and total transportation of the given cost matrix by using North west corner method.: (CO2) 10

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	P	Q	R	S	T	Supply
A	4	2	3	2	6	8
B	5	4	5	2	1	12
C	6	5	4	7	3	14
Demand	4	4	6	8	8	

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

6-a. Solve the following assignment problem by using Hungarian method: (CO3) 10

	Men					
Task		A	B	C	D	E
	I	1	3	2	8	8
	II	2	4	3	1	5
	III	5	6	3	4	6
	IV	3	1	4	2	2
	V	1	5	6	5	4

6-b. Solve the game with the payoff matrix given: (CO3) 10

Player B

$$\text{Player A} \begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$$

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

7-a. Find the sequence for the following eight jobs that will minimize the total elapsed time for the completion of all the jobs. Also calculate idle time. Each job is processed in the same order. (CO4) 10

Task	1	2	3	4	5	6	7	8
I machine	4	6	7	4	5	3	6	2
II machine	8	10	7	8	11	8	9	13
III machine	5	6	2	3	4	9	15	11

The entries give the time in hours on the machine.

7-b. What is Queuing Theory? Explain Queuing System and also discuss the essential features of queueing system. (CO4) 10

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

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8-a. A truck owner finds from his past records that the maintenance cost per year of a truck, whose purchase price is Rs. 8000 are given in the table that follows: (CO5) 10

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Maintenance cost	1000	1300	1700	2200	2900	3800	4800	6000
Resale price	4000	2000	1200	600	500	400	400	400

Determine the time at which it is profitable to replace the truck.

8-b. A project schedule has the following characteristics. (CO5) 10

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (days)	4	1	1	1	6	5	4	8	1	2	5	7

From the above information, you are required to:

i. Construct a network diagram.
ii. Compute the earliest event time and latest event time.
iii. Determine the critical path and total project duration.

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