UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 6 Examination in Engineering: November 2014

Module Number: ME 6317 **Module Name: Computer Aided Manufacturing**

[Two Hours]

[Answer **all questions**, each question carries **five** marks]

Q1. a) Briefly describe the following three basic components of a CNC system.

i. Part Program.
ii. Machine Control Unit (MCU).
iii. Machine Tool.

[3.0 Marks]

b) Differentiate "open loop control" and "closed loop control" of an NC control system.

[1.0 Marks]

c) Explain the significance of PID controlling for NC machine tools.

[1.0 Marks]

Q2. a) State basic activities that must be carried out in a factory to convert raw materials into finished products.

[1.0 Marks]

b) i. How the product variety and the production quantity are related in a typical manufacturing organization?
ii. Define the term "batch production" and describe why it is often used for medium quantity production.

[2.0 Marks]

c) What do you mean by "*CAM Systems*"?

[2.0 Marks]

Q3. a) i. What are the advantages of computer assisted part programming compared to the manual part programming.
ii. Briefly describe the Part Programmer's Job and the Computer's Job in computer assisted part programming.

[2.0 Marks]

b) Write the complete APT program for profiling and drilling operations of the part shown in ***Figure Q3***. The profiling operation is divided into two sub operations called "Rough Cut" and "Finishing Cut". The processing parameters for each operation are as follows.

	Rough Cut	Finishing Cut	Drilling
Feed Rate (inches/min.)	6.0	3.0	5.0
Spindle Speed (rpm)	450	575	500
Coolant	ON	ON	ON
Cutter Diameter (inches)	0.5	0.25	0.5

Take the tool home position as (-1, -1, 2).

(You may use the APT definition words available at *Table Q3*)

[3.0 Marks]

Q4. a) i. Briefly describe the benefits of adaptive control machining.

ii. Explain the situations where adaptive control can be applied most effectively.

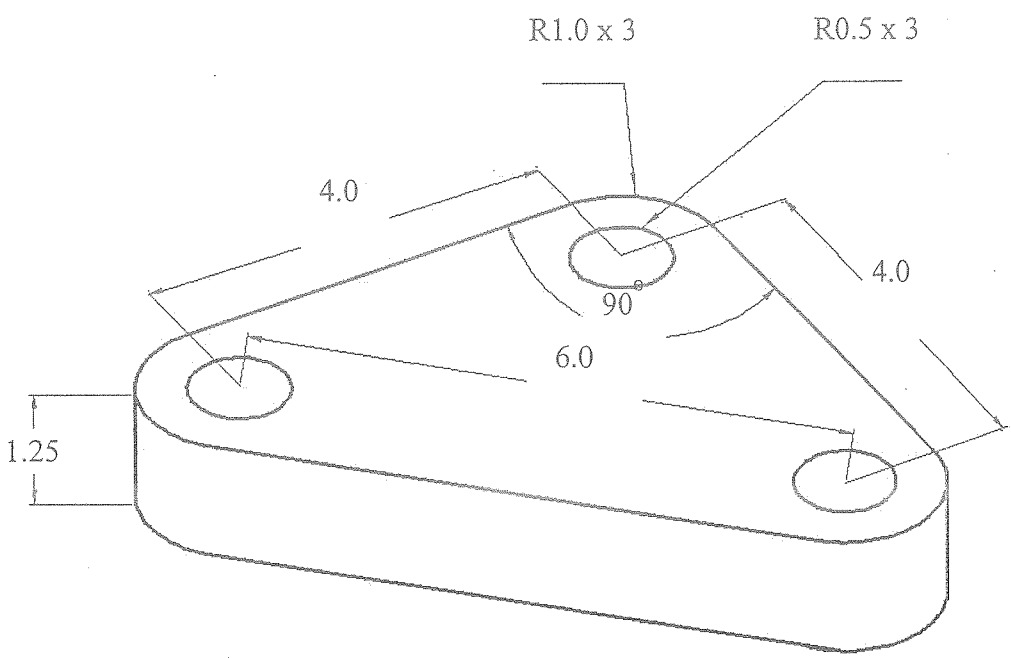
[1.5 Marks]

b) *"Adaptive control system is a combination of hardware and software components"*. Explain this statement with the aid of suitable sketches.

[1.5 Marks]

c) Compare advantages and disadvantages of "SolidCAM iMachining" package with other CAM software packages.

[2.0 Marks]



All dimensions are in inches

Figure Q3

Table Q3: APT Definition Words

APT Word	Definition
CALL	Used to call a MACRO
CIRCLE / Descriptive Data	Used to define a circle
CENTER	Used to define a center of a circle
COOLNT/ Descriptive Data (ON or	Coolant On or Off
CUTTER / Cuter Diameter	Defines cutter diameter
FEDRAT / Descriptive Data	To specify the feed rate
FINI	Must be the last word of APT program
FROM / Descriptive Data	Starting location for the program
GO / TO	Initialization command of the program
GODLTA / Descriptive Data	Point to Point motion in incremental mode
GOBACK / Descriptive Data	Instructs tool to move back
GODOWN / Descriptive Data	Instructs tool to move down
GOFWD / Descriptive Data	Instructs tool to move forward
GOLFT / Descriptive Data	Instructs tool to move left
GORGT / Descriptive Data	Instructs tool to move right
GOTO / Descriptive Data	Point to Point motion in absolute mode
GOUP / Descriptive Data	Instructs tool to move up
LINE / Descriptive Data	Used to define a line
PARALEL	To define a parallel line
PERPTO	To define a perpendicular line
MACRO	To define a MACRO
SPINDL / Descriptive Data	To specify the spindle speed
TERMAC	End of the MACRO
TO, PAST, TANTO	Modifier words to define the check surface
PLANE / Descriptive Data	To define a plane t
POINT / Descriptive Data	To define a point
RADIUS	Used to define a radius of a circle
TURRET / Descriptive Data	For tool selection
XSMALL,YSMALL,ZSMALL,XLARGE ,YLARGE,ZLARGE	Used to define the relative position of one geometric element with respect to another when there are possible alternatives