1. What do you mean by Production Management?

2. What are the functions of Production Manager?

3. What is Operations Research? What are the main characteristics of Operations Research?

4. Give the matrix form of representing a general LLP.
5. Construct a network for a project whose activities and their predecessor relationship are given in Table.

Activity | A | B | C | D | E | F | G | H | I | J | K
---|---|---|---|---|---|---|---|---|---|---|---
Predecessor | – | – | – | A | B | B | C | D | E | H, I | F, G

6. Distinguish between PERT and CPM.

7. Solve the Game Theory whose pay-off matrix is given by

\[
\begin{align*}
\text{Player B} \\
B_1 & B_2 & B_3 \\
A_1 & 1 & 3 & 1 \\
A_2 & 0 & -4 & -3 \\
A_3 & 1 & 5 & -1
\end{align*}
\]

8. In a public telephone booth, the arrivals on an average are 15 per hour. A call on an average takes three minutes. If there is just one Phone. Find (Queueing Theory)

(a) The expected number of callers in the booth at any time.

(b) The proportion of the time, the booth is expected to be idle?
Where \( x_1, x_2, x_3 \geq 0 \).

\[(V) \quad 4x_1 + 2x_2 \geq 20 \]

\[(V) \quad 4x_1 + 3x_2 \geq 5x_3 \]

\[(V) \quad 3x_1 \geq 3 \]

\[(V) \quad 6x_1 + 2x_2 \geq 20 \]

\[(V) \quad 6x_1 + 3x_2 \geq 10 \]

\[(V) \quad 6x_1 + 4x_2 \geq 14 \]

Subject to constraints,

Minimize \( Z = 6x_1 - 4x_2 + 3x_3 \)

Construct a dual for the following primal.

Minimize \( Z = 2x_1 + 10x_2 \)

Subject to, \( x_1 \geq 0 \)

\( 4x_1 + 2x_2 \geq 60 \)

\( 3x_1 + x_2 \geq 30 \)

\( 4x_1 + x_2 \geq 40 \)

Minimize \( Z = 20x_1 + 10x_2 \)

Subject to, \( x_1 \geq 0 \)

Given the cost matrix.

Following transportation problem using VAM, find the initial basic feasible solution to the problem.

Compulsory

PART B — (5 x 10 = 50 marks)

1. Solve the following LPP by Graphical Method.

2. What is Production Planning and Control? What are its main functions?

3. What is Plant Layout? Explain the advantages of the Perfect Plant Layout.

4. Answer any FIVE questions.

PART C — (1 x 20 = 20 marks)

(a) Draw the Critical Path.

(b) Find the Critical Path.

(c) Given the project plan of the project being completed in 31 days, find the probability of the project being completed.

(d) Find the expected project duration.
13. Determine an initial basic feasible solution to the following transportation problem using North West Corner Rule.

<table>
<thead>
<tr>
<th></th>
<th>D_1</th>
<th>D_2</th>
<th>D_3</th>
<th>D_4</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>O_1</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>O_2</td>
<td>8</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>O_3</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Required</td>
<td>6</td>
<td>10</td>
<td>15</td>
<td>4</td>
<td>35</td>
</tr>
</tbody>
</table>

14. The company plans to consume 760 pieces of a particular component. Past records indicate that purchasing department had used Rs. 12,000 for placing 15,000 orders. The average inventory was valued at Rs. 45,000 and the total storage cost was Rs. 7,650 which included wages, rent, taxes, insurance etc., related to store department. The company borrows capital at the rate of 10% a year.

If the price of a component is Rs. 12 and the order size is of 10 components. Determine purchase cost, Purchase expenses, storage expenses, capital cost and total cost per year.

15. Solve the following Assignment problem shown in table using Hungarian method. The matrix entries are processing time of each man in hours.

<table>
<thead>
<tr>
<th>Men</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20</td>
<td>15</td>
<td>18</td>
<td>20</td>
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<tr>
<td>II</td>
<td>18</td>
<td>20</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>III</td>
<td>21</td>
<td>23</td>
<td>25</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>IV</td>
<td>17</td>
<td>18</td>
<td>21</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>V</td>
<td>18</td>
<td>18</td>
<td>16</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

16. The following table shows the jobs of a network along with their time estimates. The time estimates are in days.

<table>
<thead>
<tr>
<th>Job</th>
<th>1-2</th>
<th>1-6</th>
<th>2-3</th>
<th>2-4</th>
<th>3-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>5</td>
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<tr>
<td>m</td>
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</tr>
<tr>
<td>b</td>
<td>15</td>
<td>14</td>
<td>30</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Job</td>
<td>4-5</td>
<td>5-8</td>
<td>6-7</td>
<td>7-8</td>
<td></td>
</tr>
<tr>
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<td>1</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>m</td>
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<tr>
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<td>28</td>
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</table>