Reg. No.															

Question Paper Code	13608

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Fourth Semester

Mechanical and Automation Engineering

20MUPC403 - CNC MACHINES AND METROLOGY

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following best describes the principle of CNC machines? (a) Manual programming of mechanical levers (b) Use of punch cards for operation (c) Automatic control of machine tools via computer-executed programs (d) Magnetic storage for manual tool movement	1	K1	CO1
2.	In CNC controllers, the function of an interpolator is to: (a) Translate commands into hydraulic signals (b) Interpolate tool paths between defined coordinates (c) Cool the system (d) Generate lubrication patterns	1	K1	CO1
3.	What device converts rotary position to electrical signals in axis measuring systems? (a) Hydraulic piston (b) Encoder (c) Solenoid (d) Stepper controller	1	K1	CO2
4.	Moiré fringe gratings are used in CNC machines primarily for: (a) Enhancing coolant flow (b) Generating interference patterns for displacement measurement (c) Holding workpieces securely (d) Controlling motor speed	1	K1	CO2
5.	In CNC programming, the coordinate system most commonly used is: (a) Cylindrical coordinate system (b) Cartesian coordinate system (c) Polar coordinate system (d) Spherical coordinate system	1	K1	CO3
6.	n CNC, a DO loop is used to: (a) Store subprograms (b) Repeat a block of code a fixed number of times (c) Reverse spindle direction (d) Switch to another tool	1	K1	CO3
7.	Linear measuring instruments are primarily used to measure: (a) Surface roughness (b) Angular displacement (c) Straight-line distances (d) Rotational velocity	1	K1	CO4
8.	Selective assembly is used when: (a) Components are of uniform size (b) Interchangeability is perfect (c) Dimensional variation is unavoidable and must be matched (d) There are no tolerance limits	1	K1	CO4
9.	A clinometer is primarily used to: (a) Check flatness of surfaces (b) Measure inclination or slope of a surface (c) Set tool height (d) Check perpendicularity	1	K1	CO5
10.	Which type of interferometer uses modulation of laser light for improved accuracy and direction sensing? (a) DC laser interferometer (b) AC laser interferometer (c) Michelson interferometer (d) Fabry–Pérot interferometer	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

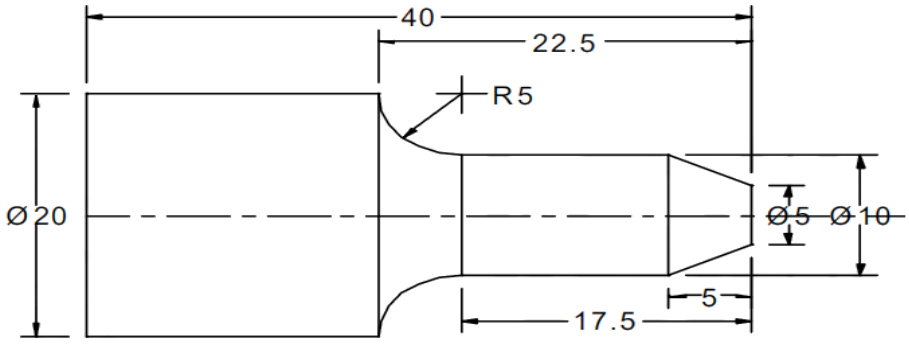
Answer ALL Questions

11.	Differentiate the NC and CNC machines.	2	K2	CO1
12.	Name the various elements of CNC machines.	2	K1	CO1
13.	What are the special requirements of feed drives of CNC machines?	2	K2	CO2
14.	How do you sense the direction of motion while using grating type transducer?	2	K2	CO2
15.	What is meant by tool nose radius compensation: how is it programmed?	2	K1	CO3
16.	Show G-codes and M-codes. Give examples.	2	K1	CO3
17.	Compare gauging and measurements.	2	K2	CO4
18.	Recall the concept of interchangeability.	2	K1	CO4
19.	What are the construction requirements of a good sine bar?	2	K1	CO5
20.	List the applications of bevel protractor.	2	K1	CO5
21.	Why is laser preferred in engineering metrology?	2	K1	CO6
22.	Name the different stages involved in the machine vision-based measurement.	2	K1	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the basic elements of NC machine with its advantages, disadvantages and applications.	11	K2	CO1
		OR			
	b)	Illustrate the different types of anti-friction guide ways with neat sketches.	11	K2	CO1
24.	a)	Enumerate the different types of stepper motors with its advantages, disadvantages and applications.	11	K2	CO2
		OR			
	b)	Outline the spindle drives used in CNC machine tool.	11	K2	CO2
25.	a)	Briefly explain the tool length compensation, cutter radius, subroutines, mirror image and Do loops of the program.	11	K2	CO3
		OR			
	b)	For the components shown below make a part program for machining on the CNC turning centre.	11	K2	CO3



All dimensions in mm

26.	a)	With neat sketch explain read type of Mechanical comparator with its advantage and limitation.	11	K2	CO4
		OR			
	b)	Summarize the GO and NOGO gauge design procedure with a sketch.	11	K2	CO4

27.	a)	Explain the construction and working of various types of CMM.	*11*	*K2*	*CO5*
		OR			
	b)	Examine the working of AC and DC Lasers interferometer with neat sketch.	*11*	*K2*	*CO5*
28.	a)	Interpret how CNC machines used for inspection purposes and summarize the role of computer aided inspection.	*11*	*K2*	*CO6*
		OR			
	b)	A Machine Vision system recovers useful information about a scene from its two dimensional digitized image. Explain the stages in machine vision process.	*11*	*K2*	*CO6*