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BBA
(SEM III) THEORY EXAMINATION 2025-26
QUANTITATIVE TECHNIQUES

TIME: 3 HRS

M.MARKS: 70

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

SECTION A

1. Attempt *all* questions in brief.

02 x 7 = 14

Q no.	Question	CO	Level
a.	Define an optimization model.	1	K2
b.	What do you mean by degenerated transportation problem?		
c.	Differentiate between basic and non-basic variables in LP problem.		
d.	Define total elapsed time.		
e.	Give an example of payoff matrix in decision theory analysis.		
f.	How do you make an unbalance assignment problem balance?		
g.	What is a saddle point?		

SECTION B

2. Attempt any *three* of the following:

07 x 3 = 21

a.	What are the advantages and disadvantages of operation research models? Why is it necessary to test models and how would you go about testing a model?	1	K2																									
b.	What is meant by a feasible solution of an LP problem? Write about the key components of a Linear Programming Problem.																											
c.	Discuss briefly about balanced, unbalanced and maximized transportation problem with suitable examples.																											
d.	XYZ Company manufactures guaranteed tennis balls. At present, approximately 10 percent of the tennis balls are defective. A defective ball leaving the factory costs the company re 0.50 to honour its guarantee. Assume that all defective balls are returned. At a cost of Re 0.10 per ball, the company can conduct a test that always correctly identifies both good and bad tennis balls. Draw a decision tree and determine the optimal course of action and its expected cost.																											
e.	Explain the principal of dominance in game theory to reduce the payoff matrix and find the optimal strategies and value of the game. <p style="text-align: center;">Player B</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Player A</th> <th>B₁</th> <th>B₂</th> <th>B₃</th> <th>B₄</th> </tr> </thead> <tbody> <tr> <td>A₁</td> <td>3</td> <td>2</td> <td>4</td> <td>0</td> </tr> <tr> <td>A₂</td> <td>3</td> <td>4</td> <td>2</td> <td>4</td> </tr> <tr> <td>A₃</td> <td>4</td> <td>2</td> <td>4</td> <td>0</td> </tr> <tr> <td>A₄</td> <td>0</td> <td>4</td> <td>0</td> <td>8</td> </tr> </tbody> </table>	Player A	B ₁	B ₂	B ₃	B ₄	A ₁	3	2	4	0	A ₂	3	4	2	4	A ₃	4	2	4	0	A ₄	0	4	0	8		
Player A	B ₁	B ₂	B ₃	B ₄																								
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SECTION C

3. Attempt any *one* part of the following:

07 x 1 = 07

a.	What techniques are used to solve decision making problems in uncertainty? Discuss the techniques used in uncertainty to get optimistic decision.	1	K2
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b.	<p>A company has three options to choose against the three events. The payoff matrix of the problem is given below :</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">State of Nature</th> <th colspan="3">Options</th> </tr> <tr> <th>O₁</th> <th>O₂</th> <th>O₃</th> </tr> </thead> <tbody> <tr> <td>E₁</td> <td>25</td> <td>-10</td> <td>-125</td> </tr> <tr> <td>E₂</td> <td>400</td> <td>440</td> <td>4000</td> </tr> <tr> <td>E₂</td> <td>650</td> <td>740</td> <td>750</td> </tr> </tbody> </table> <p>The probabilities of the states of nature are 0.1, 0.7 and 0.2 respectively. Calculate and tabulate the EMV and conclude which would prove to be the best course of action.</p>	State of Nature	Options			O ₁	O ₂	O ₃	E ₁	25	-10	-125	E ₂	400	440	4000	E ₂	650	740	750		
State of Nature	Options																					
	O ₁	O ₂	O ₃																			
E ₁	25	-10	-125																			
E ₂	400	440	4000																			
E ₂	650	740	750																			

4. Attempt any one part of the following: 07 x 1 = 07

a.	<p>A company sells two different products A and B, making a profit of Rs 40 and Rs 30 per unit respectively. Both are produced by common production processes. The production process has a total capacity of 30000 man-hours. It takes three hours to produce a unit of A and one hour to produce a unit of B. The company officials feel that that the maximum number of units of A that can be sold is 8000 units and that of B is 12000 units. Subject to these limitations, products can be sold in any combination. Formulate this problem as LP problem to maximize profit.</p>	1	K2
b.	<p>Use the graphical method to solve the following LP problem. Minimize $Z = 5x_1 + 3x_2$ Subject to $x_1 + x_2 \leq 6$, $2x_1 + 3x_2 \geq 3$, $x_1 \geq 3$, $x_2 \geq 3$ and $x_1, x_2 \geq 0$</p>		

5. Attempt any one part of the following: 07 x 1 = 07

a.	<p>Determine an initial basic feasible solution to the following transportation problem using North west Corner method, Matrix minima method and Vogel's Approximation method.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Source</th> <th colspan="4">Destination</th> <th rowspan="2">Supply</th> </tr> <tr> <th>D1</th> <th>D2</th> <th>D3</th> <th>D4</th> </tr> </thead> <tbody> <tr> <td>S1</td> <td>21</td> <td>16</td> <td>15</td> <td>3</td> <td>11</td> </tr> <tr> <td>S2</td> <td>17</td> <td>18</td> <td>14</td> <td>23</td> <td>13</td> </tr> <tr> <td>S3</td> <td>32</td> <td>27</td> <td>18</td> <td>41</td> <td>19</td> </tr> <tr> <td>Demand</td> <td>6</td> <td>6</td> <td>8</td> <td>23</td> <td></td> </tr> </tbody> </table>	Source	Destination				Supply	D1	D2	D3	D4	S1	21	16	15	3	11	S2	17	18	14	23	13	S3	32	27	18	41	19	Demand	6	6	8	23		1	K2
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b.	<p>Show how does an Assignment problem is type of Transportation problem? Discuss it's similarities and differences with transportation problem.</p>																																				

6. Attempt any one part of the following: 07 x 1 = 07

a.	<p>A company has four machines that are to be assigned on three projects. Each projects can be assigned to one and only one machine. The returns</p>	1	K2
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	obtained from each project is given in the following table.							
	Machines							
		W	X	Y	Z			
	A	32	26	22	18			
	B	42	37	33	32			
C	40	35	31	28				
Find the optimal solution for company to maximize its return.								
b.	Explain Johnson’s procedure to determine the optimal sequence for processing of n items on three machines.							

7. Attempt any one part of the following:

07 x 1 = 07

a.	What is a game in game theory? What are the properties of a game? Explain the “best Strategy” on the basis of minimax and maximin criterion of optimality.	1	K2																					
b.	A book binder has one printing press, one binding machine, and manuscripts of a number of books. The time required to perform the printing and binding operations on each book are shown below. The binder wishes to determine the order in which the books should be processed, so that the total time required to process all books is minimized.																							
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: left;">Books</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> </tr> <tr> <td>Printing time (Hours)</td> <td style="text-align: center;">30</td> <td style="text-align: center;">120</td> <td style="text-align: center;">50</td> <td style="text-align: center;">20</td> <td style="text-align: center;">90</td> <td style="text-align: center;">110</td> </tr> <tr> <td>Binding time (Hours)</td> <td style="text-align: center;">80</td> <td style="text-align: center;">100</td> <td style="text-align: center;">90</td> <td style="text-align: center;">60</td> <td style="text-align: center;">30</td> <td style="text-align: center;">10</td> </tr> </table>	Books	1	2	3	4	5	6	Printing time (Hours)	30	120	50	20	90	110	Binding time (Hours)	80	100	90	60	30	10		
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