Reg. No.																

Question Paper Code	13052

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fourth Semester

Mechanical and Automation Engineering

20MUPC403 - CNC MACHINES AND METROLOGY

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following describes the primary advantage of CNC machines over traditional manual machines? (a) They require more human intervention (b) They allow precise and repeatable machining (c) They are slower in operation (d) They are less accurate	1	K1	CO1
2.	In a CNC control system, which term refers to the calculation of intermediate points between a start and an endpoint in machining? (a) Programming (b) Interpolation (c) G-code (d) Contouring	1	K1	CO1
3.	The primary purpose of guide ways in CNC machines is to: (a) Hold the cutting tool in place (b) Control electrical flow in the machine (c) Guide and support the movement of machine components with precision (d) Transmit power to the cutting tool	1	K1	CO1
4.	Which of the following is a common application of DC shunt motors in CNC machines? (a) High-speed milling (b) Constant speed spindle drives (c) Stepper-driven feed (d) Precise positioning systems	1	K1	CO2
5.	Which type of motor is widely used for CNC feed drives due to its accurate step control? (a) DC shunt motor (b) AC induction motor (c) Stepper motor (d) Servo motor	1	K1	CO2
6.	Which motor type provides the highest torque at low speeds, making it ideal for CNC spindle drives? (a) Stepper motor (b) Servo motor (c) Three-phase AC induction motor (d) Universal motor	1	K1	CO2
7.	Which code is commonly used to initiate a rapid movement in CNC programming? (a) G01 (b) G00 (c) M30 (d) G04	1	K1	CO3
8.	What is the main purpose of using subroutines in CNC programming? (a) To define the spindle speed (b) To repeat a sequence of commands (c) To control coolant flow (d) To set tool offsets	1	K1	CO3
9.	In CNC programming for turning centers, which M-code is typically used to stop the spindle? (a) M03 (b) M04 (c) M05 (d) M06	1	K1	CO3
10.	In terms of linear measurement accuracy, which instrument generally provides the highest precision? (a) Vernier calliper (b) Micrometer (c) Steel rule (d) Tape measure	1	K1	CO4
11.	In gauge design, "Go" and "No-Go" gauges are used to: (a) Check if a part has been heat treated (b) Measure a part's surface roughness (c) Check if a part is within or out of tolerance limits (d) Measure temperature variations	1	K1	CO4

12. Angle gauges are different from sine bars because: *1 K1 CO4*
    (a) They are less accurate
    (b) They provide a direct reading of angles without complex setups
    (c) They are used only for linear measurements
    (d) They measure circularity
13. In laser interferometry, a "fringe" refers to: *1 K1 CO5*
    (a) An error in measurement
    (b) A single oscillation of the laser
    (c) An interference pattern created by light waves
    (d) A calibration mark on the machine
14. An essential element of a Machine Vision System is: *1 K1 CO5*
    (a) Laser emitter (b) Camera or sensor for capturing images
    (c) Hydraulic pump (d) Cooling system
15. Laser interferometers are often used in CNC machines for: *1 K1 CO5*
    (a) Generating spindle speed data
    (b) Calibrating and ensuring the straightness of machine movements
    (c) Applying surface finishes
    (d) Maintaining coolant levels
16. Machine Vision Systems are advantageous for quality control because they: *1 K1 CO5*
    (a) Use non-contact, high-speed inspection capabilities
    (b) Require frequent calibration
    (c) Only work with metallic parts
    (d) Are limited to manual inspections
17. Coordinate Measuring Machines (CMMs) have advanced due to the integration of: *1 K1 CO6*
    (a) Optical and touch probes with computer-based analysis (b) Manual gauges
    (c) Single-axis measurement systems (d) Vernier calipers only
18. Which technology in metrology is particularly useful for real-time monitoring of dimensions and tolerances? *1 K1 CO6*
    (a) Laser-based feedback systems (b) Manual measurement tools
    (c) Dial indicators (d) Temperature sensors
19. With advancements in metrology, automated measuring systems are now commonly used for: *1 K1 CO6*
    (a) Quality control in high-speed production lines
    (b) Simple household measurements
    (c) Temperature control
    (d) Direct manual measurements
20. Which of the following advancements in metrology improves both speed and precision of measurements on complex surfaces? *1 K1 CO6*
    (a) Analog callipers (b) Surface roughness gauges
    (c) Structured light 3D scanners (d) Mechanical dial indicators

PART - B (10 × 2 = 20 Marks)

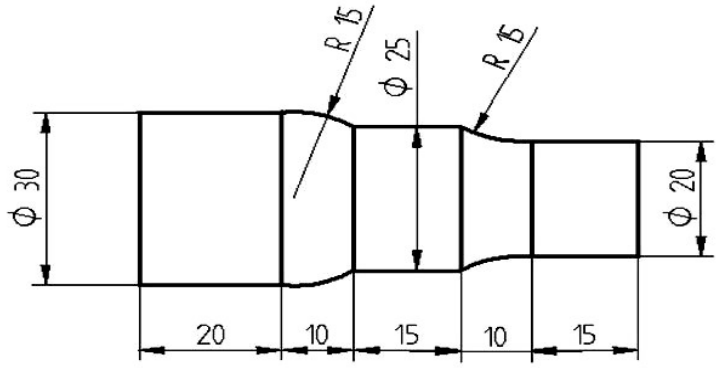
Answer ALL Questions

21. What are the types of control system? *2 K1 CO1*
22. Name the various elements of CNC machines. *2 K1 CO1*
23. Define spindle drive. *2 K1 CO2*
24. What is meant by DC shunt motor? *2 K1 CO2*
25. What is meant by parametric programming? *2 K1 CO3*
26. What is tool length compensation? Write down the G code used. *2 K1 CO3*
27. Summarize the various types of linear measuring instruments. *2 K1 CO4*
28. Explain the concept of interchangeability. *2 K1 CO4*
29. Discuss the applications of computer aided inspection. *2 K1 CO5*
30. What is the function of MCU? *2 K1 CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Explain the basic elements of NC machine with its advantages, disadvantages and applications.	*10*	*K2*	*CO1*
		OR			
	b)	What is guide ways? Explain the different types of guide ways with neat sketches.	*10*	*K2*	*CO1*
32.	a)	With neat sketch explain the construction and working principle of DC shunt motor.	*10*	*K2*	*CO2*
		OR			
	b)	Explain the working principles of AC and DC servo motor in CNC machine with its applications.	*10*	*K2*	*CO2*
33.	a)	Develop the programming for machining centre and turning centre with neat sketches.	*10*	*K3*	*CO3*
		OR			
	b)	Write the CNC lathe programming for a FANUC controlled machine using canned cycles. Take the diameter of the work piece = 30mm, depth of cut = 0.5mm, speed = 1200rpm. Assume feed and other data suitably.	*10*	*K3*	*CO3*



34.	a)	Briefly explain the construction and working principle of an autocollimator with neat a diagram and its application.	*10*	*K2*	*CO4*
		OR			
	b)	Explain read type of Mechanical comparator with neat sketch and also explain the concept of Sigma comparator with sketch.	*10*	*K2*	*CO4*
35.	a)	Explain the working principle of DC Laser interferometer with neat diagram.	*10*	*K2*	*CO5*
		OR			
	b)	Interpret the various steps of machine vision system in metrology.	*10*	*K2*	*CO5*
36.	a)	Generalize the needs, types & constructional features of Co-ordinated Measuring Machine.	*10*	*K3*	*CO6*
		OR			
	b)	Explain any two advanced measurement techniques used in the metrology and measurement.	*10*	*K3*	*CO6*