Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 712803N

Subject Name: Product Automation & CNC Technology

Date: 02 /02 /2011 **Time: 02.30 pm – 05.00 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)**	Define automation and discuss various strategies adopted in automation.	**07**
	(b)	Explain the concept of adaptive controls and discuss ACC system diagram for turning center.	**07**
Q.2	**(a)**	With neat sketch explain P, L and C type of controls with example.	**07**
	(b)	Explain design considerations of NC machine tools.	**07**
		OR	
	(b)	1. Designate the axis on 4-axis turn mill center	**03**
		2. A bar of 152.5 mm dia is to be reduced to 147.5 mm in one turning cut with a feed rate of 0.15 mm/rev and cutting speed 152 m/min on a NC lathe. Calculate essential data for part program and MRR.	**04**
Q.3	**(a)**	Describe with neat sketch the construction and working of recirculating ball screw. Explain preloading and it's purpose.	**07**
	(b)	Justify the advantages of roller screw over recirculating ball screws.	**03**
	(c)	Discuss the comparison between manual and computer aided part programming.	**04**
		OR	
Q.3	**(a)**	Describe the MCU functions in CNC machine tool.	**07**
	(b)	Describe the post processors in computer aided part programming.	**07**
Q.4	**(a)**	List out the drives for CNC machine tools and with neat sketch explain hydraulic drive systems.	**07**
	(b)	Describe with sketch the construction and working of incremental and absolute optical encoders.	**07**
		OR	
Q.4	**(a)**	Describe the flowchart of DDA interpolators for feed back subroutine	**03**
	(b)	Explain geometric & motion statement in APT stating an illustrations.	**07**
	(c)	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 4:1 ratio reduction gear box. The ball screw has 2 threads per cm. the optical encoder is directly attached to the ball screw and emits 400 counts per revolution (CPR) of the ball screw. The motor rotates at a maximum speed of 800 rpm. Calculate: 1. (BLU) the linear control resolution of the system in a axis 2. The linear travel speed of table at max. motor speed. 3. Pulse frequency emitted by encoder at max. speed.	**04**

Q.5 **(a)** Write a complete part program for machining the component as shown in fig.1 **10**

(b) Describe action while the following statements were executed. **04**

N001 M06 T03
N002 G43 G01 Z5.0 H03 F100
N003 G91 G28 G49 Z0

OR

Q.5 **(a)** Write a complete APT program for machining the component as shown in fig.2 **10**

(b) Describe action while the following statements were executed. **04**

N001 M98 P1020 L1
N101 G25 P020 Q40 L4

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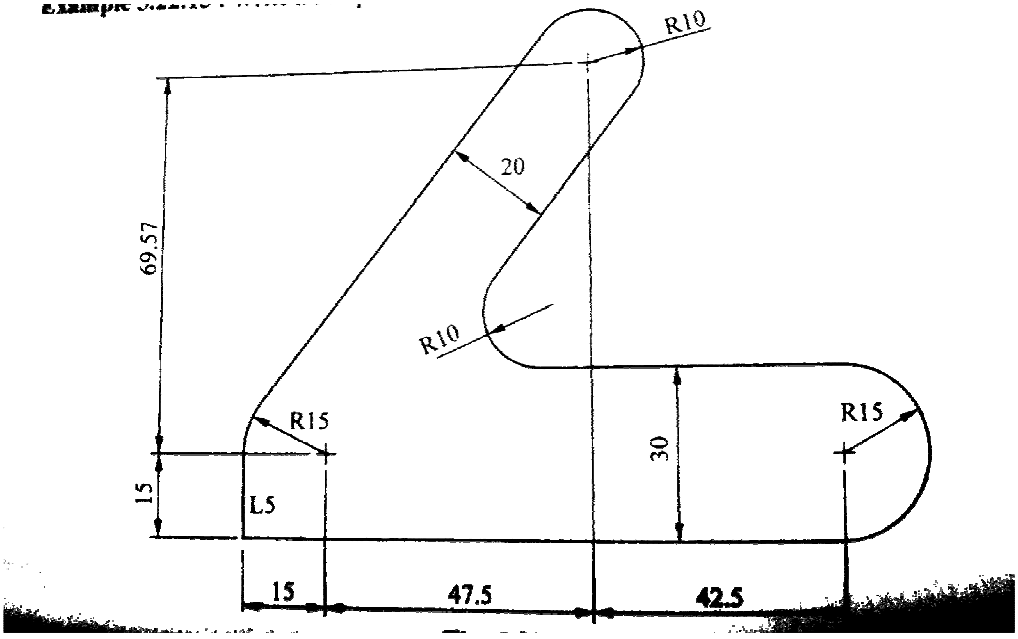

Fig.1

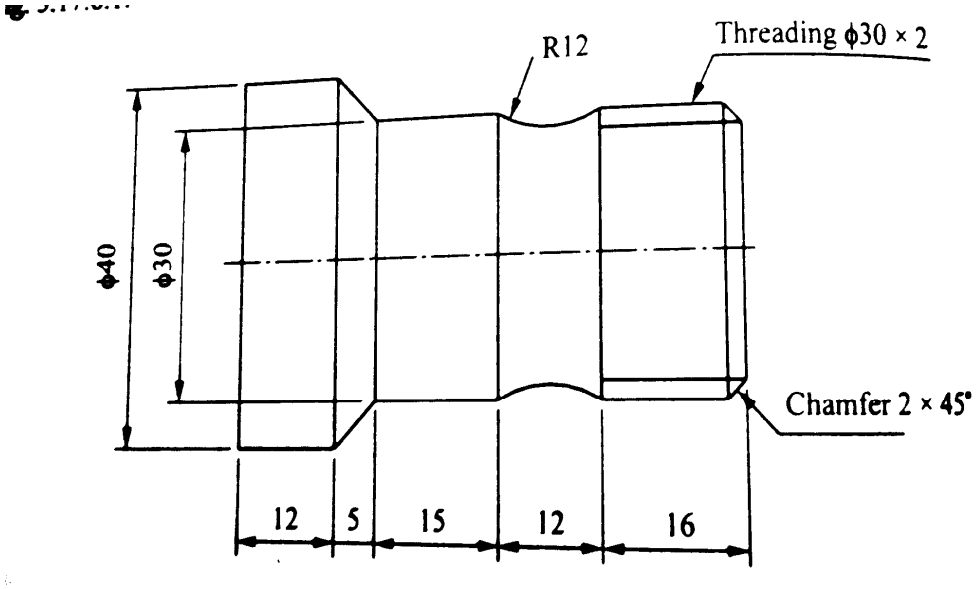

Fig.2