Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II– EXAMINATION – WINTER - 2016

Subject Code: 2720802 **Date: 17/11/ 2016**

Subject Name: Computer Aided Manufacturing

Time: 2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q-1 **(a)** Which are the different reference points important for CNCs? Explain any one in details with neat sketch. **07**
Justify "Part accuracy may depend on the where the part origin is set".

(b) Draw a block diagram of open and closed loop position control systems used for a CNC machine. State the function of each element of a block diagram for both systems. What are the typical accuracy of CNC lathes in microns? **07**

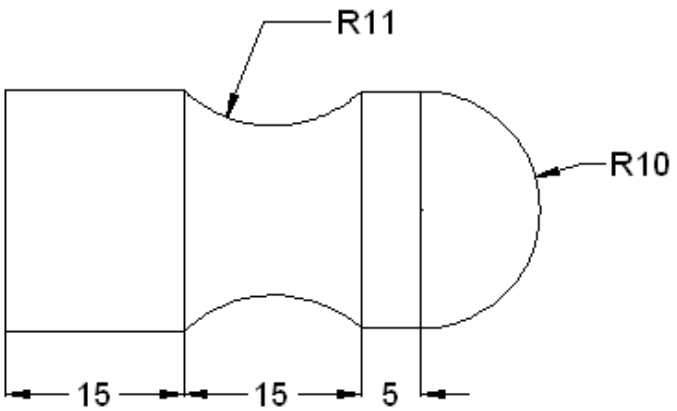
Q.2 **(a)** Sketch a 4-bit absolute rotary encoder. What is maximum angular resolution of 4-bit absolute encoder? What is a measurable linear resolution of a ball screw with pitch of 5mm, if the same absolute encoder is attached to its one end? **07**

(b) A 200 step stepper motor is directly connected to a 4 mm pitch ball screw. Calculate the resolution of the axis. Also calculate the number of pulses required to move the axis by a distance of 54.78 mm. What shall be the pulse frequency to the stepper motor in order to achieve a linear velocity of 240 mm/min? **07**

OR

(b) A DC servomotor is used to drive one of the table axes of a CNC milling machine. The motor is coupled directly to the lead screw for the axis and the lead screw pitch = 5 mm. The optical encoder attached to the lead screw emits 500 pulses per revolution of the lead screw. The motor rotates at a normal speed of 300 rev/min. Determine, **07**
(a) The control resolution of the system, expressed in linear travel distance of the table axis,(b) The frequency of the pulse train emitted by the optical encoder when the servomotor operates at full speed, and (c) The travel rate of the table at normal revolutions per minute of the motor.

Q.3 **(a)** Write a manual part program for the component shown in figure-1 (FANUC controller). Assume program origin at suitable location. Mention important tool positions used for programming in tabular format. **07**



(b) What is a canned cycle? Explain any two canned cycles used for CNC Lathes along with their formats and cycle diagrams. **07**

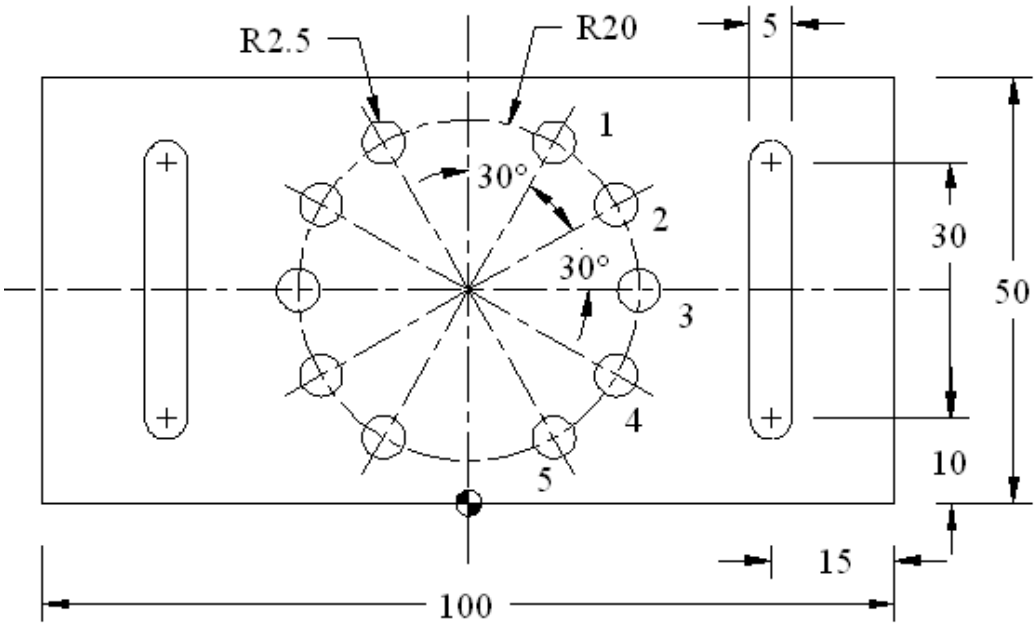
OR

Q.3 **(a)** Write a manual part program to machine the Aluminum component shown in figure-2 on CNC Machining center. **07**

- Thickness of raw material: 100 mm × 50 mm× 10 mm
- Calculate necessary tool positions in tabular format
- Use of subprogram and Mirroring concept is mandatory.
- Hole size: Ø5.0 mm through holes
- Depth of slots: 2 mm.
- All dimensions are in mm.

Process Plan:

Op. No.	Operation	Speed (m/min)	Feed (mm/min)	Depth (mm)	Tool
10	Drilling	30	60	--	T02
20	Slot Milling	25	60	2	T04



(b) What is the format for a subprogram call? Give an example of a sub program. What are the advantages of sub-programming? **07**

Q.4 **(a)** What is meaning of design by features? Explain procedural design by feature and declarative design by features. **07**

(b) What is a formal definition of a feature? How one can characterize a feature? List feature attributes. Mention various types of features by using sub classification of features. **07**

OR

Q.4 **(a)** What do you mean by feature recognition? Explain machining region and predefined feature recognition. **07**

(b) Explain intrinsic and extrinsic properties of features. **07**

Q.5 **(a)** Define macro. Express usage of local, common and system variables for a macro. How can be macro called within a program by a programmer? **07**

(b) Enlist any five extended capabilities of CNC machines over conventional machines. Mention various industrial applications of CNC machines. **07**

OR

Q.5 **(a)** Explain various network topologies. State merits and limitations of each of the topologies. **07**

(b) Draw a flow chart for automated NC program generation for any integrated CAD/CAM/CAE software. Also explain each step to be followed in brief. **07**

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