INDIAN INSTITUTE OF MATERIALS MANAGEMENT  
Post Graduate Diploma in Materials Management

Paper – 18-C

Operations Research

Date: 15.12.2009  Max Marks: 100  
Time: 2.00 pm to 5.00pm  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 Emotions and guess work is not part of Operation research.  
1.2 Operation research is the scientific way to managerial decision making.  
1.3 The objective of LP Model is to maximize the total transportation cost.  
1.4 Transshipment Problem in which commodity can be transported to a particular destination through only one node.  
1.5 A linear programming model can be used to solve the assignment problem.  
1.6 PERT stands Project Evaluation and Return Technique.  
1.7 CPM applied first in Chemical Industry.  
1.8 Queuing involves problems of waiting.  
1.9 Inventory Storing is not so important part of inventory control.  
1.10 Game Theory is determining irrational behavior in game situation.

Q.2 Fill in the blanks.  
Marks: 05

2.1 The major advantage of mathematical model is that it facilitates in taking -------------- faster and more accurate.  
2.2 A ---------------- is a complete test of the model to confirm that it provides an accurate representation of the -------------- problem.  
2.3 -------------- is trying for the best result by manipulating the model to the problem.  
2.4 Transportation problem is a particular class of ---------- programming.  
2.5 In -------------- method, the time estimates are assumed to be known with certainty.

Q.3 Expand the following  
Marks: 05

3.1 PERT  
3.2 ABC  
3.3 FIFO  
3.4 SIRO  
3.5 CPM
PART B

Q. 5  Geetha Perfume Company produces both perfumes and body spray from two flower extract F1 and F2. The following data has provided:

Data Collected

<table>
<thead>
<tr>
<th>Liters of Extract</th>
<th>Perfume</th>
<th>Body Spray</th>
<th>Daily availability (Liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower Extract, F1</td>
<td>8</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Flower Extract, F2</td>
<td>2</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Profit per liter</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

The maximum daily demand of body spray of 20 bottles of 100 ml each. A market survey indicates that the daily demand of body spray cannot exceed that of perfume by more than 2 liters. The company wants to find out the optimal mix of perfume and body spray that maximizes the total daily profit. Formulate the problem as a linear programming model.

Marks: 16

Q. 6  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.

Transportation Model

<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. 7  A project scheduled has following characteristics

Project Schedule

<table>
<thead>
<tr>
<th>Activity</th>
<th>Name</th>
<th>Time</th>
<th>Activity</th>
<th>Name</th>
<th>Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>A</td>
<td>4</td>
<td>5-6</td>
<td>G</td>
<td>4</td>
</tr>
<tr>
<td>1-3</td>
<td>B</td>
<td>1</td>
<td>5-7</td>
<td>H</td>
<td>8</td>
</tr>
<tr>
<td>2-4</td>
<td>C</td>
<td>1</td>
<td>6-8</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td>3-4</td>
<td>D</td>
<td>1</td>
<td>7-8</td>
<td>J</td>
<td>2</td>
</tr>
<tr>
<td>3-5</td>
<td>E</td>
<td>6</td>
<td>8-10</td>
<td>K</td>
<td>5</td>
</tr>
<tr>
<td>4-9</td>
<td>F</td>
<td>5</td>
<td>9-10</td>
<td>L</td>
<td>7</td>
</tr>
</tbody>
</table>

1. Construct PERT
2. Compute T_e and T_l for each activity.

Marks: 16
Q.8

a) Explain the process of inventory control.  

b) From following particulars, calculate  
   1) Reorder level  
   2) Minimum level  
   3) Maximum level  
   4) Average level  

Normal Usage: 100 units per day  
Minimum Usage: 60 units per day  
Maximum Usage: 130 units per day  
EOQ: 5,000 UNITS  
Re-order period: 25 to 30 days.  

Q.9

a) Explain the types on maintenance cost.  

b) A machine cost Rs 500/- to operate, while maintenance costs are zero for the first year, increasing by the Rs 100/- every year. If the interest rate is 5 percent every year, determine the best age at which the machine should be replaced.  

Q.10 Solve the following LPP using Big M Method  

Minimize the constraints  

Subject to constraints  

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

X1, X2 ≥ 0