Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

COURSE NAME	:	COMPUTER AIDED DESIGN AND MANUFACTURING
COURSE CODE	:	BDD 40203
PROGRAMME	:	4 BDD
EXAMINATION DATE	:	JUNE 2017
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: ANSWER ALL QUESTIONS

Q1 (a) Explain why datum is important in geometrical design.

(2 marks)

(b) Interpret the drawing in Figure **Q1(b)** according to the concept of Geometric Dimension and Tolerancing (GD&T).

(6 marks)

(c) **Figure Q1(c)** shows a component of a new model. As a Test Engineer, you must to make sure that the completed component is compliance with the standard specification. However, this component comes without any specification and indication of GD&T. Evaluate this component by providing the details of datum reference, feature control frame and appropriate material conditions.

(12 marks)

Q2 (a) Explain a technique how to transfer a CNC program to the CNC machine.

(2 marks)

(b) Differentiate between Numerical Control (NC) system and Computer Numerical Control (CNC) system? Sketch a drawing to support your answer.

(6 marks)

(c) The component shown in **Figure Q2(c)** is to be machined on a CNC machining center. As a CNC Program Engineer, you are required to develop a CNC program using G90 coordinate system for the component. In addition, you must determine what are the suitable cutting tools and machining parameters together with the calculation to be used in the CNC program. You can use a given steps in **Table 1** as a guideline to create the CNC program.

(12 marks)

Table 1 : Machining sequence

Steps	Tasks
1	Contour machining for outer profile with depth 10 mm, 4 flutes end mill with a diameter of 10 mm, cutting speed 100 m/min, feed rate 50 mm/min, offset to right.
2	Pocket machining (thru slot) , 4 flutes end mill with a diameter of 8 mm, cutting speed 70 m/min, feed rate 50 mm/min
3	Pocket machining of blank slot, 4 flutes end mill with a diameter of 8 mm, feed rate 50 mm/min
4	Thru holes drilling, tool diameter 8 mm, cutting speed 20 m/min, feed rate 20 mm/min

SECTION B: ANSWER THREE QUESTIONS ONLY

Q3 (a) Explain the function of Directory Entry 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 structure entities and geometric entities in the IGES.

(10 marks)

Q4 (a) Differentiate between Variant and Generative approaches in Computer Aided Process Plan (CAPP).

(5 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 0.1 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 1500 and 50Hz, calculate:

i) The work table speed, v
ii) Distance traveled by the table, x
iii) Basic length unit (BLU)
iv) The new table speed (v) if the ratio between motor and lead screw is 2:1.

(5 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 Q2(c)**, propose and develop a process plan for machining process of the component.

(10 marks)

Q5 (a) Explain why duplex is suitable to be used rather than simplex as a communication mode?

(2 marks)

(b) Open System Interconnection (OSI) consists of several layers for the data communication. Discuss the following layers:

i. Network layer
ii. Transport layer
iii. Session layer

(9 marks)

(c) Recently, Internet of Things (IoT) in the Industrial Revolution 4.0 has been introduced to computerized all activities in manufacturing process. The machineries and equipments need to be communicated between each other by receiving and transferring the data and information. As a Facility Engineer, you are requested to set up a new manufacturing plant by implementing the IoT. Propose and discuss **THREE (3)** network methods in a network topology category to communicate and integrating all systems in the manufacturing plant.

(9 marks)

Q6 (a) Explain the benefits by implementing of Group Technology (GT).

(4 marks)

(b) Propose an OPITZ code for the given component shown in **Figure Q6 (b)**. You can use **Table 2** 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)

- END OF QUESTION –

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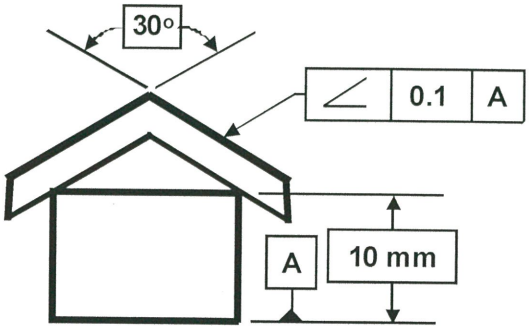
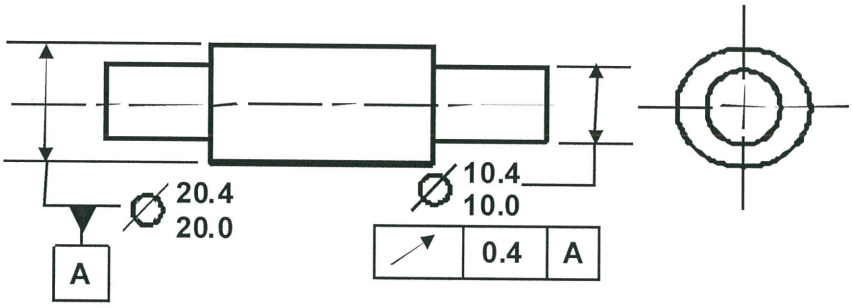


(i)



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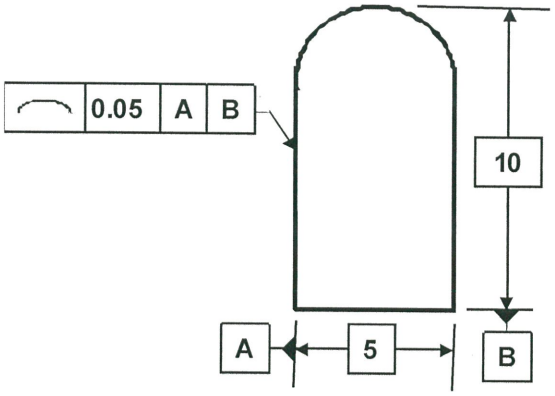

(iii)

Figure Q1(b)

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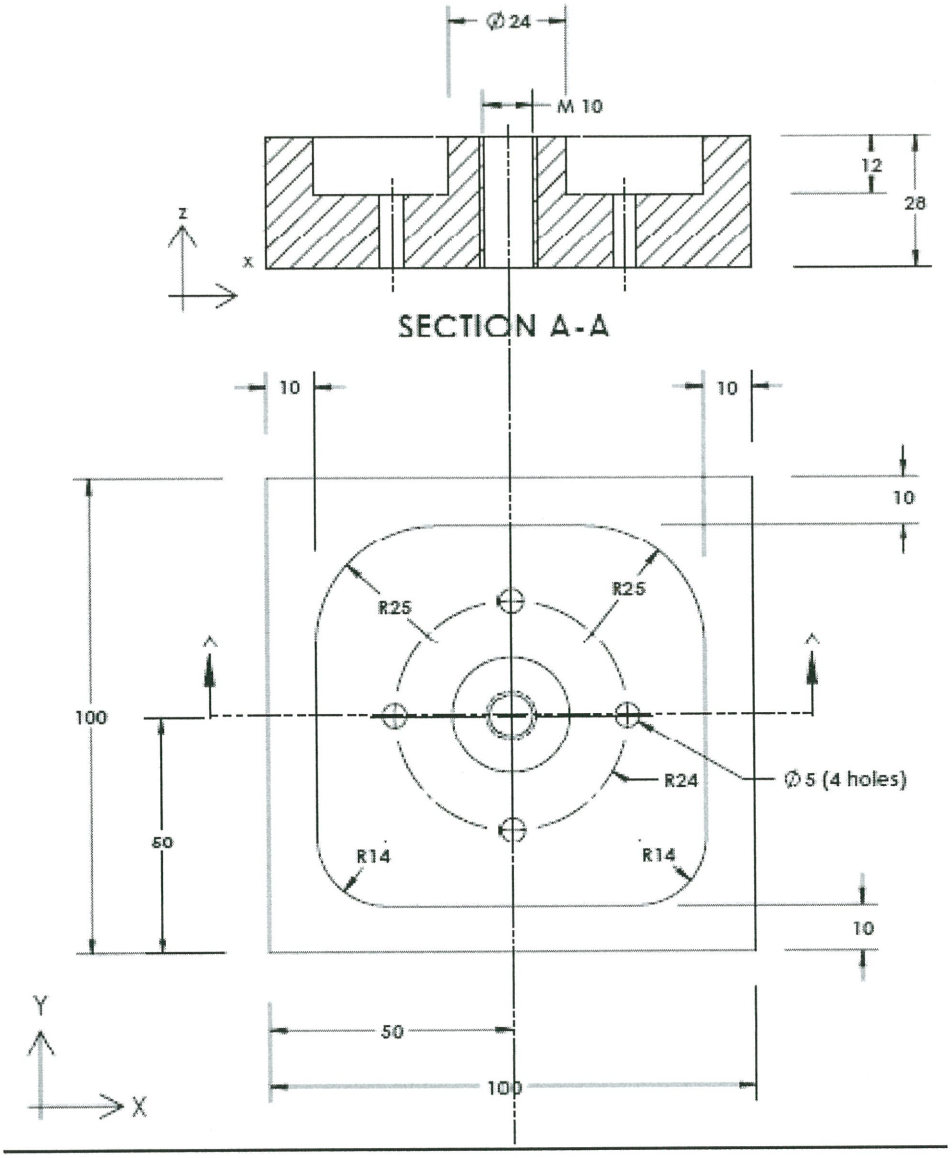

Unit is in millimeter

Figure Q1(c)

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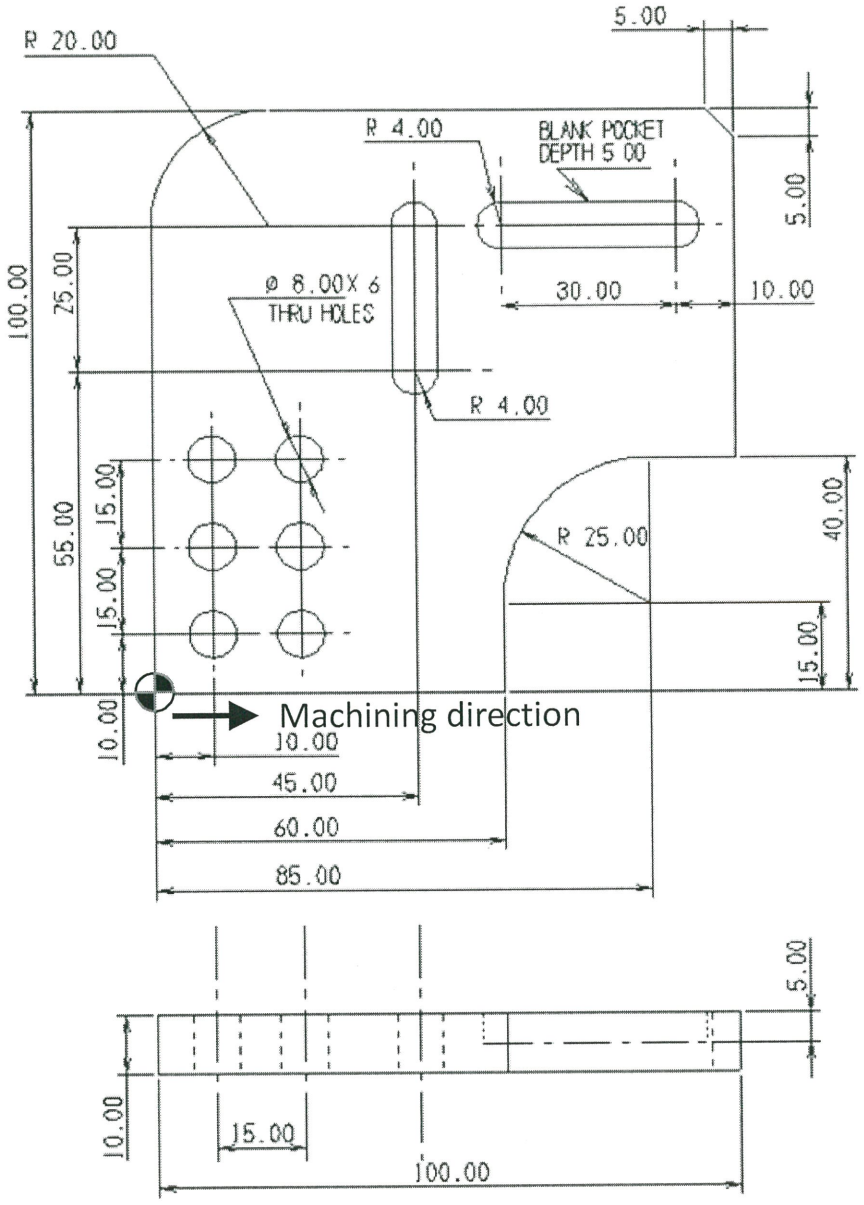

Figure Q2(c)

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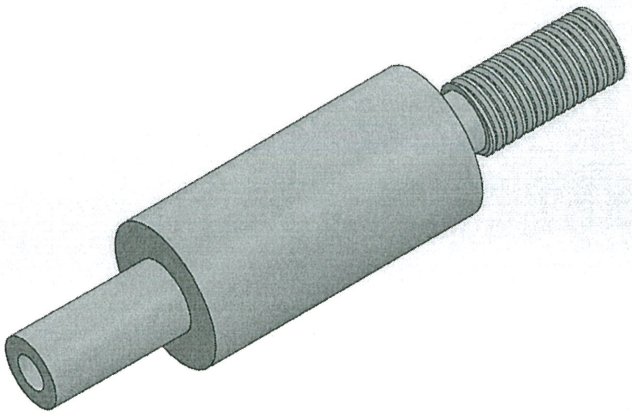

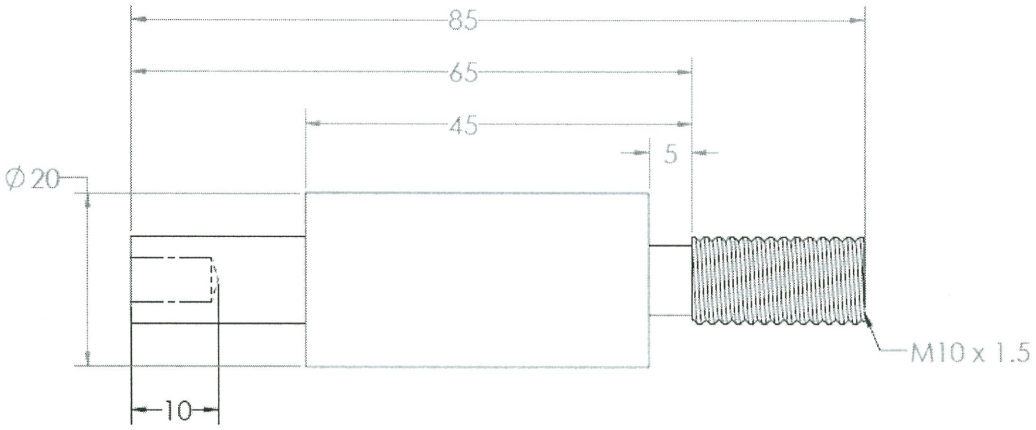

Figure Q6(b)

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Table 2

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

Digit 1			Digit 2			Digit 3			Digit 4		Digit 5		
Part class			External shape, external shape element			Internal shape, internal shape element			Plane surface machining		Auxiliary holes and gear teeth		
0	Rotational parts	L/D ≤ 0.5	0	Smooth no shape element		0	No hole, no breakthrough		0	No surface machining	0	no gear teeth	No auxiliary hole
1		0.5 < L/D < 3	1	Stepped at one end	No shape element	1	Smooth or stepped to one end	No shape element	1	Surface plane and/or curved in one direction	1		Axial, not on pitch circle diameter
2		L/D ≥ 3	2		Smooth thread	2		Thread	2	External plane surface related by graduation around a circle	2		Axial on pitch circle diameter
3			3		Smooth functional groove	3		Functional groove	3	External groove and/or slot	3		Radial, not on pitch circle diameter
4			4	Stepped at both end	No shape element	4	Stepped at both end	No shape element	4	External spline (polygon)	4		Axial and/or radial and/or other direction
5			5		Thread	5		Thread	5	External plane surface and/or slot, external spline	5		Axial and/or radial on pitch circle diameter and/or other direction
6			6		Functional groove	6		Functional groove	6	Internal plane surface and/or slot	6		spur gear teeth
7	Nonrotational parts		7	Functional cone		7	Functional cone		7	Internal spline (polygon)	7	With gear teeth	Bevel gear teeth
8			8	Operating thread		8	Operating thread		8	Internal and external polygon, groove and/or slot	8		Other gear teeth
9			9	All others		9	All others		9	All others	9		All others