Paper id: 252389

Roll No: | | | | | | | | | | | | | |

MBA

(SEM II) THEORY EXAMINATION 2024-25

QUANTITATIVE TECHNIQUES FOR MANAGERS

TIME: 3 HRS **M.MARKS: 100**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

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

Q No.	Question	CO	Level
a.	Define operation research.	1	K1
b.	Briefly explain the scope of Operations Research in business.	1	K2
c.	What is duality in linear programming?	2	K1
d.	Explain the decision variables in Linear Programming.	2	K1
e.	What is a two-person zero-sum game?	3	K1
f.	Define balanced and unbalanced assignment problem.	3	K1
g.	In sequencing, what is meant by idle time?	4	K1
h.	Define arrival rate and service rate.	4	K2
i.	What is replacement problem in operation research?	5	K1
j.	Give examples of application of CPM and PERT.	5	K1

SECTION B

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

<table>
<tr><td>a.</td><td>Define decision-making under uncertainty and discuss the various decision criteria used for decision making under uncertainity.</td><td>1</td><td>K2</td></tr>
<tr><td>b.</td><td>Explain the linear programming problem giving an example. What are the essential characteristics of a linear programming model?</td><td>2</td><td>K2</td></tr>
<tr><td>c.</td><td>Solve the game with the payoff matrix for player A as given in Table below.
<table>
<tr><td colspan="2"></td><td colspan="3">Player B</td></tr>
<tr><td rowspan="4">Player A</td><td></td><td>B_1</td><td>B_2</td><td>B_3</td></tr>
<tr><td>A_1</td><td>-4</td><td>0</td><td>4</td></tr>
<tr><td>A_2</td><td>1</td><td>4</td><td>2</td></tr>
<tr><td>A_3</td><td>-1</td><td>5</td><td>-3</td></tr>
</table></td><td>3</td><td>K4</td></tr>
<tr><td>d.</td><td>In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order A, B. The processing timings (in hours) for the jobs are given here. You are required to determine the sequence for performing the jobs that would minimize the total elapsed time, T. What is the value of T?
<table>
<tr><td>Job</td><td>J_1</td><td>J_2</td><td>J_3</td><td>J_4</td><td>J_5</td><td>J_6</td></tr>
<tr><td>Machine A</td><td>1</td><td>3</td><td>8</td><td>5</td><td>6</td><td>3</td></tr>
<tr><td>Machine B</td><td>5</td><td>6</td><td>3</td><td>2</td><td>2</td><td>10</td></tr>
</table></td><td>4</td><td>K4</td></tr>
<tr><td>e.</td><td>What is Program Evaluation and Review Technique (PERT)? How is it used in project management under uncertain activity durations? Explain the use of three time estimates in calculating the expected time and variance.</td><td>5</td><td>K2</td></tr>
</table>

SECTION C

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

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a.	Discuss the scope of operation research.	1	K2
b.	What is decision tree analysis? What are the main steps associated with decision tree analysis	1	K2

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

a.	Solve the following LP problem using graphical method: Maximize $Z = 6X_1 + 8X_2$ Subject to $5X_1 + 10X_2 \leq 60$ $4X_1 + 4X_2 \leq 40$ X_1 and $X_2 \geq 0$	2	K2
b.	Consider the following Transportation problem involving three sources and four destinations. The cell represent the cost of transportation per unit. Destinations | | | 1 | 2 | 3 | 4 | Supply | | Source | 1 | 3 | 1 | 7 | 4 | 300 | | | 2 | 2 | 6 | 5 | 9 | 400 | | | 3 | 8 | 3 | 3 | 2 | 500 | | | Demand | 250 | 350 | 400 | 200 | 1200 | Obtain the initial basic feasible solution using the following methods: 1. Northwest corner cell method. 2. Least cost method	2	K4

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

a.	Consider the following assignment problem where 5 different jobs are to be assigned to 5 different operators such that the total processing time is minimized. The matrix entries represent the processing time in hours. Solve using Hungarian method. Operator | | | 1 | 2 | 3 | 4 | 5 | | Job | 1 | 10 | 12 | 15 | 12 | 8 | | | 2 | 7 | 16 | 14 | 14 | 11 | | | 3 | 13 | 14 | 7 | 9 | 9 | | | 4 | 12 | 10 | 11 | 13 | 10 | | | 5 | 8 | 13 | 15 | 11 | 15 |	3	K4
b.	Consider the payoff matrix with respect to the Player A and solve it optimally: | | | **B** | | | **A** | | 1 | 2 | | | 1 | 6 | 9 | | | 2 | 8 | 4 |	3	K4

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

a.	Consider the two machines and six job flow shop scheduling problem. Using Johnson's algorithm, obtain the optimal sequence which will minimize the	4	K4

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make span. Also, determine the corresponding makespan.

Job 1	Job 2	Job 3
1	4	6
2	10	12
3	14	10
4	8	12
5	18	6
6	16	8

b. What is queuing theory? Discuss the applications areas of Queuing Theory. 4 K2

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

a. A firm is considering replacement of a machine, whose cost price is Rs. 12,200 and the scrap value is Rs. 200. The running (maintenance and operating) cost are found from experience are as follows: 5 K6

Year	1	2	3	4	5	6	7	8
Running Cost	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

b. A project consists of the following activities: 5 K7

Activity	Predecessor	Optimistic	Most Likely	Pessimistic
A		2	4	6
B	A	3	5	11
C	A	4	5	6
D	B, C	2	3	4

Draw the network diagram. Identify the critical path and the expected project duration.

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