Printed Pages : 4   **TME-702**

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

PAPER ID : 0401   Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ]

B. Tech.

## (SEM. VII) EXAMINATION, 2007-08

COMPUTER AIDED MANUFACTURING (CAM)

Time : 3 Hours]   *[Total Marks : 100*

Note :   *All questions carry equal marks. Attempt all questions.*

1   Attempt any two parts : $10 \times 2 = 20$
- (a)   (i)   Discuss fixed, programmable and flexible type of automation in industry using suitable examples.
-       (ii)   Explain concept of control resolution, accuracy and repeatability for a feed axes in CNC machine tools.
- (b)   Describe the different advantages and disadvantages of NC-Manufacturing. Under what conditions use of NC/CNC machines can be justified? Also explain how non-productive time is minimized in NC-manufacturing.
- (c)   (i)   Explain the function of MCU in NC machine tools. What is the role of PLC in CNC system?
-       (ii)   What is an automatic tool changer? Write a note on the necessity and advantages of an ATC.

0401]   1   [Contd...

Attempt any two parts : 10×2=20

(a) (i) Explain logical block of information in a CNC Part Program. Which of the modes, constant RPM or constant cutting speed do you use for the machining of tapered surfaces? Explain the effects of the two modes on the surface finish.

(ii) Explain, Point-to-Point, Straight-Cut and Contouring, with reference to NC motion control. Also write their advantages, limitations and applications.

(b) (i) What is the difference between fixed/canned cycles and subroutine/subprogram? Discuss how canned cycles can reduce programming efforts.

(ii) What is tool nose radius compensation? Discuss when it is used and how it is included in the part program?

(c) Write a part program in word address format or in APT for the part shown below. Clearly mention whether diameter or radius programming has been used. Show datum/program reference. Prepare process plan and show tool path. Also write comments explaining each block of part program. Assume suitable billet size, process parameters and any dimension if missing :
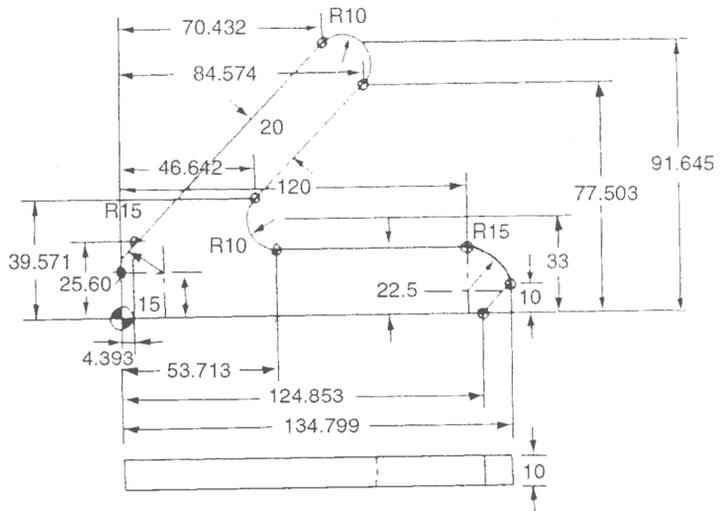
All dimensions are in mm.

3   Attempt any **four** parts :   5×4=20

(a)   By means of a block diagram, explain the operation of CNC system. Write about feedback control loops and mention their specific importance in the CNC system.

(b)   What are the main advantages of adaptive control? Distinguish between ACC and ACO types of adaptive controls.

(c)   Which feed back devices are used in CNC machine tools? Explain briefly working of rotary encoder. An NC machine uses a 200-pulse/rev encoder and a 10-teeth/inch lead screw for its axis control. What is the BLU of the machine?

(d)   What is servo principle? Which characteristics of servomotors make it suitable for feed drives of CNC machines?

(e)   An NC machine has a resolution (BLU) 0.01 mm. To move the cutter from coordinates (1,1) to (3,4) (both coordinates in mm) at 18 mm/min, how many pulses and at what rate would the controller send to the X and Y servo motors?

0401]   3   [Contd...

(f) The worktable in an NC positioning system is driven by a lead screw with a 4.0 mm pitch. The lead screw is powered by a stepping motor that has 250 step angles. The worktable is programmed to move a distance of 100 mm from its present position at a travel speed of 300 mm/min.

    (i) How many pulses are required to move the table the specified distance?

    (ii) What are the required motor speed and

    (iii) pulse rate to achieve the desired table speed?

4   Attempt any **two** parts :   10×2=20

  (a) Briefly explain the guidelines for implementing group technology. Explain the advantage achieved by group technology and its limitations.

  (b) What are the advantages and disadvantages of using backward planning? Discuss the potential difficulties of implementing a generative process planning system.

  (c) Define FMS clearly by showing the various desirable features/components that are required for proper functioning with reference to current day manufacturing scene.

5   Attempt any two parts :   10×2=20

  (a) What do you understand by robot joints, degree of freedom, pay load and work volume. What are the reasons for the successful application of robots in manufacturing industry?

  (b) (i) Compile a list of sensors that might be used in robotic systems. For each sensor give an application.

     (ii) Explain why homogeneous transformations are required in modelling of robotic manipulators. What do you understand by screw transformation?

  (c) Write short notes on any two:

     (i) Linear versus Circular Interpolator

     (ii) Programming methods of robots

     (iii) Artificial intelligence.