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Question Paper Code : 21300

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Third/Fourth Semester

Mechanical Engineering

ME 3493 — MANUFACTURING TECHNOLOGY

(Common to Mechanical Engineering (Sandwich)/Mechanical and Automation
Engineering/Mechatronics Engineering and Robotics and Automation)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List of type of cutting tool used in machining process.
2. Compare orthogonal and oblique cutting in lathe operation.
3. List the operation to produce diamond shape on the shaft.
4. Compare capstan and turret lathe in terms of machining process.
5. Differentiate upward and downward milling with sketch.
6. Define centerless grinding with its application.
7. Define recirculating ball screws in computer numerical control machine.
8. Compare open and closed loop system and its significance.
9. Differentiate loops and subroutine CNC machine tools.
10. List different types of code language used in CNC programming.

PART B — (5 × 13 = 65 marks)

11. (a) (i) List and illustrate the major material properties required of cutting tool. (5)
- (ii) Explain what is meant by the term machinability and what it involves. Why does titanium have poor machinability? (8)

Or

- (b) (i) Describe effect of temperature on tool life. (5)
- (ii) Explain why continuous chips are not necessarily desirable. (4)
- (iii) Comment on the role and importance of the relief angle. (4)

12. (a) (i) List the types of machining operations that can be performed on a lathe. (5)
- (ii) Locate compound rest on lathe machine with sketch. (4)
 - (iii) Briefly discuss about compound rest and cross slide. (4)

Or

- (b) (i) Estimate the machining time required to rough turn a 0.50-m-long annealed copper-alloy round bar from a 60-mm diameter to a 58-mm diameter, using a high-speed steel tool. Estimate the time required for an uncoated carbide tool. (6)
- (ii) A high-strength cast-iron bar 200 mm in diameter is being turned on a lathe at a depth of cut $d = 1.25$ mm. The lathe is equipped with a 12-kW electric motor and has a mechanical efficiency of 80%. The spindle speed is 500 rpm. Estimate the maximum feed that can be used before the lathe begins to stall? (7)

13. (a) (i) Explain why milling is such a versatile machining operation. (4)
- (ii) Describe the different types of cutters used in milling operations and give an application of each type. (9)

Or

- (b) (i) Explain why the axis of a hob is tilted with respect to the axis of the gear blank. (6)
- (ii) A single-thread hob is used to cut 40 teeth on a spur gear. The cutting speed is 35 m/min and the hob is 75 mm in diameter. Calculate the rotational speed of the spur gear. (7)

14. (a) (i) Identify the differences between mechanization and automation. (6)
- (ii) Define numerical control machines with example. (7)

Or

- (b) (i) Explain open-loop and closed-loop control circuits with sketch. (8)
- (ii) Describe the factors that have led to the development of numerical control. (5)

15. (a) (i) Define significance of computer-integrated manufacturing operations. (6)
- (ii) Explain with flow chart of setting up a CNC machine for machining in lathe. (7)

Or

- (b) (i) Define terms fixed cycles, loops and subroutine in computer numerical control machine. (7)
- (ii) Differentiate the terms computer aided and computer integrated. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Design a boring bars with internal damping capabilities to reduce or eliminate vibration and chatter during machining with sketch.

Or

- (b) The part shown in Figure is to be machined from a rectangular blank. Suggest the machine tool (s) required, the fixtures needed, and the types and sequence of operations to be performed. Discuss your answer in terms of the work piece material, such as aluminum versus stainless steel.

