

B.E. PRODUCTION ENGG. 4TH YEAR 1ST SEMESTER EXAMINATION 2025

Subject : CNC MACHINES AND ROBOTICS

Time: 3 hours

Full Marks: 100

Use separate Answer-Script for each part

Part I (50 marks)

Answer any **five** questions

1. With neat sketches show the axis system for CNC lathe and CNC milling machine. 10
2. Show the basic components of a CNC m/c tool using a neat sketch indicating the locations of motors and internal sensors for the various movements of tool and job and the electrical interface between them & the CNC m/c controller. 10
3. Write a manual part program for turning a job for the finishing cycle as shown in fig. A using a CNC lathe. Show tool start point & axis system on figure. Indicate point-to-point, paraxial & continuous path control movements in the program. 10

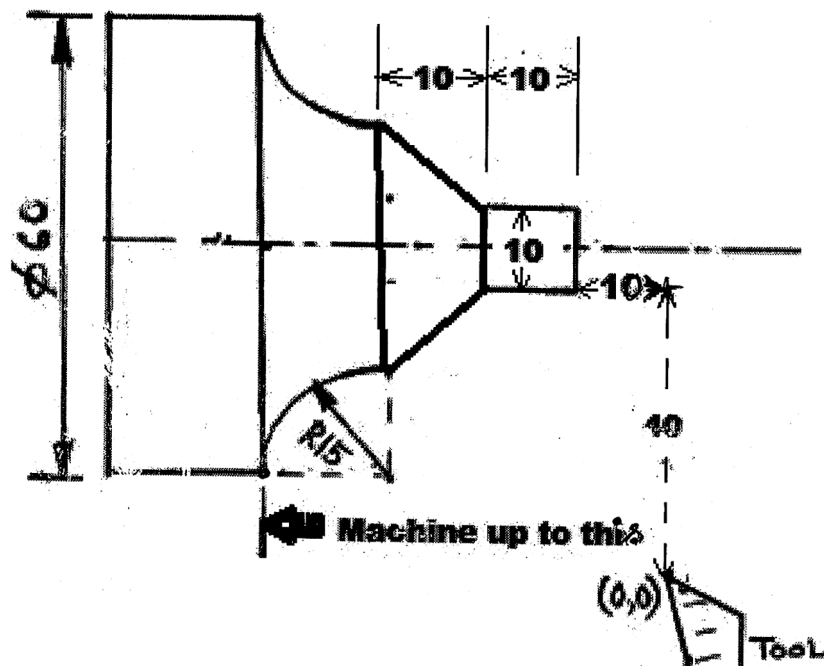


FIG. A

4. Write a manual part program to drill five holes as shown in fig. B using a CNC machine. Show tool start point & axis system on figure. Indicate point-to-point, paraxial & continuous path control movements in the program.

10

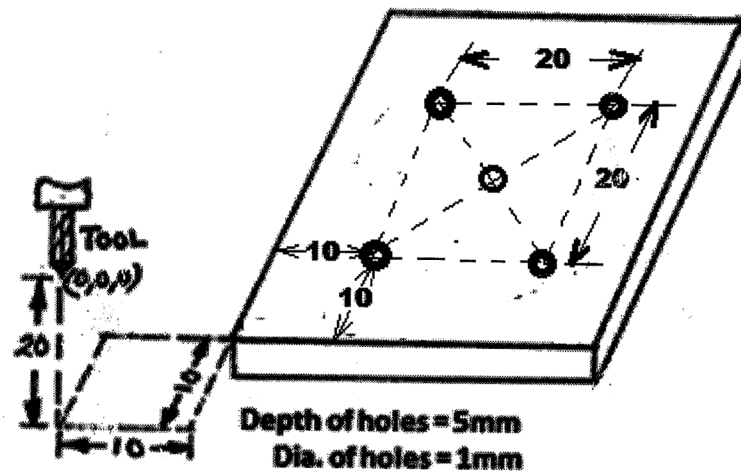


Fig. B

5. Write a manual part program to machine a quarter circular slot as shown in fig.C with a CNC milling machine using an end-mill cutter. Show tool start point & axis system on figure. Indicate point-to-point, paraxial & continuous path control movements in the program.

10

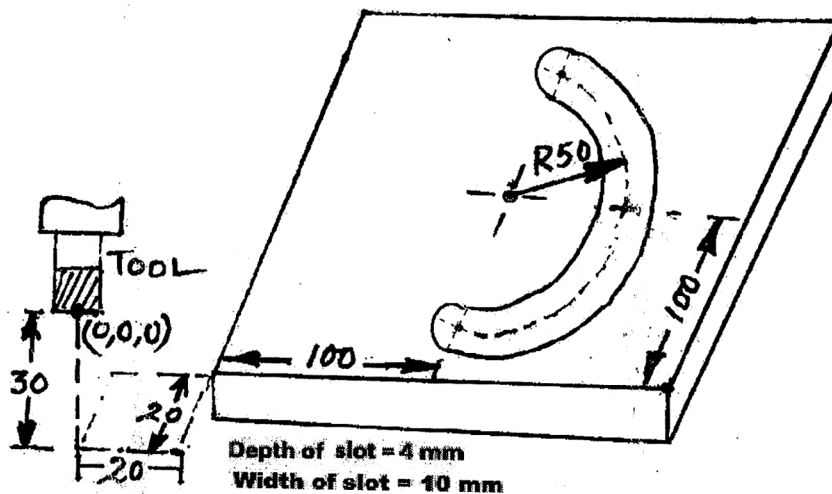


FIG. C

Ref. No.: EX/PROD/PC/B/T/414/2025

6. Show the various robot configurations using neat sketches, stating their co-ordinate systems. 10
7. What do you mean by the working envelope of a robot? Draw the working envelopes for Cartesian type & cylindrical type robot configurations. 10

Part II (50 marks)

Answer any **five** questions

1. Explain point-to-point control, paraxial control and contouring control in the context of CNC machine tools. What type of operations may be done in each type of control in CNC machine tools? 10
2. Explain the basic operating principle of
 - (i) a permanent magnet type stepper motor, and
 - (ii) a variable reluctance type stepper motor 5+5
3. Show and explain the control circuit with transistor switches used for controlling the operation of a bipolar permanent magnet type stepper motor, and also show the switching sequence for both full-stepping and half-stepping. 10
4. Explain the working principle of an optical absolute encoder used for providing feedback of angular position of the axis leadscrew in a CNC machine. What would be the angular resolution of such encoder having 12 tracks? 8+2
5. What are the advantages of linear position sensors over angular position sensors? Explain the working principle of a linear grating sensor used for providing feedback of linear displacement of the axis leadscrew in a CNC machine tool. 3+7
6. What are the reasons for using sensors in robots? Explain the difference between internal and external sensors used in robots with suitable examples. 6+4
7. What are meant by range and proximity sensors? Explain briefly the working principles of an inductive proximity sensor. 4+6