Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject Code: 172002 **Date: 02-12-2014**

Subject Name: Automated Manufacturing - I

Time: 10:30 am - 01:00 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)** The following component is to be made using a CNC turning centre equipped with a FANUC OT controller. Write a complete manual part program for machining of the component shown in figure1. The datum is to be set as shown. Take Raw material of size Φ90 x 125 mm. Limit maximum spindle speed to 3000 RPM. **07**

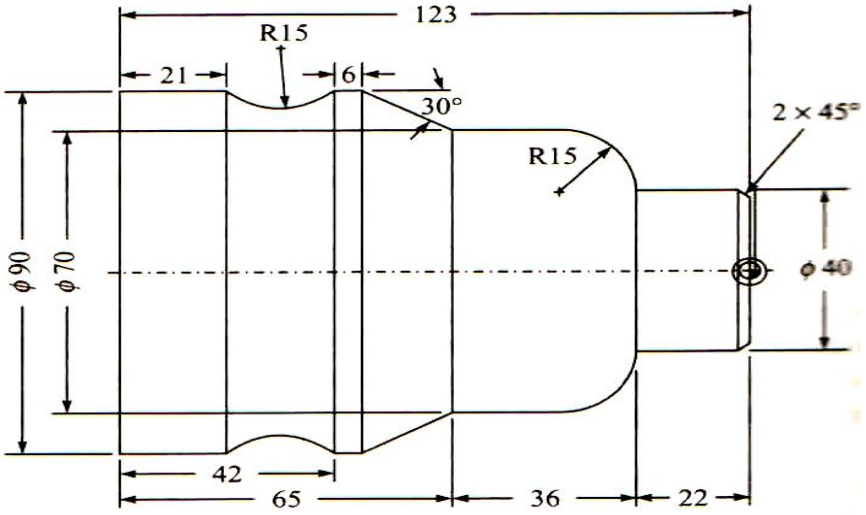

Figure 1(All Dimension are in mm)

(b) Write a part program to machine the symmetric profile as shown in fig.2. Using subprogram facility. Raw material size: 100×100×5mm. **07**

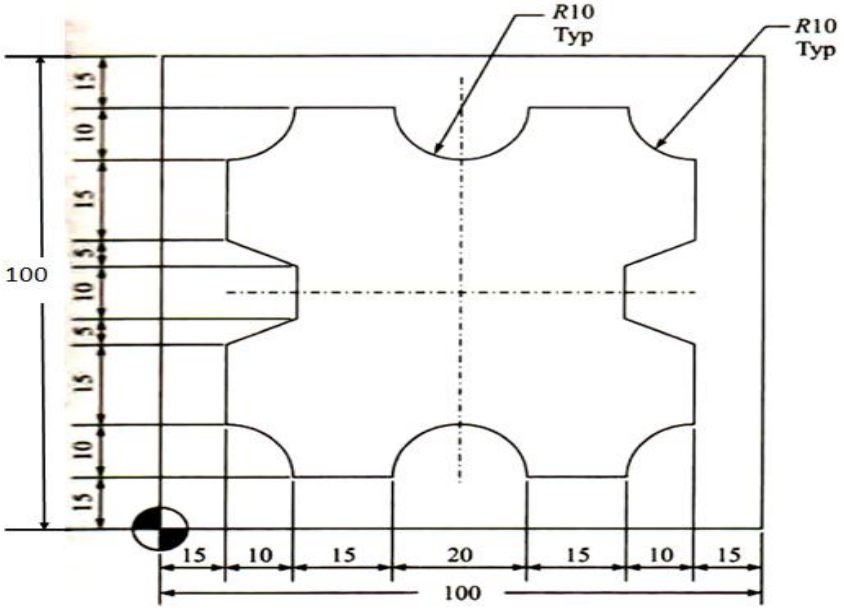

Figure 2. (All Dimension are in mm)

Q.2 **(a)** A CNC machine tool table is powered by a servomotor, a ball screw and an optical encoder. The servomotor is connected to the ball screw through a 5:1 ratio reduction gear box. The ball screw has 2 threads per cm. the optical encoder is directly attached to the ball screw and emits 500 counts per revolution of the ball screw. The motor rotates at maximum speed of 1000 rpm. Determine: **07**

(1) The linear control resolution of the system in one axis
(2) The linear travel speed of table at maximum motor speed.
(3) The frequency of pulse train emitted by encoder at maximum speed.

(b) Explain the two most popular methods of preloading the ball screw nut in CNC machine. **07**

OR

(b) How does the operation of a CNC controller differ from that hardwired MCU? **07**

Q.3 **(a)** What is the USA Principle? List and explain the ten strategies for automation and process improvement. **07**

(b) The following component is to be made using a CNC turning centre equipped with a FANUC OT controller. Write a complete manual part program for machining of the component shown in figure1. The datum is to be set as shown. Take Raw material of size Φ22 x 65 mm. Limit maximum spindle speed to 2000 RPM. **07**

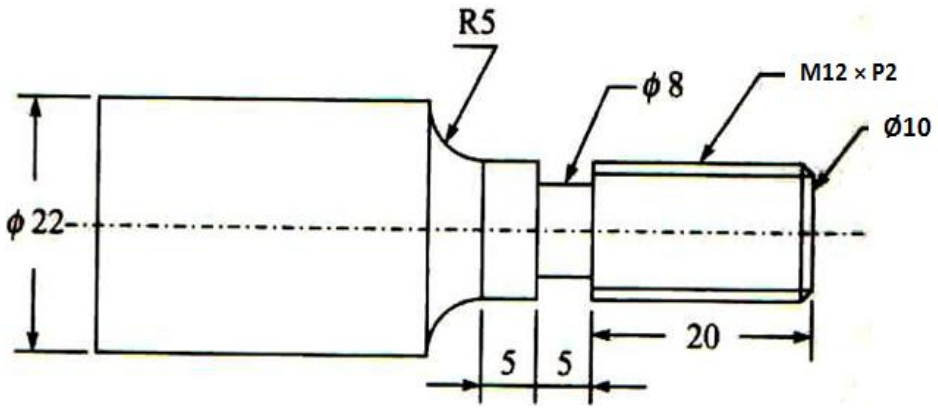

Figure 3.(All Dimension are in mm)

OR

Q.3 **(a)** Differentiate Automatic Tool Changer (ATC) and Automatic Pallet Changer (APC) in CNC machine. **07**

(b) The length of the storage aisle in an AS/RS = 240 ft and its height = 60 ft. suppose horizontal and vertical speeds of the S/R machine are 400 ft/min and 60 ft/min, respectively. The S/R machine requires 20 sec to accomplish a pick up –and –deposit operation. Find: (a) throughput for the aisle under assumptions that storage system utilization = 90% and a ratio of single-command to dual-command cycles of 3:1. **07**

Q.4 **(a)** Describe briefly various guidance methods available for automated guided vehicle (AGV). **07**

(b) What is process planning? Briefly describe the two basic approaches in computer aided process planning. **07**

OR

Q.4 **(a)** Describe traffic control patterns used in AGV's traffic management. **07**

(b) What is the AS/RS system and carousel system? Explain basic component of automated storage/retrieval system. **07**

Q.5	**(a)**	With neat sketch explain the four basic steps of rapid prototype techniques. Describe the Sterelithography (SLA) technology.	**07**
	(b)	Explain the application and advantage of integration of CAQC with CAD/CAM systems.	**07**

OR

Q.5	**(a)**	With neat sketch explain six different types of coordinate measuring machine (CMM) configuration.	**07**
	(b)	(i) Contact and non-contact type inspection techniques.	**04**
		(ii) Application of rapid prototyping techniques.	**03**

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