

GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 172002

Date: 31/12/2012

Subject Name: Automated Manufacturing - I

Time: 10.30 am - 01.00 pm

Total Marks: 70

Instructions:

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

- Q.1 (a)** Write the complete manual part program using G71 multiple turning cycles for the turning the part shown in fig.1. Use Billet of size $\phi 45 \times 85$. Take datum at the centre of the right hand face and chamfer 2×2 . **07**

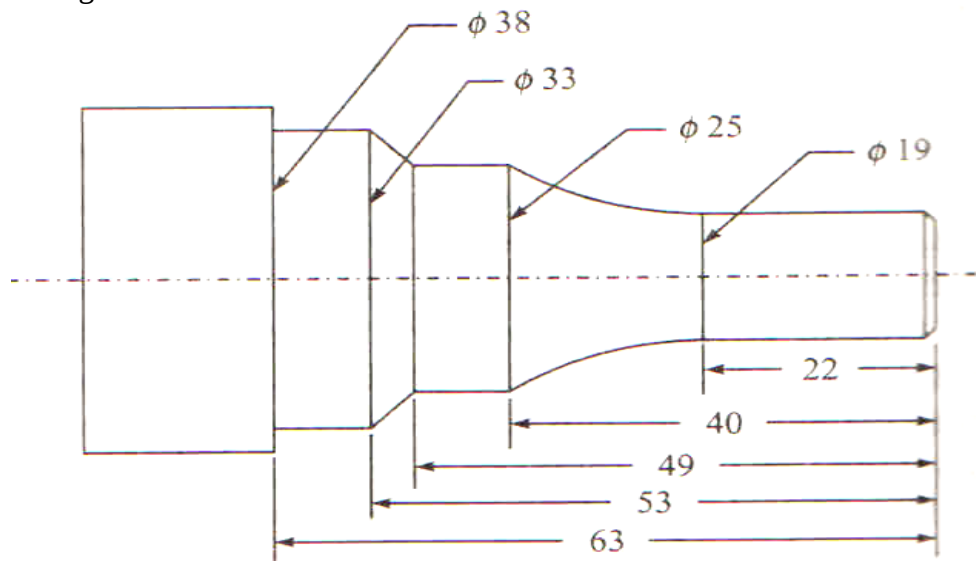


Fig.1

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

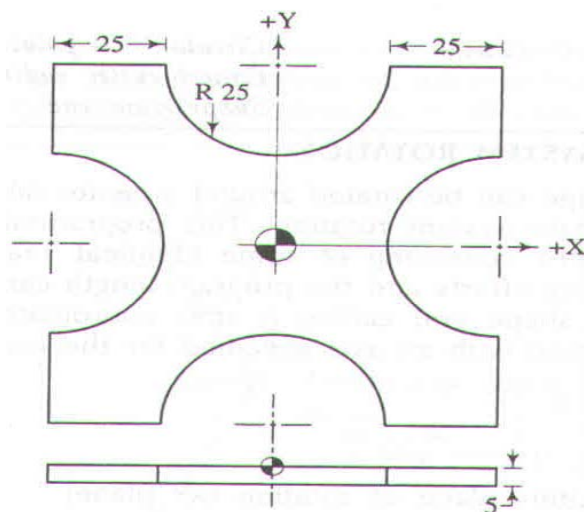


Fig.2

- Q.2 (a)** An NC worktable operates by closed-loop positioning. The system consists of a servomotor, leadscrew, and optical encoder. The leadscrew has pitch=6.0mm and is coupled to the motor shaft with a gear ratio of 5:1 (5 turns of the drive motor for each turn of the leadscrew). The optical encoder generates 48 pulses/rev of its output shaft. **07**

The encoder output shaft is coupled to the leadscrew with a 4:1 reduction (4 turns of the encoder shaft for each turn of the leadscrew). The table has been programmed to move a distance of 250mm at a feed rate =500mm/min. Determine:

- (a) How many pulses should be received by the control system to verify that the table has moved exactly 250mm?
 - (b) The pulses rate of the encoder, and
 - (c) The drive motor speed that correspond to the specified rate.
- (b)** Explain the stick slip phenomenon in machine tools showing the relationship between coefficient of friction and slide velocity for friction guide ways. How is it prevented? **07**
- OR**
- (b)** Differentiate between open loop and closed loop control system. **07**
- Q.3 (a)** Explain the recirculating ball screw mechanism used in a CNC machine tool. **07**
- (b)** (i) Using neat sketch explain the working principal of incremental and absolute optical encoder. **04**
- (ii) "CNC machine tools are not suitable for mass production" evaluate **03**
- OR**
- Q.3 (a)** What are the various types of tool magazines used in CNC machine tools? Give their relative merits. How does a tool change take place in a typical Automatic Tool Changer? **07**
- (b)** (i) Differentiate absolute mode programming and incremental mode programming. Under what conditions incremental mode is preferred. **04**
- (ii) "G codes are modal whereas M codes can be modal or nonmodal" Evaluate **03**
- Q.4 (a)** The oval rail of a carousel storage system has length=12m and width=1m. There are 75 carries equally spaced around the oval. Suspended from each carrier are six bins. Each bin has volumetric capacity =0.026m³. Carousel speed=20m/min. average P&D time for retrieval=20sec. Determine: **07**
- (a) Volumetric capacity of the storage system and
- (b) Hourly retrieval rate of the storage system.
- (b)** An automated guided vehicle system has an average travel distance per delivery 200m and an average empty travel distance 150m. Load and unload times are each 24sec and the speed of the AGV is 1m/s. traffic factor =0.9. How many vehicles are needed to satisfy a delivery requirement of 30del/hr? assume A=0.95 **07**
- OR**
- Q.4 (a)** Each aisle of four –aisle AS/RS is to contains 60 storage components in the length direction and 12 components vertically, in which an S/R machine is used for each aisle. The length of the storage aisle =280ft and its height = 46ft suppose horizontal and vertical speeds of the S/R machine are 200ft/min and 75ft/min, respectively. The S/R machine requires 20 sec to accomplish a P&D operation. Find: **07**
- a) AS/RS capacity
- b) The single command and dual command cycle times per aisle, and
- c) Throughput per aisle under the assumptions that storage system utilization =90% and the number of single command and dual command cycles are equal.
- (b)** List the various types of vehicle guidance technologies used in commercial AGV systems and explain imbedded guide wire technology. **07**
- Q.5 (a)** What is the Rapid Prototyping? List different RP methods and explain any two. **07**
- (b)** (i) Explain the concepts of concurrent engineering with diagram. **04**
- (ii) Explain different CMM controls in brief. **03**
- OR**
- Q.5 (a)** What is computer Aided Process Planning? Explain in details Generative CAPP systems. **07**
- (b)** State different physical configurations of CMM with their relative advantage and disadvantage. **07**
