Instructions –

1. All Questions are **Compulsory**.
2. Answer each next main Question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of Non-programmable Electronic Pocket calculator is permissible.
7. Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

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Marks

1. a) **Attempt any THREE of the following:**

   (i) Define production and list the types of production system.
   (ii) How productivity is measured? Explain any one method of productivity measurement.
   (iii) Explain techniques for improving productivity.
   (iv) Define dispatching and list any two functions of dispatching department.

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b) **Attempt any ONE of the following:**

   (i) Discuss in brief important factors to be considered while making ‘site selection’ for a new industry/plant.
   (ii) Explain the concept of line balancing. State its importance and objectives.

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P.T.O.
2. **Attempt any TWO of the following:**

a) Name different types of material handling equipments used in industry. Explain any one with neat sketch.

b) State and explain the various factors affecting process planning.

c) How inspection stages are determined? State the significance of operation sheet.

3. **Attempt any FOUR of the following:**

a) State different types of plant layout. Explain any one type.

b) State and explain the basic principle to be followed to develop a good plant layout.

c) Explain in brief steps involved in process planning.

d) State and explain how the different operations can be combined?

e) What are the objectives of method study.

f) Differentiate between Jig and Fixture.

4. a) **Attempt any THREE of the following:**

   (i) Explain any two clamping devices with neat sketch.

   (ii) Explain the concept of ERP.

   (iii) Explain the concept of continuous improvement (Kaizen).

   (iv) Explain Robot Anatomy and structure with sketch.

b) **Attempt any ONE of the following:**

   (i) Construct two handed process chart for the assembly of Nut and Bolt with summary.

   (ii) Explain pull and push types of manufacturing system.
5. **Attempt any FOUR of the following:**

a) Explain 3-2-1 principle of location with suitable example.
b) State and explain the general principle of Jig Fixture design.
c) What is meant by ‘5S’? State meaning of each “S” in detail.
d) Explain spherical configuration with sketch.
e) Explain the tactile sensors in robots.
f) What are grippers? Explain vacuum actuated gripper in brief.

6. **Attempt any TWO of the following:**

a) Explain the GANTT CHART used in production planning and control. State its advantages and disadvantages.
b) A shop floor activity consists of three elements. Calculate the standard time for the activity. The various allowances are given as percentage of normal time.

<table>
<thead>
<tr>
<th>Elements</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed time (min)</td>
<td>1.25</td>
<td>1.2</td>
<td>2.85</td>
</tr>
<tr>
<td>Rating factor (%)</td>
<td>90</td>
<td>115</td>
<td>85</td>
</tr>
<tr>
<td>Relaxation allowances (%)</td>
<td>12</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Delay allowance (%)</td>
<td>3</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Personal allowance (%)</td>
<td>8</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

c) What are actuators? Explain mechanical and hydraulic actuators type with advantages and disadvantages.