PEPERIKSAAN AKHIR SEMESTER KEDUA SESI 2012/2013
FINAL EXAMINATION SECOND SEMESTER SESSION 2012/2013

KOD / NAMA KURSUS : BJTM 3033 - KEJURUTERAAN SISTEM PEMBUATAN
COURSE CODE / NAME : MANUFACTURING SYSTEM ENGINEERING

TARIKH : 09 JUN 2013 – AHAD / SUNDAY
DATE
MASA : 9.00 PG – 11.30 PG (2 ½ JAM / HOURS)
TIME
TEMPAT : TE
VENUE

ARAHAN :
1. Buku soalan ini mengandungi LIMA (5) soalan di dalam EMPATBELAS (14) halaman bercetak tidak termasuk kulit hadapan.
2. Sila jawab SEMUA soalan di dalam ruang yang disediakan.
3. Calon TIDAK DIBENARKAN membawa keluar kertas soalan dan buku jawapan dari Dewan Peperiksaan.
4. Calon adalah tertakluk di bawah TATACARA PERATURAN KECURANGAN AKADEMIK, UUM.

INSTRUCTIONS:
1. This book script contains FIVE (5) questions in FOURTEEN (14) printed pages excluding the cover page.
2. Answer ALL the questions in the space provided.
3. Candidates are NOT ALLOWED to take both exam question and exam sheet out of the exam hall.
4. Candidates are bound by the UUM’S RULES AND PROCEDURES ON ACADEMIC FRAUD.

NO. MATRIK : ______________________
MATRIC NO. (dengan perkataan / with word ) (dengan angka / with number)

NO. KAD PENGENALAN :
IDENTIFICATION CARD NO.

PENSYARAH :
LECTURER

KUMPULAN GROUP : ☐ NO.MEJA TABLE NO. :

JANGAN BUKA KERTAS PEPERIKSAAN INI SEHINGGA DIBERI ARAHAN
DO NOT OPEN THIS EXAMINATION PAPER UNTIL INSTRUCTED

SULIT/CONFIDENTIAL
QUESTION ONE (20 MARKS)

a) Production systems can be divided into two categories or levels. Name and briefly define the two levels.

(2 MARKS)

b) What are manufacturing systems, and how are they distinguished from production systems?

(2 MARKS)

c) There are certain basic activities that must be carried out in a factory to convert raw material into finished products. By limiting our scope to a plant engaged in making discrete products, list FOUR (4) basic activities that are must be performed in manufacturing operations.

(4 MARKS)
d) Company Alpha has designed a new product line and is planning to build a new plant to manufacture this product line. The new line consists of 150 different product types, and for each product type the company wants to produce 5,000 units annually. The products average 1000 component each, and the average number of processing steps required for each component is 10. Each processing step takes an average of 1 minute. Determine:

i. how many products

(2 MARKS)

ii. how many parts

(2 MARKS)

iii. how many production operations will be required each year

(2 MARKS)

iv. how many workers will be needed for the plant if it operates one shift for 250 day/yr?

(2 MARKS)
e) A production machine operates 80 hr/wk (2 shifts, 5 days) at full capacity. Its production rate is 20 unit/hr. During a certain week, the machine produces 1000 parts and was idle the remaining time. Determine:

i. the production capacity of the machine

   (2 MARKS)

ii. what was the utilization of the machine during the week under consideration?

   (2 MARKS)
QUESTION TWO (20 MARKS)

a) State TWO (2) types of single station manufacturing cells.  
(2 MARKS)

b) Give TWO (2) reasons why manufacturers choose each type of single station manufacturing cells stated in question 2(a).  
(4 MARKS)

c) Clearly define the term group technology and cellular manufacturing.  
(4 MARKS)

d) List FOUR (4) typical objectives when implementing cellular manufacturing.  
(4 MARKS)
e) Apply the rank order clustering technique to the part-machine incidence matrix in the following table to identify logical part families and machine groups. Parts are identified by letters, and machines are identified numerically.

<table>
<thead>
<tr>
<th>Machines</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
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<tbody>
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<td>1</td>
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<td>2</td>
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<td>1</td>
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</tbody>
</table>

(6 MARKS)
<BLANK PAGE FOR ANSWERING QUESTION 2e>
QUESTION THREE (20 MARKS)

a) Material handling can be defined as the movement, storage, protection and control of materials throughout the manufacturing and distribution process. Briefly discussed FOUR (4) types of material handling equipment.

(4 MARKS)

b) The industrial trucks can be divided into TWO (2) categories: non-powered and powered. Briefly discussed the typical applications of these categories by using suitable examples for each category.

(4 MARKS)

c) There are three technologies that are used in commercial systems for vehicle guidance. List TWO (2) features that distinguish self-guided vehicles from conventional AGVs?

(4 MARKS)
d) Briefly discuss **TWO (2)** differences between rail-guided vehicles and automated guided vehicles.

(4 MARKS)

e) The function of a material storage system is to store materials and to permit access to those materials when required. There are various measures used to assess the performance of a storage system. Briefly describe these four measures as stated below:

i. Storage capacity

(1 MARKS)

ii. Storage density

(1 MARKS)

iii. Accessibility

(1 MARKS)

iv. System throughput

(1 MARKS)
QUESTION FOUR (20 MARKS)

a) Manual assembly line is a production line that consists of a sequence of workstations where assembly tasks are performed by human workers. Name and discuss FOUR (4) factors that favor the use of manual assembly lines.

(4 MARKS)

b) Identify and briefly describe the THREE (3) major categories of mechanized work transport systems used in production lines?

(3 MARKS)

c) What is meant by the term balance efficiency?

(2 MARKS)
d) The table below defines the precedence relationships and element times for a new model toy.

<table>
<thead>
<tr>
<th>Work element</th>
<th>T_e (min)</th>
<th>Immediate predecessors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>0.3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>0.2</td>
<td>2</td>
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<tr>
<td>5</td>
<td>0.1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>0.6</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>0.4</td>
<td>4,5</td>
</tr>
<tr>
<td>8</td>
<td>0.5</td>
<td>3,5</td>
</tr>
<tr>
<td>9</td>
<td>0.3</td>
<td>7,8</td>
</tr>
<tr>
<td>10</td>
<td>0.6</td>
<td>6,9</td>
</tr>
</tbody>
</table>

i. Construct the precedence diagram for this job.  

(2 MARKS)
ii. If the ideal cycle time = 1.1 minute, repositioning time = 0.1 minute, and uptime proportion is assumed to be 1.0, what is the theoretical minimum number of workstations required to minimize the balance delay under the assumption that there will be one worker per station?

(2 MARKS)

iii. Use the largest candidate rule to assign work elements to stations.

(5 MARKS)
iv. Compute the balance delay for your solution.

(2 MARKS)
QUESTION FIVE (20 MARKS)

a) Name **THREE (3)** of the four conditions under which automated production lines are appropriate.  

(3 MARKS)

b) There are three basic control functions in the operation of an automatic transfer machine. Briefly discuss the **THREE (3)** basic control functions.  

(6 MARKS)

c) Parts delivery system typically consists of several hardware. Discuss the following hardware:  

(3 MARKS)

i. Hopper –

ii. Parts feeder –

iii. Selector –
d) An eight-station automatic assembly machine has an ideal cycle time of 10 sec. Downtime is caused by defective parts jamming at the individual assembly stations. The average downtime per occurrence is 3.0 min. The fraction defect rate is 1.0% and the probability that a defective part will jam at a given station is 0.6 for all stations. The cost to operate the assembly machine is $90.00 per hour and the cost of components being assembled is $0.60 per unit assembly. Ignore other costs. Determine:

i. yield of good assemblies

(2 MARKS)

ii. average production rate of good assemblies

(3 MARKS)

iii. proportion of assemblies with at least one defective component, and

(1 MARKS)

iv. unit cost of the assembled product.

(2 MARKS)

END OF QUESTIONS