

END SEMESTER EXAMINATION, MAY - 2026**B. B. A. Semester - IV****Paper Code: 541224****Subject Name: Quantitative Techniques****Subject Code: BBA405****Time allotted: 03 Hours****Max. Marks: 100****Note: Read all the instructions carefully.**

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Q.1	VERY SHORT ANSWER QUESTIONS – Attempt All.	(10x2 = 20 Marks)																												
a.	Critical Path	CO1																												
b.	Constraint	CO1																												
c.	Formula for activity variance	CO1																												
d.	Forward Pass Schedule	CO1																												
e.	Activity Slack	CO1																												
f.	Examples of maximizing the objective function	CO1																												
g.	Demand constraint in Transportation problem	CO2																												
h.	Saddle point	CO2																												
i.	Formula for determining probability of completion time of project.	CO2																												
j.	VAM	CO2																												
Q.2	SHORT ANSWER QUESTIONS – Attempt any Five.	(5x4 = 20 Marks)																												
a.	For the following LPP develop Standard form of LPP formulation Max $Z = 4X + 6Y$ $3X + 2Y \leq 15$ $X + 2Y \leq 10$ $X_1, X_2 \geq 0$	CO2																												
b.	With example explain the application of transportation Model.	CO2																												
c.	For following project develop simple network diagram and list various path from start to end. If the project completion time is 100 days, what will be the latest start time for activity F and G. The duration of F and G are 20 and 10 respectively.	CO2																												
	<table> <tr> <td>Activity</td> <td>A</td> <td>B</td> <td>C</td> <td>D</td> <td>E</td> <td>F</td> <td>G</td> </tr> <tr> <td>Preceding activity</td> <td>-</td> <td>-</td> <td>A</td> <td>B</td> <td>C, D</td> <td>D</td> <td>E</td> </tr> </table>	Activity	A	B	C	D	E	F	G	Preceding activity	-	-	A	B	C, D	D	E													
Activity	A	B	C	D	E	F	G																							
Preceding activity	-	-	A	B	C, D	D	E																							
d.	For following transportation problem formulate linear programming problem. Define decision variables, objective function, and constraints.	CO3																												
	<table> <tr> <td></td> <td colspan="2">Warehouse</td> <td rowspan="2">Supply</td> </tr> <tr> <td>Factory</td> <td>W</td> <td>X</td> </tr> <tr> <td>A</td> <td>26</td> <td>63</td> <td>400</td> </tr> <tr> <td>B</td> <td>22</td> <td>64</td> <td>500</td> </tr> <tr> <td>Demand</td> <td>300</td> <td>600</td> <td></td> </tr> </table>		Warehouse		Supply	Factory	W	X	A	26	63	400	B	22	64	500	Demand	300	600											
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e.	In project management techniques explain the importance of slack of activity?	CO4																												
f.	For given activities determine activities expected time and variance. Also determine the standard deviation of the project completion time.	CO3																												
	<table> <tr> <td rowspan="2">Activity</td> <td rowspan="2">Preceding activity</td> <td>Optimistic time</td> <td>Most Likely time</td> <td>Pessimistic time</td> </tr> <tr> <td>o</td> <td>m</td> <td>p</td> </tr> <tr> <td>X</td> <td>-</td> <td>9</td> <td>15</td> <td>21</td> </tr> <tr> <td>S</td> <td>X</td> <td>13</td> <td>21</td> <td>23</td> </tr> <tr> <td>E</td> <td>S</td> <td>23</td> <td>35</td> <td>47</td> </tr> <tr> <td>H</td> <td>S</td> <td>8</td> <td>11</td> <td>16</td> </tr> </table>	Activity	Preceding activity	Optimistic time	Most Likely time	Pessimistic time	o	m	p	X	-	9	15	21	S	X	13	21	23	E	S	23	35	47	H	S	8	11	16	
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g.	Explain steps in formulating the Linear programming problem.	CO3																												

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Q.3		STRUCTURED QUESTIONS – Attempt any Three.			(3x10 = 30 Marks)																															
	a.	The shop owner purchases the product in a lot of 40 units each day. If the product is not sold in same day, at the end of day the shop owner sells the product at Rs. 6 to the local vendor. The selling price of product is Rs. 15. The purchase cost of product is Rs. 5 per unit. Simulate the profit for 10 days and determine the average profit. The demand distribution for the product is as follows:				CO4																														
		<table><tr><td>Demand (units)</td><td>0</td><td>20</td><td>40</td><td>60</td></tr><tr><td>Probability</td><td>0.05</td><td>0.3</td><td>0.6</td><td>0.05</td></tr></table>					Demand (units)	0	20	40	60	Probability	0.05	0.3	0.6	0.05																				
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Random number for the demand simulation: 20, 40, 46, 81, 67, 09, 99, 21, 50, 89																																				
	b.	Fun-pick Ltd. planning to produce product A and B at its facility to maximize its profit. The available labor hours at various department and time required by each product in department are provided in following table. The company has to produce at least 20 units of product A. As a management trainee, formulate the problem as LPP and obtain optimal solution by graphical method. List decision variables, objective function, constraints, graph, feasible area, units of A & B to be produced and total profit of optimal solution.				CO3																														
		<table><tr><td>Department</td><td>Product A (hrs/unit)</td><td>Product B (hrs/unit)</td><td>Labor-hours available</td></tr><tr><td>Cutting</td><td>0.2</td><td>0.25</td><td>10</td></tr><tr><td>Welding</td><td>0.1</td><td>0.5</td><td>12</td></tr><tr><td>Packing</td><td>2</td><td>3</td><td>50</td></tr><tr><td>Profit/unit</td><td>Rs. 25</td><td>Rs. 30</td><td></td></tr></table>				Department	Product A (hrs/unit)	Product B (hrs/unit)	Labor-hours available	Cutting	0.2	0.25	10	Welding	0.1	0.5	12	Packing	2	3	50	Profit/unit	Rs. 25	Rs. 30												
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	c.	The supervisor of the production shop is dilemma of assigning jobs to the workstation. The manager has asked supervisor to assign the jobs such that total completion time of all for jobs is minimized, so that next order can be planned accordingly. The table provides the time required by job to be completed on particular workstation.				CO4																														
		<table><tr><td></td><td colspan="4">Workstation</td></tr><tr><td>Job</td><td>W1</td><td>W2</td><td>W3</td><td>W4</td></tr><tr><td>A</td><td>1</td><td>4</td><td>6</td><td>3</td></tr><tr><td>B</td><td>9</td><td>7</td><td>10</td><td>9</td></tr><tr><td>C</td><td>4</td><td>5</td><td>11</td><td>7</td></tr><tr><td>D</td><td>8</td><td>7</td><td>8</td><td>5</td></tr></table>					Workstation				Job	W1	W2	W3	W4	A	1	4	6	3	B	9	7	10	9	C	4	5	11	7	D	8	7	8	5	
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		Develop optimal allocation to minimize the total time of production.																																		
	d.	Illustrate how Decision Theory is applied to solve real business problems.				CO6																														

Q.4		Case Analysis/ Situation Based QUESTIONS – Attempt any Two.	(2x15 = 30 Marks)																														
a	For following project evaluate the slack of all the activities and suggest which activities has to be performed critically.	<table><tr><th>Activity</th><th>Predecessor</th><th>Duration (days)</th></tr><tr><td>A</td><td>--</td><td>4</td></tr><tr><td>B</td><td>A</td><td>6</td></tr><tr><td>C</td><td>A</td><td>5</td></tr><tr><td>D</td><td>C</td><td>10</td></tr><tr><td>E</td><td>C</td><td>15</td></tr><tr><td>F</td><td>B</td><td>2</td></tr><tr><td>G</td><td>F, D</td><td>5</td></tr><tr><td>H</td><td>E</td><td>1</td></tr><tr><td>I</td><td>G, H</td><td>3</td></tr></table>	Activity	Predecessor	Duration (days)	A	--	4	B	A	6	C	A	5	D	C	10	E	C	15	F	B	2	G	F, D	5	H	E	1	I	G, H	3	CO4
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H	E	1																															
I	G, H	3																															
b	Mr. Rohan is considering the possibility of opening a dress shop near university to attract students. Her options/alternatives are to open a small shop, a medium-sized shop, or large-size shop. The demand for a dress shop can be high, average or low. The net profit or loss (in Rs. Lakhs) for the alternatives for the various market conditions are given in the following table. List various decision-making approaches under uncertainty and apply those approaches here to determine optimal decisions.	<table><tr><th>Action</th><th>High Demand</th><th>Average Demand</th><th>Low Demand</th></tr><tr><td>Small Shop</td><td>60</td><td>45</td><td>25</td></tr><tr><td>Medium-sized shop</td><td>90</td><td>50</td><td>-10</td></tr><tr><td>Large-sized shop</td><td>120</td><td>80</td><td>-50</td></tr></table>	Action	High Demand	Average Demand	Low Demand	Small Shop	60	45	25	Medium-sized shop	90	50	-10	Large-sized shop	120	80	-50	CO6														
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c	Lutz Brewery brews health drinks for the North India. It have brewing plants are location A, B, and C. The Dealers are located in cities – 1, 2, 3, and 4. The transportation cost per bottle from plant locations to dealer locations is provided in the table given below. The company wants to know how many bottles are to be transported from plant to dealer’s location such that total transportation cost is minimized. The production capacities of plants A, B, and C are 1500, 2500, and 1000 bottles per week respectively. The demand from dealership 1, 2, 3, and 4 are 500, 1500, 1500, and 1500 units per week respectively.	<table><tr><th></th><th colspan="4">Profit per bottle transported</th></tr><tr><th></th><th colspan="4">Dealership</th></tr><tr><th>Plant</th><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><th>A</th><td>10</td><td>2</td><td>20</td><td>11</td></tr><tr><th>B</th><td>12</td><td>7</td><td>9</td><td>20</td></tr><tr><th>C</th><td>4</td><td>14</td><td>16</td><td>18</td></tr></table> a. Develop initial feasible solution by VAM method and determine the allocation and total transportation cost. b. Evaluate the optimality of the IBF solution by MODI method and If improvement is required develop new feasible solution.		Profit per bottle transported					Dealership				Plant	1	2	3	4	A	10	2	20	11	B	12	7	9	20	C	4	14	16	18	CO5
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