

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2978 Roll No. 1003240015

B.Tech.

(SEM. VII) ODD SEMESTER THEORY
EXAMINATION 2013-14

COMPUTER AIDED MANUFACTURING

Time : 3 Hours

Total Marks : 100

Note :- Attempt all **five** questions, as instructed. Marks are indicated alongside.

1. Answer any **four** : (5×4=20)
- (a) Discuss, why NC machines have higher productivity and accuracy compared to traditional machines.
 - (b) Describe the methods for achieving position and velocity control in NC machines.
 - (c) Discuss the principal requirements of a well designed CNC control system. How are these different from NC controllers?
 - (d) Discuss the significance of the advantages that NC brings to manufacturing. Why NC is not used for large scale production of same type of parts ? Discuss.

- (e) Discuss the reasons for a need of automating the batch production systems. What are the arguments against automation ?
- (f) Explain what is meant by CAM. How is CAM different from CIM ? Describe the important manufacturing activities covered under CAM.

2. Answer any four : (5×4=20)

- (a) During taper turning with a tool of nose radius "r" if r is ignored what type of machining error would occur ? If $r = 0.5$ mm and included taper angle = 60° , what would be the magnitude of dimetral error if "r" is ignored during NC turning ?
- (b) What is the difference between Linear and Circular interpolation ? Explain each term in the following block of information :

N035, G90, G02, X40, Y52.5, I15, J25

Calculate the arc radius in the above sequence.

- (c) What is the code for boring canned cycle ? Explain how the cycle works. What is the difference between boring and drilling canned cycles ?

- (d) Explain what is a MACRO and its purpose. Two holes, each 10 mm diameter, are to be drilled in a steel plate 15 mm thick, a plate size 120×120 mm. The hole centers are 50 mm apart and the holes are placed symmetrically with respect to plate's vertical center line. Write a subroutine for the MACRO to be used. Drill speed = 750 mm, feed = 70 mm/min.
- (e) What are the advantages of Computer Assisted Part Programming (CAPP) ? Discuss, what specific functions are performed by the computer and programmer in CAPP.
- (f) The part shown in Fig. 1 is to be milled along the face A-B, on a vertical milling machine. Compute the co-ordinates of the cutter center-points for use in manual part programming. Cutter diameter = 10 mm.

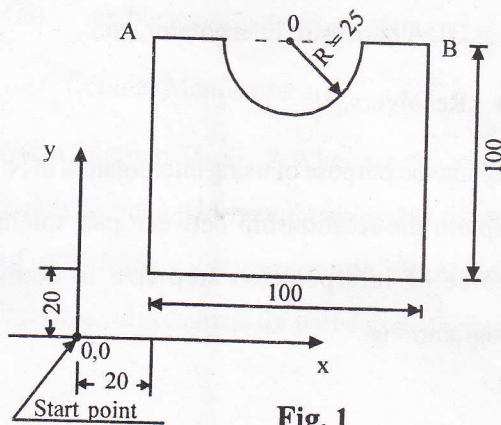


Fig. 1

3. Answer any two : (10×2=20)

- (a) Differentiate between NC open-loop and closed-loop positioning systems.

A NC table is operated by a closed-loop positioning system. The system comprises of a servo-motor, lead-screw and optical sensor. Lead-screw pitch = 5000 mm and is coupled to motor shaft with a gear, ratio = 3:1 (3 motor turns for each turn of lead screw). The table has been programmed to move 350 mm at a feed rate of 400 mm/min. The optical-sensor is directly coupled to the lead screw shaft and generates 60 pulses/revolution of the shaft. Determine the motor speed (RPM) and the number of pulses required for positioning of the table.

- (b) Describe the working principles of the following :

(i) DDA hardware interpolator, and

(ii) Resolvers.

- (c) Explain the purpose of using interpolators in NC machining.

Explain the relationship between part tolerance and the choice of interpolation step-size in manual-NC part programming.

Perform CCW circular interpolation for the following operation :

Arc Radius = 10 mm

Center point of the arc = 20, 10

Outer tolerance = 0.5 mm

Compute the co-ordinates of the vertices of the polygon approximating the circle.

4. Answer any two : (10×2=20)

(a) Write short notes on any three :

(i) Computer aided inspection

(ii) CAD/CAM Systems

(iii) Flexible manufacturing system

(iv) Cellular Manufacturing.

(b) What is a part family ? What are the advantages of part family formation in manufacturing ? Discuss the advantages of polycode over monocode. Explain how coding information is utilized for part-family formation.

- (c) What are the advantages and disadvantages of using computer aided process planning ? Discuss under what kind of environment should generative process planning be used instead of Variant process planning and indicate the potential problems in using a generative process planning system.

5. Answer any two :

(10×2=20)

(a) Write short notes on any **three** of the following :

- (i) Powered lead through vs manual lead through programming of robots.
- (ii) Characteristics of the various types of joints in robots.
- (iii) Robotic applications in machine loading and unloading.
- (iv) Forward and backward reasoning techniques for expert systems.

(b) With the help of suitable sketches describe the basic geometries of :

- (i) Cartesian
- (ii) Cylindrical, and
- (iii) Spherical robots.

Discuss the advantages of Cartesian and Spherical robots.

(c) A die-casting shop is proposing to buy 5 robots to handle molten material. This would replace 15 nos. of manual labour. The manual system handles 75 castings per shift (8 hr/shift). The average cost of human operator inclusive of all expenses is Rs. 300/hr. In addition, the maintenance cost of manual system is Rs. 100/hr.

The robotic system can handle 200 castings per shift. The cost of robotic system is Rs.700/hr. whereas the maintenance cost is 200/hr. You are required to determine whether the proposal to buy the robotic system be accepted.