

Code: 23HS1403

**II B.Tech - II Semester – Regular / Supplementary Examinations
APRIL 2026**

**OPTIMIZATION TECHNIQUES
(Common for IT, AIML, DS)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.

2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.

3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.

4. All parts of Question paper must be answered in one place.

BL – Blooms Level

CO – Course Outcome

PART – A

		BL	CO
1.a)	What are the advantages of using OR techniques?	L1	CO1
1.b)	What is an infeasible solution?	L1	CO1
1.c)	Why is a dummy row or dummy column introduced in transportation problems?	L1	CO1
1.d)	What is a degenerate solution in a transportation problem?	L1	CO1
1.e)	What is meant by a sequencing problem in operations research?	L1	CO1
1.f)	What is Johnson's rule for n jobs and 2 machines?	L1	CO1
1.g)	What is the objective of inventory control?	L1	CO1
1.h)	What is meant by lead time?	L1	CO1
1.i)	Distinguish between pure strategy and mixed strategy.	L2	CO1
1.j)	Explain a saddle point in a game.	L2	CO1

PART – B

		BL	CO	Max. Marks																																										
UNIT-I																																														
2	Use Simplex method to solve the following LP problem: Max $Z = 400x_1 + 400x_2$ subject to $4x_1 + 2x_2 \leq 1600$ $\frac{5}{2}x_1 + x_2 \leq 1200$ $\frac{9}{2}x_1 + \frac{3}{2}x_2 \leq 1600$ And $x_1, x_2 \geq 0$	L3	CO2	10 M																																										
OR																																														
3	Apply BIG-M method to solve the following LP problem: Max $Z = 8x_1 + 15x_2 + 25x_3 - x_4$ subject to $x_1 + 2x_2 + 3x_3 = 15$ $2x_1 + x_2 + 5x_3 = 20$ $x_1 + 2x_2 + x_3 + x_4 = 10$ and $x_1, x_2, x_3, x_4 \geq 0$	L3	CO2	10 M																																										
UNIT-II																																														
4	Evaluate the initial basic feasible solution by VAM and optimize solution <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">F ▼</th> <th style="padding: 5px;">D1</th> <th style="padding: 5px;">D2</th> <th style="padding: 5px;">D3</th> <th style="padding: 5px;">D4</th> <th style="padding: 5px;">D5</th> <th style="padding: 5px;">Capacity</th> </tr> </thead> <tbody> <tr> <th style="padding: 5px;">D ►</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th style="padding: 5px;">F1</th> <td style="padding: 5px;">1</td> <td style="padding: 5px;">9</td> <td style="padding: 5px;">13</td> <td style="padding: 5px;">36</td> <td style="padding: 5px;">51</td> <td style="padding: 5px;">50</td> </tr> <tr> <th style="padding: 5px;">F2</th> <td style="padding: 5px;">24</td> <td style="padding: 5px;">12</td> <td style="padding: 5px;">16</td> <td style="padding: 5px;">20</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">100</td> </tr> <tr> <th style="padding: 5px;">F3</th> <td style="padding: 5px;">14</td> <td style="padding: 5px;">33</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">23</td> <td style="padding: 5px;">23</td> <td style="padding: 5px;">150</td> </tr> <tr> <th style="padding: 5px;">Demand</th> <td style="padding: 5px;">100</td> <td style="padding: 5px;">70</td> <td style="padding: 5px;">50</td> <td style="padding: 5px;">40</td> <td style="padding: 5px;">40</td> <td></td> </tr> </tbody> </table>	F ▼	D1	D2	D3	D4	D5	Capacity	D ►							F1	1	9	13	36	51	50	F2	24	12	16	20	1	100	F3	14	33	1	23	23	150	Demand	100	70	50	40	40		L3	CO3	10 M
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5	Find the optimum allotment of tasks to minimize total man hours	SUBORDINATES				L3	CO3	10 M		
			I	II	III				IV	
		TASKS	A	8	26				17	11
			B	13	28				4	26
			C	38	19				18	15
			D	19	26				24	10

UNIT-III

6	Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC. Processing times (in hours) are given in the following table:	L3	CO3	10 M																								
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-bottom: 1px solid black;"><i>Job</i></td> <td style="border-bottom: 1px solid black;">: 1</td> <td style="border-bottom: 1px solid black;">2</td> <td style="border-bottom: 1px solid black;">3</td> <td style="border-bottom: 1px solid black;">4</td> <td style="border-bottom: 1px solid black;">5</td> </tr> <tr> <td>Machine A</td> <td>: 8</td> <td>10</td> <td>6</td> <td>7</td> <td>11</td> </tr> <tr> <td>Machine B</td> <td>: 5</td> <td>6</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Machine C</td> <td>: 4</td> <td>9</td> <td>8</td> <td>6</td> <td>5</td> </tr> </table>					<i>Job</i>	: 1	2	3	4	5	Machine A	: 8	10	6	7	11	Machine B	: 5	6	2	3	4	Machine C	: 4	9	8	6	5
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OR

7	From the following particulars of a Project (a) Draw the network diagram. (b) Identify the critical path (c) Calculate the project duration and total float of each activity	L3	CO3	10 M												
<table border="1" style="width: 100%; text-align: center;"> <tr> <td>Activity</td> <td>1-2</td> <td>1-3</td> <td>2-3</td> <td>2-4</td> <td>3-4</td> </tr> <tr> <td>Duration (In days)</td> <td>3</td> <td>6</td> <td>9</td> <td>7</td> <td>3</td> </tr> </table>					Activity	1-2	1-3	2-3	2-4	3-4	Duration (In days)	3	6	9	7	3
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UNIT-IV

8	A company that operates for 50 weeks in a year is concerned about its stocks of copper cable. This costs Rs 240 a meter and there is a demand for 8,000 meters a week. Each replenishment costs Rs 1,050 for administration and Rs 1,650 for delivery, while holding costs are estimated at 25 percent of value held a year. Assuming no shortages are allowed, what is the optimal	L4	CO4	10 M
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	inventory policy for the company? How would this analysis differ if the company wanted to maximize its profits rather than minimize cost? What is the gross profit if the company sells the cable for Rs 360 a meter.			
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OR

9	A factory requires 1,500 units of an item per month, each costing Rs 27. The cost per order is Rs 150 and the inventory carrying charges work out to 20 percent of the average inventory. Find the economic order quantity and the number of orders per year. Calculate total annual inventory cost.	L4	CO4	10 M
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UNIT-V

10	<p>A company management and the labour union are negotiating a new three year settlement. Each of these has 4 strategies. The costs to the company are given for every pair of strategy choice. What strategy will the two sides adopt? Also determine the value of the game.</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" rowspan="2">Union Strategies</th> <th colspan="4">Company Strategies</th> </tr> <tr> <th><i>I</i></th> <th><i>II</i></th> <th><i>III</i></th> <th><i>IV</i></th> </tr> </thead> <tbody> <tr> <td><i>I</i></td> <td></td> <td>20</td> <td>15</td> <td>12</td> <td>35</td> </tr> <tr> <td><i>II</i></td> <td></td> <td>25</td> <td>14</td> <td>8</td> <td>10</td> </tr> <tr> <td><i>III</i></td> <td></td> <td>40</td> <td>2</td> <td>10</td> <td>5</td> </tr> <tr> <td><i>IV</i></td> <td></td> <td>- 5</td> <td>4</td> <td>11</td> <td>0</td> </tr> </tbody> </table>	Union Strategies		Company Strategies				<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>I</i>		20	15	12	35	<i>II</i>		25	14	8	10	<i>III</i>		40	2	10	5	<i>IV</i>		- 5	4	11	0	L4	CO5	10 M
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OR

11	<p>Mr Sethi has Rs 10,000 to invest in one of three options: A, B or C. The return on his investment depends on whether the economy experiences inflation, recession, or no change at all. The possible returns under each economic condition are given below. What should he decide, using the pessimistic criterion, optimistic criterion, equally likely criterion and regret criterion?</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Strategy</th> <th colspan="3">State of Nature</th> </tr> <tr> <th>Inflation</th> <th>Recession</th> <th>No Change</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>2,000</td> <td>1,200</td> <td>1,500</td> </tr> <tr> <td>B</td> <td>3,000</td> <td>800</td> <td>1,000</td> </tr> <tr> <td>C</td> <td>2,500</td> <td>1,000</td> <td>1,800</td> </tr> </tbody> </table>	Strategy	State of Nature			Inflation	Recession	No Change	A	2,000	1,200	1,500	B	3,000	800	1,000	C	2,500	1,000	1,800	L4	CO5	10 M
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