



R20 Regulation

Subject code: 3P5CD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

TKRCET
WISDOM IN CHARACTER INTERNATIONAL IN EXCELLENCE

**B.Tech V Semester Regular/Supplementary Examinations, February 2024
OPERATIONS RESEARCH**

Maximum Marks: 70

Date: 22.02.2024. Duration: 3 hours

- Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A		CO	Bloom Tx																														
All the following questions carry equal marks (10x2M=20 Marks)																																	
1	Define feasible solution.	1	1																														
2	When do you say that a LPP has infinite number of solutions?	1	1																														
3	What is degeneracy in transportation problems?	2	1																														
4	Formulate the travelling – Salesman problem as an assignment problem.	2	6																														
5	Define the problem of sequencing.	3	1																														
6	What is present worth factor and state its importance in replacement?	3	1																														
7	Explain 'best strategy' on the basis of minimax criterion of optimalities.	4	2																														
8	Define the terms 'safety stock' and 'EOQ' with the help of ideal inventory model.	4	1																														
9	Describe the various elements of the queue.	5	3																														
10	Define Bellman's principle of optimality.	5	1																														
Part-B			Bloom Tx level																														
Answer All the following questions. (5X10M=50Marks)																																	
11	Use penalty (or Big-M) method to minimize $Z = 4x_1 + x_2$ Subject to the constraints $3x_1 + x_2 = 3$, $4x_1 + 3x_2 \geq 6$, $x_1 + 2x_2 \leq 3$, $x_1, x_2 \geq 0$ [10]	1	6																														
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12	What is a simplex? Describe simplex method of solving linear programming problem. [10]	1	1																														
13	Find the optimum solution to the transportation problem given in the Table for which the cost, origin-availabilities, and destination-requirements are given (Use VAM). <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>D1</td> <td>D2</td> <td>D3</td> <td>D4</td> <td>Supply</td> </tr> <tr> <td>S1</td> <td>11</td> <td>13</td> <td>17</td> <td>14</td> <td>250</td> </tr> <tr> <td>S2</td> <td>16</td> <td>18</td> <td>14</td> <td>10</td> <td>300</td> </tr> <tr> <td>S3</td> <td>21</td> <td>24</td> <td>13</td> <td>10</td> <td>400</td> </tr> <tr> <td>Demand</td> <td>200</td> <td>225</td> <td>275</td> <td>250</td> <td></td> </tr> </table> [10]		D1	D2	D3	D4	Supply	S1	11	13	17	14	250	S2	16	18	14	10	300	S3	21	24	13	10	400	Demand	200	225	275	250		2	3
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14	<p>Find the optimal solution for the assignment problem with the following cost matrix.</p> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th></th> <th>I</th> <th>II</th> <th>III</th> <th>IV</th> <th>V</th> </tr> </thead> <tbody> <tr> <th>A</th> <td>11</td> <td>17</td> <td>8</td> <td>16</td> <td>20</td> </tr> <tr> <th>B</th> <td>9</td> <td>7</td> <td>12</td> <td>6</td> <td>15</td> </tr> <tr> <th>C</th> <td>13</td> <td>16</td> <td>15</td> <td>12</td> <td>16</td> </tr> <tr> <th>D</th> <td>21</td> <td>24</td> <td>17</td> <td>28</td> <td>26</td> </tr> <tr> <th>E</th> <td>14</td> <td>10</td> <td>12</td> <td>11</td> <td>15</td> </tr> </tbody> </table> <p style="text-align: right;">[10]</p>		I	II	III	IV	V	A	11	17	8	16	20	B	9	7	12	6	15	C	13	16	15	12	16	D	21	24	17	28	26	E	14	10	12	11	15	2	2
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15	<p>Determine the sequence that minimizes the total elapsed time required to complete the following jobs. Also find the total elapsed time and idle time of each machine.</p> <table style="margin-left: 40px;"> <thead> <tr> <th></th> <th colspan="6">Processing times in hours</th> </tr> </thead> <tbody> <tr> <td>No. of jobs</td> <td>:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>Machine A</td> <td>:</td> <td>4</td> <td>8</td> <td>3</td> <td>6</td> <td>7</td> <td>5</td> </tr> <tr> <td>Machine B</td> <td>:</td> <td>6</td> <td>3</td> <td>7</td> <td>2</td> <td>8</td> <td>4</td> </tr> </tbody> </table> <p style="text-align: right;">[10]</p>		Processing times in hours						No. of jobs	:	1	2	3	4	5	6	Machine A	:	4	8	3	6	7	5	Machine B	:	6	3	7	2	8	4	3	5					
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16	<p>An Engineering company is offered a material handling equipment A. The machine A is priced at Rs.60, 000 including cost of installation. The costs for operation and maintenance are estimated to be Rs 10, 000 for each of the first five years, increasing every year by Rs 3,000 in the sixth and subsequent years. The company expects a return of 10% on all its investments. What is the optimal replacement period? [10]</p>	3	2																																				
17	<p>A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at Rs.50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs.75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find (a) the economic lot size (b) the total optimal cost. [10]</p>	4	2																																				
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18	<p>In a game of matching biased coins, player A gets Rs 8 if two heads turn up and Re 1 if two tails turn up. Player B gets Rs 3 if it is otherwise. Solve the game. [10]</p>	4	3																																				
19	<p>A supermarket has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes, and if people arrive in a Poisson fashion at the counter at the rate of 10 per hour, then calculate:</p> <p>a) The probability of having to wait for service; b) The expected percentage of idle time for each girl; c) If a customer has to wait, find the expected length of his waiting time. [10]</p>	5	4																																				
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20	<p>Solve the following problem by using dynamic programming:</p> <p>Max. $Z = 2X_1 + 9X_2$ subject to $2X_1 + X_2 \leq 25$; $X_2 \leq 11$ $X_1, X_2 \geq 0$.</p> <p style="text-align: right;">[10]</p>	5	6																																				