Operations Research

Date: 19.6.2010                                                                                    Max Marks: 100
Time: 2.00 pm to 5.00 pm                                                                    Duration: 3 hours

Instructions:
1. The question paper is in two parts.
2. Part A is compulsory. Each question carries one mark

PART A

Q.1. State true or false.                                                                                         Marks: 10
1.1 Linear Programming is a widely used mathematical modeling technique.
1.2 ABC Analysis Technique is type of inventory management.
1.3 The minimum stock level represents the highest quantitative balance of materials.
1.4 Simulation can generate optimal solution.
1.5 CPM used in research and development.
1.6 In maximization problem, the objective is maximizing the profit.
1.7 Assignment models can be applied for many decision making problems.
1.8 Queuing involves problems of moving.
1.9 Transportation problem is a particular class of linear programming.
1.10 Modern probability theory studies predictions for future experiments.

Q.2 Fill in the blanks.                                                                                 Marks: 05
2.1 Any type of human decision making ---------------- as well as qualitative –involves an intellectual process.
2.2 Transportation model can also be used in making location ------------------.
2.3 The -------------- mechanism is a description of resources required for service.
2.4 In simulation, the experiment are carried out with out disturbing the --------------.
2.5 Materials controls helps managers in ------------------making.

Q.3 Expand the following                                                                               Marks: 05
3.1 EOQ
3.2 LPP
3.3 FIFO
3.4 SIRO
3.5 CPM
PART B

Q. 4 Solve the LP problem using Simplex method. Determine the following
a) What is optimal solution?
b) What is the value of objective function?
c) Which constraint has excess resources and how much?

\[ Z_{\text{max}} = 5X_1 + 6X_2 \]
Subject to constraints,
\[ 2X_1 + X_2 \leq 2000 \]
\[ X_1 \leq 800 \]
\[ X_2 \leq 200 \]
\[ X_1, X_2 \geq 0 \]  
Marks: 16

Q. 5 The cost of transportation per unit from three sources and four destinations are given here. Obtain initial basic feasible solutions using the following methods.
1. North west corner method.
2. Vogel’s approximation method.

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Demand</td>
<td>200</td>
<td>400</td>
</tr>
</tbody>
</table>

Marks: 16

Q. 6 The following gives the activities of a construction project and other data.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Normal</th>
<th>Crash</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time (days)</td>
<td>Cost (Rs.)</td>
</tr>
<tr>
<td>1-2</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>1-3</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>2-4</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>2-5</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>3-4</td>
<td>5</td>
<td>140</td>
</tr>
<tr>
<td>4-5</td>
<td>2</td>
<td>60</td>
</tr>
</tbody>
</table>

If the indirect cost is Rs. 20 per day, crash the activities to find the minimum duration of the project and the project cost associated.  
Marks: 16

Q. 7
a) Explain the scope of Operation Research.  
Marks: 08

b) Calculate 1) Re-order Level 2) Minimum level 3) Maximum level for each component A and B form the following information.
Normal Usage: 50 Units per week each
Minimum Usage: 25 Units per week each
Maximum Usage: 75 units per week each
Re-order Quantity: A: 300 Units, B: 500 Units
Re-order Period: 4 to 6 weeks, B: 2 TO 4 Weeks

Q.8
a) Explain the term breakdown maintenance and preventive maintenance? Marks: 08

b) Truck owner finds from his past records that the maintenance cost per year of a truck whose purchase price Rs. is 8000 are as given.

<table>
<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>Cost</td>
<td>1000</td>
<td>1300</td>
<td>1700</td>
<td>2200</td>
<td>2900</td>
<td>3800</td>
<td>4800</td>
<td>6000</td>
</tr>
<tr>
<td>Rs.</td>
<td>4000</td>
<td>2000</td>
<td>1200</td>
<td>600</td>
<td>500</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

Determine the time at which it is profitable to replace the truck. Marks: 08

Q.9 Solve the following LPP using Big M Method Marks: 16
Minimize the constraints Z = 3X1 + X2
Subject to constraints

4X1 + X2 = 4
5X1 + 3X2 ≥ 7
3X1 + 2X2 ≤ 6

X1, X2 ≥ 0

10. a) Describe the aims and objective of simulation. Marks: 08

b) An ice cream parlor's record of previous month’s sale of a particular variety of ice cream as follows

<table>
<thead>
<tr>
<th>Demand (No. of ice creams)</th>
<th>No. of days</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

Simulate the demand for first 10 days of the month. Marks: 08