

Programme: MCA

Course: Optimization Techniques Linear Programming

Course Code:3CMT102

Enrolment no. _____

Full Marks: 70

Time: 3 Hrs.

Q.No.	Questions	CO	Bloom Taxonomy Category	Marks																																																																																				
Section I																																																																																								
1	Short Answer type questions.			4 x 5 = 20																																																																																				
a	Define Non – degenerate and degenerate basic feasible solution. or Express standard and canonical form of given L.P.P Maximize $Z = 3x_1 + 2x_2 + 5x_3$ Subject to constraints $2x_1 - 3x_2 \leq 3; x_1 + 2x_2 + 3x_3 \geq 5; 3x_1 + 2x_3 \leq 2; \text{ and } x_1, x_2, x_3 \geq 0$	CO1	Remember																																																																																					
	b	Discuss the following terms: traffic intensity, balking, reneging and Jockeying. or Write mathematical form of transportation problem and assignment problem.	CO2		Remember																																																																																			
c		What reasons for maintaining inventories? or What types of variables involved in the inventory model?	CO3		Remember																																																																																			
	d	Define event, activity, looping, network and project. or Discuss the terms: (i) Optimistic time (ii) Pessimistic time (iii) Most likely time in PERT network.	CO4		Remember																																																																																			
Section II																																																																																								
	Long Answer type questions.				3 x 10 = 30																																																																																			
2	Use simplex method to solve the LPP Maximize $Z = 2X_1 + 5X_2$ Subject to $X_1 + 4X_2 \leq 24; 3X_1 + X_2 \leq 21; X_1 + X_2 \leq 9; \text{ and } X_1, X_2 \geq 0$ or Using Big – M method to solve the given LPP Minimize $Z = 4X_1 + X_2$ Subject to $3X_1 + X_2 = 3; 4X_1 + 3X_2 \geq 6; X_1 + 2X_2 \leq 3; \text{ and } X_1, X_2 \geq 0.$	CO1	Apply																																																																																					
	3	A marketing manager has 5 salesmen and there are 5 sales districts. Considering the capabilities of the salesmen and the nature of districts, the capabilities of the salesmen and the sales per month (in 1000 rupees) for each salesmen in each district would be as follow: <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> </tr> </thead> <tbody> <tr> <th>1</th> <td>32</td> <td>38</td> <td>40</td> <td>28</td> <td>40</td> </tr> <tr> <th>2</th> <td>40</td> <td>24</td> <td>28</td> <td>21</td> <td>36</td> </tr> <tr> <th>3</th> <td>41</td> <td>27</td> <td>33</td> <td>30</td> <td>37</td> </tr> <tr> <th>4</th> <td>22</td> <td>38</td> <td>41</td> <td>36</td> <td>36</td> </tr> <tr> <th>5</th> <td>29</td> <td>33</td> <td>40</td> <td>35</td> <td>39</td> </tr> </tbody> </table> Find the assignment of salesmen to the districts that will result in the maximum sales. or A company has 5 jobs to be done on six machines. Any job can be done on any machine. The cost of doing the jobs in different machines is given below. Assign the jobs for different machine so as to minimize the total cost. <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Jobs</th> <th colspan="6">Machine</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> </tr> </thead> <tbody> <tr> <th>1</th> <td>12</td> <td>10</td> <td>15</td> <td>22</td> <td>18</td> <td>8</td> </tr> <tr> <th>2</th> <td>10</td> <td>18</td> <td>25</td> <td>15</td> <td>16</td> <td>12</td> </tr> <tr> <th>3</th> <td>11</td> <td>10</td> <td>3</td> <td>8</td> <td>5</td> <td>9</td> </tr> <tr> <th>4</th> <td>6</td> <td>14</td> <td>10</td> <td>13</td> <td>13</td> <td>12</td> </tr> <tr> <th>5</th> <td>8</td> <td>12</td> <td>11</td> <td>7</td> <td>13</td> <td>10</td> </tr> </tbody> </table>				A	B	C	D	E	1	32	38	40	28	40	2	40	24	28	21	36	3	41	27	33	30	37	4	22	38	41	36	36	5	29	33	40	35	39	Jobs	Machine						A	B	C	D	E	F	1	12	10	15	22	18	8	2	10	18	25	15	16	12	3	11	10	3	8	5	9	4	6	14	10	13	13	12	5	8	12	11	7	13	10
		A	B		C	D	E																																																																																	
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		CO3	Apply																																																																																					

4	The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7,000 is given below:	CO3	Evaluate																											
	<table border="1"> <thead> <tr> <th>Year</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>Maintenance cost in Rs.</td> <td>900</td> <td>1,200</td> <td>1,600</td> <td>2,100</td> <td>2,800</td> <td>3,700</td> <td>4,700</td> <td>5,900</td> </tr> <tr> <td>Resale value in Rs.</td> <td>4,000</td> <td>2,000</td> <td>1,200</td> <td>600</td> <td>500</td> <td>400</td> <td>400</td> <td>400</td> </tr> </tbody> </table>			Year	1	2	3	4	5	6	7	8	Maintenance cost in Rs.	900	1,200	1,600	2,100	2,800	3,700	4,700	5,900	Resale value in Rs.	4,000	2,000	1,200	600	500	400	400	400
	Year			1	2	3	4	5	6	7	8																			
Maintenance cost in Rs.	900	1,200	1,600	2,100	2,800	3,700	4,700	5,900																						
Resale value in Rs.	4,000	2,000	1,200	600	500	400	400	400																						
When machine will replace?																														
or																														
	The annual demand of an item in the stores of a foundry is 9000 units. Its annual carrying cost is 15% of the purchase price of the item per year, where the purchase price is Rs. 20 per unit. The ordering cost is Rs. 15 per order. Presently, the order size of the item is the average monthly demand of that item. Find the economic order quantity and compare its cost with the present ordering system and find the corresponding cost advantage if exists.	CO3	Evaluate																											

Section III

Application based questions																																			
5	A small project is composed of seven activities whose time estimates are listed in the table as follow:	CO4	Analyze																																
	<table border="1"> <thead> <tr> <th>Activity</th> <th>1-2</th> <th>1-3</th> <th>2-4</th> <th>2-5</th> <th>3-5</th> <th>4-6</th> <th>5-6</th> </tr> </thead> <tbody> <tr> <td>T_o</td> <td>1</td> <td>1</td> <td>2</td> <td>1</td> <td>2</td> <td>2</td> <td>3</td> </tr> <tr> <td>T_m</td> <td>1</td> <td>4</td> <td>2</td> <td>1</td> <td>5</td> <td>5</td> <td>6</td> </tr> <tr> <td>T_p</td> <td>7</td> <td>7</td> <td>8</td> <td>1</td> <td>14</td> <td>8</td> <td>15</td> </tr> </tbody> </table>			Activity	1-2	1-3	2-4	2-5	3-5	4-6	5-6	T_o	1	1	2	1	2	2	3	T_m	1	4	2	1	5	5	6	T_p	7	7	8	1	14	8	15
	Activity			1-2	1-3	2-4	2-5	3-5	4-6	5-6																									
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T_p	7	7	8	1	14	8	15																												
From given information (i) Draw the project network (ii) Find the expected duration and variance of each activity. (iii) Calculate the variance and standard deviations of project length.(iv) What is probability that the project will be completed 4 week earlier than expected?																																			
or																																			
	A project schedule has the following characteristics:	CO4	Analyze																																
	<table border="1"> <thead> <tr> <th>Activity</th> <th>Time (Weeks)</th> <th>Activity</th> <th>Times (Weeks)</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>4</td> <td>5-6</td> <td>4</td> </tr> <tr> <td>1-3</td> <td>1</td> <td>5-7</td> <td>8</td> </tr> <tr> <td>2-4</td> <td>1</td> <td>6-8</td> <td>1</td> </tr> <tr> <td>3-4</td> <td>1</td> <td>7-8</td> <td>2</td> </tr> <tr> <td>3-5</td> <td>6</td> <td>8-10</td> <td>5</td> </tr> <tr> <td>4-9</td> <td>5</td> <td>9-10</td> <td>7</td> </tr> </tbody> </table> <p>(i) Construct the network (ii) Compute E and L for each activity. (iii) Find the critical path (iv) Total project duration.</p>			Activity	Time (Weeks)	Activity	Times (Weeks)	1-2	4	5-6	4	1-3	1	5-7	8	2-4	1	6-8	1	3-4	1	7-8	2	3-5	6	8-10	5	4-9	5	9-10	7				
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4-9	5	9-10	7																																

1 x 20 = 20

COURSE OUTCOME

- CO1 Decompose the given project in various phases of a lifecycle.
- CO2 Choose appropriate process model depending on the user requirements.
- CO3 Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
- CO4 Apply the knowledge, techniques, and skills in the development of a software product.