PROGRAM : NATIONAL DIPLOMA

ENGINEERING : INDUSTRIAL

SUBJECT : PRODUCTION ENGINEERING 2

CODE : BEP 231

DATE : WINTER EXAMINATION 2016

9 JUNE 2016

DURATION : (SESSION 2) 12:30 - 15:30

WEIGHT : 40 : 60

TOTAL MARKS : 100

ASSESSOR : MR P. DUBE

MODERATOR : MR O. CHIMUSORO 2315

NUMBER OF PAGES : 4 PAGES

INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

REQUIREMENTS

ONLY ONE POCKET CALCULATOR PER CANDIDATE MAY BE USED.
Question 1

Burger Doodle is a fast-food restaurant that processes an average of 680 food orders each day. The average cost of each order can be corrected with additional food items at an average cost of R1.75. The remaining defective orders have to be thrown out.

1.1 Compute the average product cost. (2)
1.2 In order to reduce the number of wrong orders, Burger Doodle is going to invest in computerized ordering and cash register system. The cost of the system will increase the average order cost by R.05 and will reduce defective orders to 1 percent. What is the annual net cost effect of this quality-improvement initiative? (4)
1.3 What other indirect effect on quality might be realized by the new computerised order system? (2)
1.4 Compute the quality-productivity ratio (QPR) for the Burger Doodle restaurant in parts (1.1) and (1.2) in Question 1 (4)

[12 Marks]

Question 2

Hlabangane Corporation makes two versions of the same basic file cabinet, the TOL (Top-of-the-line) five drawer file cabinet and the HQ (High-quality) five drawer filing cabinet.

The TOL and HQ use the same cabinet frame and locking mechanism. The drawer assemblies are different although both use the same drawer frame assembly. The drawer assemblies for the TOL cabinet use a sliding assembly that requires four bearings per side whereas the HQ sliding assembly requires only two bearings per side. (These bearings are identical for both cabinet types.) 100 TOL and 300 HQ file cabinets need to be assembled in week 10.

2.1 Develop a material structure tree for the TOL and the HQ file cabinets. (6)
2.2 Develop a net material requirements plan for the TOL and HQ file cabinets in the previous problems assuming a current on-hand finished goods inventory of 100 TOL cabinets. The lead times are given below.
   - Painting and final assembly of both HQ and TOL requires 2 weeks.
   - Both cabinet frames and lock assembly require 1 week for manufacturing.
   - Both drawer assemblies require 2 weeks for assembly.
   - Both sliding assemblies require 2 weeks for manufacturing.
   - Bearings require 2 week to arrive from the supplier. (11)

[17 Marks]
Question 3

Using the information in Table Q3 for a project answer the questions below:

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Duration</th>
<th>Predecessors</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Requirement Analysis</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Systems Design</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>C</td>
<td>Programming</td>
<td>25</td>
<td>B</td>
</tr>
<tr>
<td>D</td>
<td>Telecoms</td>
<td>15</td>
<td>B</td>
</tr>
<tr>
<td>E</td>
<td>Hardware Installation</td>
<td>30</td>
<td>B</td>
</tr>
<tr>
<td>F</td>
<td>Integration</td>
<td>10</td>
<td>C,D</td>
</tr>
<tr>
<td>G</td>
<td>System Testing</td>
<td>10</td>
<td>E,F</td>
</tr>
<tr>
<td>H</td>
<td>Training/Support</td>
<td>5</td>
<td>G</td>
</tr>
<tr>
<td>I</td>
<td>Handover and Go-Live</td>
<td>5</td>
<td>H</td>
</tr>
</tbody>
</table>

3.1 Draw the network diagram (5)
3.2 Calculate the planned duration of the project in weeks (5)
3.3 Identify any non-critical tasks and the float on each activity (5)

[15 Marks]

Question 4

Five jobs must be processed on three machines in the sequence M1, M2, and M3. The processing times (in hours) are as follows:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine 1</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Machine 2</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Machine 3</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Due Date</strong></td>
<td>16</td>
<td>11</td>
<td>27</td>
<td>14</td>
<td>30</td>
</tr>
</tbody>
</table>

The schedule for the eight jobs, through the three machines, was based on the shortest processing time rule (SPT) on M2. The proposed schedule is 2, 3, 1, 4, and 5.

4.1 Draw Gantt charts for M1, M2, and M3. (5)
4.2 What is the make-span for the six jobs? (4)
4.3 Calculate the average flow-time (4)
4.4 Calculate total tardiness (4)

[17 Marks]
Question 5

Overland Motors uses 25,000 gear assemblies each year (i.e. 52 weeks) and purchases them at R3.40 per unit. It costs R50 to process and receive each order, and it costs R1.10 to hold one unit in inventory for a whole year. Assume demand is constant.

Themba has been ordering 1,000 gear assemblies at a time, but can adjust his order quantity if it will lower costs.

5.1 What is the annual cost of the current policy of using a 1,000-unit lot size? (3)
5.2 What is the order quantity that minimizes cost? (4)
5.3 What is the time between orders for the quantity in part 5.2? (3)
5.4 If the lead time is two weeks, what is the reorder point, R? (2)

[12 Marks]

Question 6

6.1 Discuss the following types of maintenance (3)
6.1.1 Preventive Maintenance
6.1.2 Reactive Maintenance
6.1.3 Predictive Maintenance
6.1.4 Reliability Centred Maintenance

6.2 What is the difference between, responsive supply chain and efficient supply chain? (6)

6.3 Define the following order decoupling points: (3)
6.3.1 Make-to-order
6.3.2 Assemble-to-order
6.3.3 Make-to-stock

[27 Marks]