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Roll No. | | | | | | | | | | |

MBA(INTEGRATED)
(SEM V) THEORY EXAMINATION 2022-23
OPERATIONS RESEARCH

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

(a) Mention two essential characteristics of OR.
(b) What is decision making under risk?
(c) What is Linear Programming?
(d) What is 'Artificial variable'?
(e) What is Sensitivity Analysis?
(f) What is an Assignment Model?
(g) Define Saddle point for a game?
(h) What is a sequencing problem?
(i) What is an Activity in a project?
(j) What is critical path?

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

(a) Discuss the scope and methodology of Operations Research, explaining briefly the main phases of an OR study and techniques used in solving OR problems.

(b) Solve the LPP problem using Graphical Method:
Maximize Z = 11X1 + 4X2, Subject to the constraints

$$7X1 + 6X2 \leq 84$$
$$4X1 + 2X2 \leq 32$$
$$X1, X2 \geq 0$$

(c) What is a Transportation problem? Explain any one method of finding Initial basic feasible solution.

(d) What is a replacement problem? Discuss the difference between replacement problem for items that fails suddenly and the items that deteriorate with time.

(e) Explain the steps in crashing of network?

SECTION C

3. Attempt any *one* part of the following: **10 x 1= 10**

(a) Five lathe are to be allotted to five operators (one for each) The following table gives weekly output figures (in pieces):

Operator \ Lathe	L1	L2	L3	L4	L5
A	20	22	27	32	36
B	19	23	29	34	40
C	23	28	35	39	34
D	21	24	31	37	42
E	24	28	31	36	41

Profit per piece is Rs. 25. Find the maximum profit. Use the Hungarian method to determine the optimal assignments.

(b) A company is transporting its products from four factories to five warehouses. The supply, demand and unit cost of transportation are given below. Find initial basic solution using VAM, and test the optimality of the solution.

	W1	W2	W3	W4	availability
F1	11	13	17	14	250
F2	16	18	14	10	300
F3	21	24	13	10	400
Requirement	300	225	275	250	

4. Attempt any *one* part of the following: **10 x 1= 10**

(a) Explain the Simplex procedure to solve a linear programming problem.

(b) A company manufactures three types of leather belts namely A, B and C on three machines M1, M2, and M3. The unit profits from these three varieties are RS 3, RS 5 and RS 4 respectively. Belt A requires 2 hrs on M1 and 3 hrs on M3. Belt B requires 3hrs on M1, 2 hrs on M2 and 2 hrs on M3, and Belt C requires 5 hrs on M2 and 4 hrs on M3. There are 8 hrs time available on M1, 10 hrs on M2, and 15 hrs on M3 per day. What should be daily production of each type of belt so that total profit is maximum?

5. Attempt any *one* part of the following: **10 x 1= 10**

(a) Solve the game whose payoff matrix is given below

	B1	B2	B3
A1	-3	-2	6
A2	2	0	2
A3	5	-2	-4

(b) A firm is considering replacement of a machine whose cost price is RS 17,500 and the scrap value is RS 500. The maintenance cost (in RS) is found from experience to be as follows, when should the machine be replaced?

Year	1	2	3	4	5	6	7	8
Maintenance cost	200	300	3500	1200	1800	2400	3300	4500

6. Attempt any *one* part of the following: **10 x 1= 10**

(a) In a factory, there are seven jobs to be perform, each of which should go through two machines A and B. The processing times (in hrs) for the jobs are given below. Determine the sequence of these jobs that will minimize total elapsed time.

Jobs ⇨ / Machines ⇩	1	2	3	4	5	6	7
A	4	13	16	7	11	12	10
B	9	11	11	7	13	2	4

(b) What is Queuing theory? State and describe the basic elements of queues.

7. **Attempt any *one* part of the following:** **10 x 1= 10**

(a) An automatic vending machine at the airport dispenses a cup of coffee in 48 seconds. Customer arrives according to Poisson process with a mean rate of 25 per hour. Considering service is constant Calculate-

i. The average number of people that will be waiting for service.
ii. The average waiting time of the customer
iii. Average number of customers in the system.

(b) A Project consists of following activities, find the critical path and total project duration

Activity	Preceding Activity/s	Activity Duration(days)
A	none	2
B	A	4
C	B	10
D	none	6
E	D	2
F	E	4
G	none	2
H	F	2