Name:
Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

End Semester Examination (Online) – July, 2020

Program: MBA (FIN/HRM/MKTG/O&PM/BA) **Semester: II**
Subject/Course: Operations Research **Max. Marks: 100**
Course Code: DSQT7002 **Duration: 3 Hours**

IMPORTANT INSTRUCTIONS

1. *The student must write his/her name and enrolment no. in the space designated above.*
2. *The questions have to be answered in this MS Word document.*
3. *After attempting the questions in this document, the student has to upload this MS Word document on Blackboard.*

<table>
<tr><th></th><th></th><th>Marks</th><th>COs</th></tr>
<tr><td>Q.1</td><td>The supervisor of a petroleum treatment facility must settle on the ideal blend of two potential mixing procedure of which the data sources and yields per creation run are as per the following.

<table>
<tr><th rowspan="2">Process (units)</th><th colspan="2">Input (units)</th><th colspan="2">Output (units)</th></tr>
<tr><th>Grade A</th><th>Grade B</th><th>Gasoline X</th><th>Gasoline Y</th></tr>
<tr><td>1</td><td>5</td><td>3</td><td>5</td><td>8</td></tr>
<tr><td>2</td><td>4</td><td>5</td><td>4</td><td>4</td></tr>
</table>

The greatest sums accessible of crudes A and B are 200 units and 150 units, individually. Market necessities show that in any event 100 units of gas X and 80 units of gas Y must be created. The benefits per creation run for process 1 and procedure 2 are ₹300 and ₹400, separately. Formulate this problem as an LP model. Write the dual of this linear programing problem and give the economic interpretation of variables.</td><td>20</td><td>CO1</td></tr>
<tr><td>Q.2</td><td>A company has four warehouses A, B, C and D from which they deliver to five markets.

<table>
<tr><th></th><th>Market</th><th></th><th></th><th></th><th></th></tr>
<tr><th></th><th>P</th><th>Q</th><th>R</th><th>S</th><th>T</th></tr>
<tr><td>A</td><td>8</td><td>10</td><td>12</td><td>17</td><td>15</td></tr>
<tr><td>B</td><td>15</td><td>13</td><td>18</td><td>11</td><td>9</td></tr>
<tr><td>C</td><td>14</td><td>20</td><td>6</td><td>10</td><td>13</td></tr>
<tr><td>D</td><td>13</td><td>19</td><td>7</td><td>5</td><td>12</td></tr>
</table>
Warehouse</td><td>20</td><td>CO2</td></tr>
</table>

	The manager of the company made allocation from warehouses to markets as follows: A to P : 90 units A to Q : 10 units B to Q : 150 units C to Q : 10 units C to R: 50 units C to T : 120 units D to S : 210 units D to T: 70 units a) Justify with the reason whether the given transportation problem is a balanced transportation problem or not. b) Check whether the allocation made by the manager is optimal or not. c) If in the above problem, the transportation cost from A to R is reduced to 10. How this change will affect the optimum solution.		
Q.3	A firm is contemplating the introduction of three products, 1, 2 and 3 in its three plants A, B and C only a single product is decided to be introduced in each of the plant. The unit cost of producing one product in a plant, is given in the following matrix.	20	CO3

		Plant		
		A	B	C
Product	1	8	12	2
	2	10	6	4
	3	7	6	6

a) How should the product be assigned so that the total unit cost is minimized?

b) If the quantity of different products to be produced is as follows, then what assignment shall minimize the aggregate production cost?

Product	Quantity (in units)
1	2000
2	2000
3	10,000

<table>
<tr>
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<td>
c) What would your answer be if the three product were to be produced in equal quantities?
d) It is expected that the selling prices of the product produced by different plants would be different. The prices are shown in the following table:
<table>
<tr><td></td><td></td><td>Plant</td><td></td></tr>
<tr><td></td><td></td><td>A</td><td>B</td><td>C</td></tr>
<tr><td rowspan="3">Product</td><td>1</td><td>15</td><td>18</td><td>2</td></tr>
<tr><td>2</td><td>18</td><td>16</td><td>10</td></tr>
<tr><td>3</td><td>12</td><td>10</td><td>8</td></tr>
</table>
Assuming the quantities mentioned in (b) above would be produced and sold, how should the products be assigned to the plants in order to obtain maximum profits?
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<td>Q.4</td>
<td>
In a railroad marshaling yard, merchandise trains show up at a pace of 30 trains for each day. Accepting that the between appearance time follows an exponential appropriation and the administration time (the time taken to bump a train) dissemination is likewise exponential with a normal of 36 minutes. Explain with reasoning:
a) expected queue size (line length)
b) Probability that the queue size exceeds 10.
If the input of trains increases to an average of 33 per day, what will be the change in (i) and (ii)?
</td>
<td>20</td>
<td>CO4</td>
</tr>
<tr>
<td>Q.5</td>
<td>
A firm is thinking about the substitution of a machine, whose cost is ₹12200, and its piece esteem is ₹200. For a fact the running(maintenance and working) costs are seen as follows:
<table>
<tr><td>Year</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>Running Cost(₹)</td><td>200</td><td>500</td><td>800</td><td>1200</td><td>1800</td><td>2500</td><td>3200</td><td>4000</td></tr>
</table>
When should the machine be replaced?
</td>
<td>20</td>
<td>CO1</td>
</tr>
</table>

ANSWERS