Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	COMPUTER AIDED DESIGN AND MANUFACTURING
COURSE CODE	:	BDD 40203
PROGRAMME	:	4 BDD
EXAMINATION DATE	:	DECEMBER 2014/JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS IN **SECTION A** AND **THREE (3)** QUESTIONS IN **SECTION B**

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

SECTION A

Q1 (a) Explain the function of tool path generation and verification in the CADCAM software.

(3 marks)

(b) The function of part programming is to give the instruction to the machine to perform a motion and activities. However, the engineer should be able to read and interpret the program. From the given part programming, please interpret every block number of the program.

```
N5 G17 G71 G90 G94 G54
N10 T2 L90
N15 G00 Z50 M3 S700 X10 Y-25
N20 G01 Z-1.5
N25 G01 X4 F100 M8
N30 G00 Z100 M9
N35 M30
```

(7 marks)

(c) The component shown in **Figure Q1(c)** is to be machined on a CNC machining center. Develop a CNC program using G90 coordinate system for the component. The end mill diameter of 6 mm, depth of cut of 2 mm depth, cutting speed of 200 m/min and feed rate of 300 mm/min should be employed in the program.

(10 marks)

Q2 (a) Differentiate between forward and backward process planning.

(6 marks)

(b) Discuss the importance of process planning in product development

(4 marks)

(c) Consider yourself as a process planner, you are assigned to fabricate the product as shown in **Figure Q2(c)**. Develop the process plan for that particular product.

(10 marks)

SECTION B

Q3 (a) Differentiate between numerical control (NC), computer numerical control (CNC) and direct numerical control (DNC).

(6 marks)

(b) A vertical machining center is driven by a closed loop system consisting of a servo motor, leadscrew and optical encoder. The leadscrew has a pitch, p of 0.15 mm and is coupled to the motor shaft with a screw to motor gear ratio 1:1. The encoder generates 300 pulses per revolution (N) of the leadscrew. If the number of pulses (n) and the pulse rate (f) received by the control system are 2000 and 100Hz, calculate:

i) The work table speed
ii) Distance traveled by the table
iii) Basic length unit (BLU)
iv) The new table speed if the ratio between motor and lead screw is 3:1.

(6 marks)

(c) As a process engineer, you should be able to identify and determine the suitable manufacturing process to produce a component. By referring to the **Figure Q3(c)**, propose and develop a detail process plan for machining process of the component.

(8 marks)

Q4 (a) Explain the function of Global Section in Initial Graphic Exchange Specification (IGES).

(4 marks)

(b) Explain the working principle of pre-processor and post-processor in Initial Graphic Exchange Specification (IGES).

(6 marks)

(c) Differentiate between direct and indirect translator in data exchange standard.

(10 marks)

Q5 (a) Explain the function of part classification and coding in Group Technology.

(4 marks)

(b) Propose an OPITZ code for the given component shown in **Figure Q5 (b)**. You can use **Table 1** as a guideline.

(6 marks)

(c) Logical decision is a traditional implementation technique used in Computer Aided Process Planning (CAPP). It consists of decision table, decision tree and artificial intelligence (AI). Explain each of them.

(10 marks)

Q6 (a) Describe the primary, secondary and tertiary datum planes. You can use a diagram to describe those planes.

(3 marks)

(b) **Figure Q6(b)** shows the features control frame (FCF) for engineering components. Interpret these drawings according to their FCF.

(8 marks)

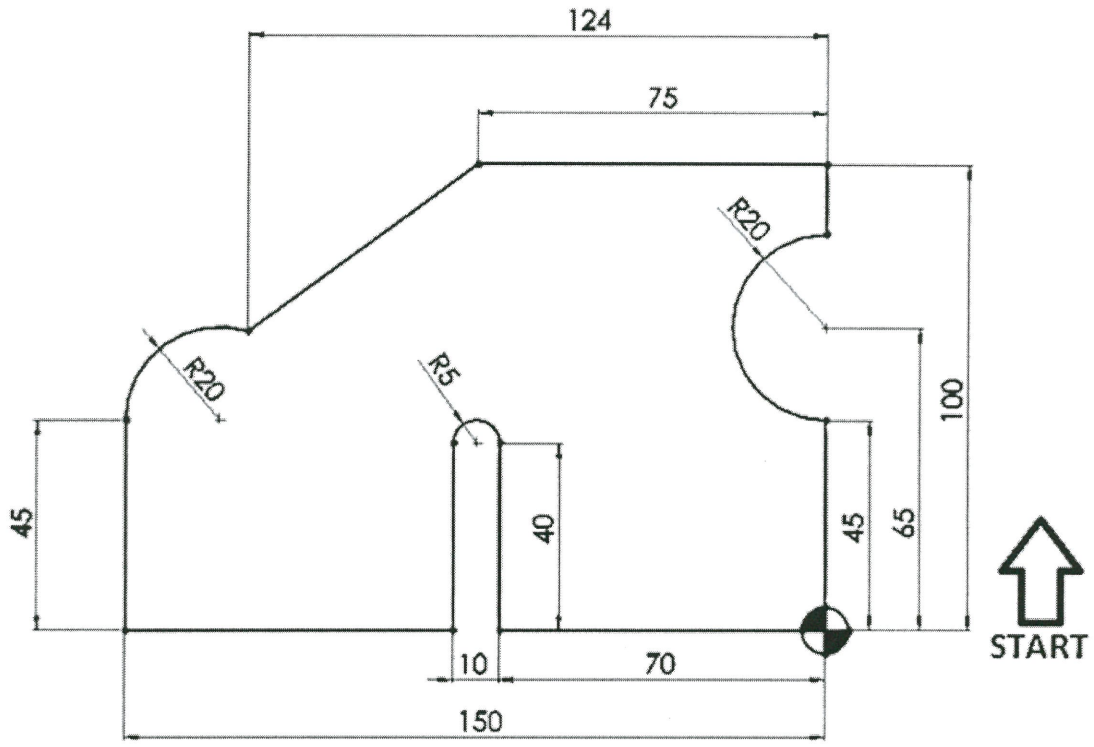
(c) As a design engineer, you have been given a project to produce a component as shown in **Figure Q3(c)**. This component has a very tight tolerance especially the holes and slots. Construct (by sketching) all the GD&T elements that should be included in the drawing.

(9 marks)

- END OF QUESTION -

FINAL EXAMINATION

SEMESTER/SESSION: SEM I/2014-2015 PROGRAMME : 4 BDD
COURSE NAME : COMPUTER AIDED DESIGN & MANUFACTURING COURSE CODE: BDD 40203



Unit is in millimeter

FIGURE Q1(c)

FINAL EXAMINATION

SEMESTER/SESSION: SEM I/2014-2015 PROGRAMME : 4 BDD
COURSE NAME : COMPUTER AIDED DESIGN & MANUFACTURING COURSE CODE: BDD 40203

TABLE 1

Cutter	Spindle speed (rpm)	Feed rate (mm/min)
T8 Drill Ø 8	1500	200
T6 Ball end mill Ø 8	1200	300
T10 Flat end mill Ø 4	1600	250

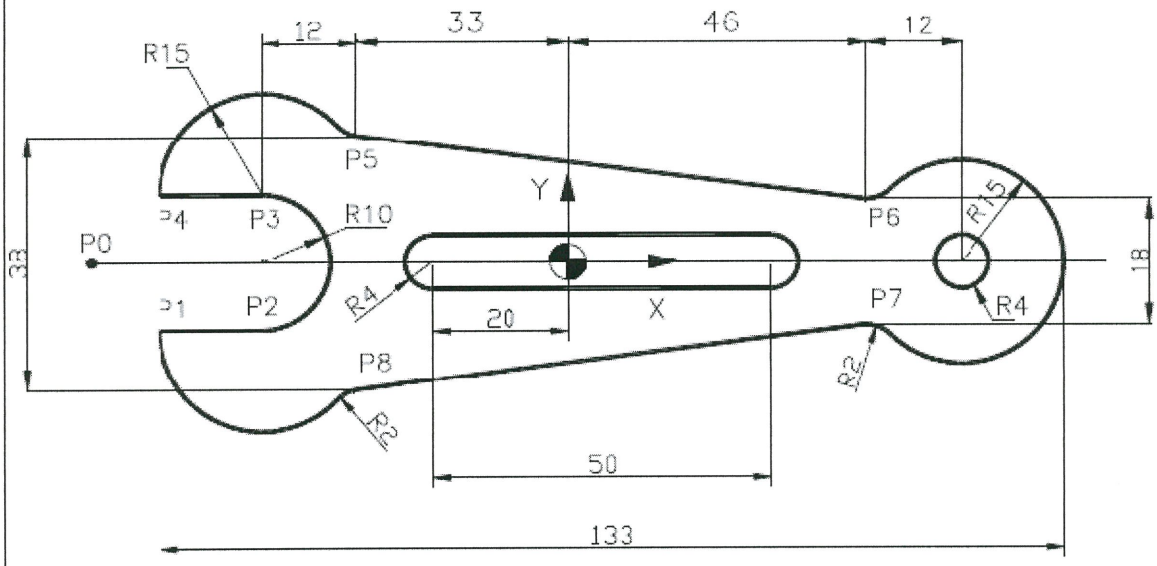
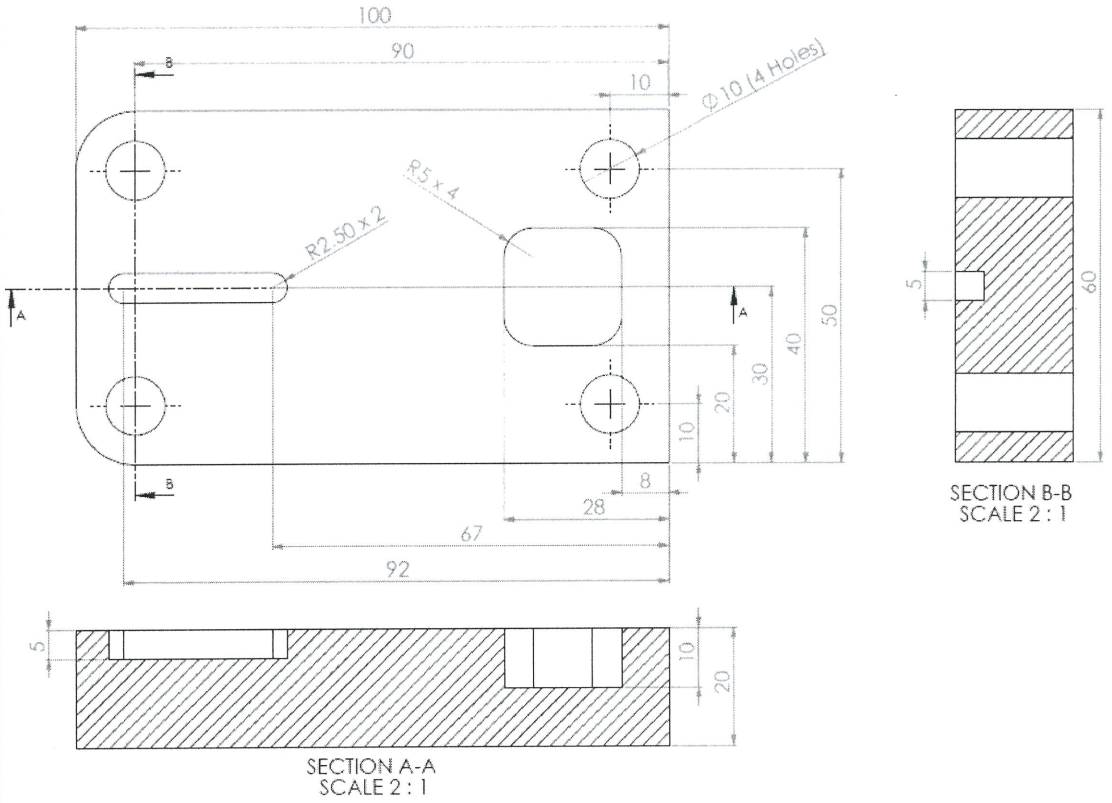


FIGURE Q2 (c)

FINAL EXAMINATION

SEMESTER/SESSION: SEM I/2014-2015 PROGRAMME : 4 BDD
COURSE NAME : COMPUTER AIDED DESIGN & MANUFACTURING COURSE CODE: BDD 40203



Unit is in millimeter

FIGURE Q3(c)

FINAL EXAMINATION

SEMESTER/SESSION: SEM I/2014-2015 PROGRAMME : 4 BDD
COURSE NAME : COMPUTER AIDED DESIGN & MANUFACTURING COURSE CODE: BDD 40203

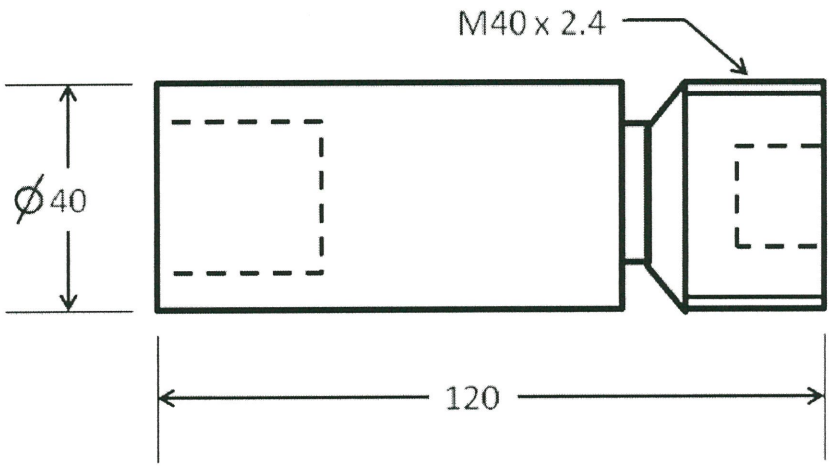


FIGURE Q5(b)

TABLE 2

Form code (digit 1-5) for rational parts in the optiz system. Part classes 0, 1, and 2.

Digit 1		
Part class		
0	Rotational parts	L/D ≤ 0.5
1		0.5 < L/D < 3
2		L/D ≥ 3
3		
4		
5		
6		
7	Nonrotational parts	
8		
9		

Digit 2		
External shape, external shape element		
0	Smooth no shape element	
1	Stepped at one end	No shape element
2		Smooth thread
3		Smooth functional groove
4	Stepped at both end	No shape element
5		Thread
6		Functional groove
7	Functional cone	
8	Operating thread	
9	All others	

Digit 3		
Internal shape, internal shape element		
0	No hole, no breakthrough	
1	Smooth or stepped to one end	No shape element
2		Thread
3		Functional groove
4	Stepped at both end	No shape element
5		Thread
6		Functional groove
7	Functional cone	
8	Operating thread	
9	All others	

Digit 4	
Plane surface machining	
0	No surface machining
1	Surface plane and/or curved in one direction
2	External plane surface related by graduation around a circle
3	External groove and/or slot
4	External spline (polygon)
5	External plane surface and/or slot, external spline
6	Internal plane surface and/or slot
7	Internal spline (polygon)
8	Internal and external polygon, groove and/or slot
9	All others

Digit 5		
Auxiliary holes and gear teeth		
0	no gear teeth	No auxiliary hole
1		Axial, not on pitch circle diameter
2		Axial on pitch circle diameter
3		Radial, not on pitch circle diameter
4		Axial and/or radial and/or other direction
5		Axial and/or radial on pitch circle diameter and/or other direction
6	With gear teeth	spur gear teeth
7		Bevel gear teeth
8		Other gear teeth
9		All others

FINAL EXAMINATION

SEMESTER/SESSION: SEM I/2014-2015 PROGRAMME : 4 BDD
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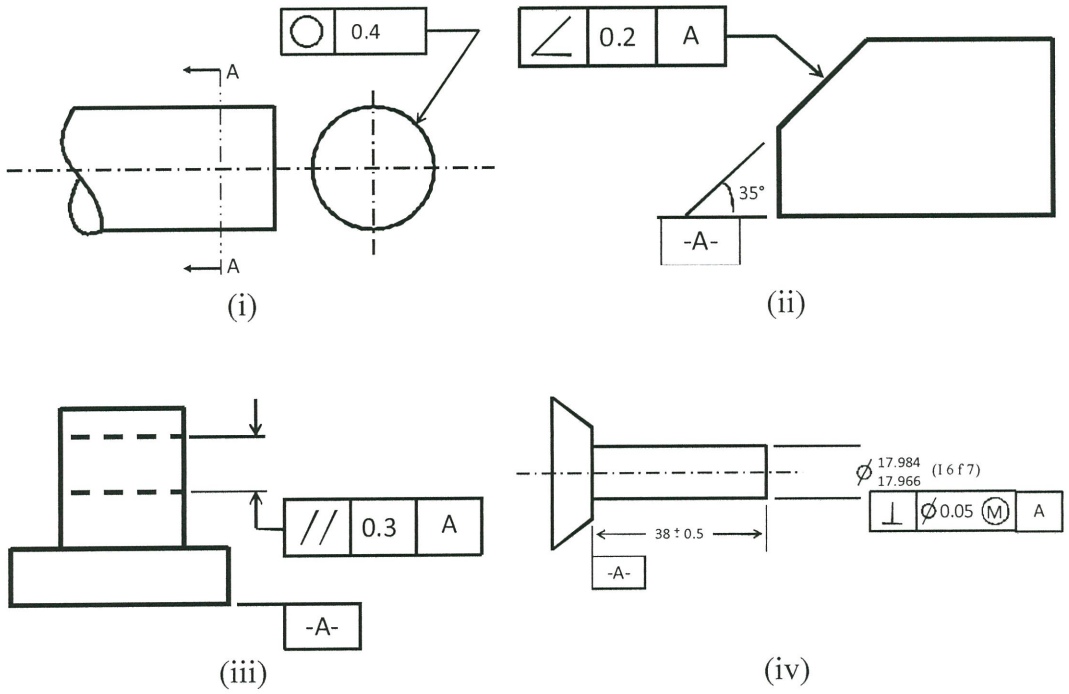

FIGURE 6(b)