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17ME45B/17MEB405

Fourth Semester B.E. Degree Examination, June/July 2023
Machine Tools and Operations

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a. Define machine Tool. Classify machine tools. (08 Marks)
    b. With a neat sketch, explain the construction and working of a lathe. (12 Marks)

OR

2   a. With a neat sketch, explain column and knee type horizontal milling machine. (10 Marks)
    b. With a neat sketch, explain centre type cylindrical grinding machine. (10 Marks)

Module-2

3   a. Explain the working and auxiliary motions in machine tools. (10 Marks)
    b. With a neat sketch explain taper turning using compound rest swiveling method. (05 Marks)
    c. Differentiate between up milling and down milling. (05 Marks)

OR

4   a. With neat sketches, explain the following operations to be carried out on drilling machine.
       i)   Reaming
       ii) Boring
       iii) Counter sinking
       iv) Tapping. (12 Marks)
    b. List out different milling operations. Explain face milling and end -- milling. (08 Marks)

Module-3

5   a. Briefly explain the characteristics of cutting tool materials. (06 Marks)
    b. List the properties of an ideal cutting fluid. (06 Marks)
    c. With a neat sketch, explain twist drill nomenclature. (08 Marks)

OR

6   a. With a neat sketch, explain single point cutting tool geometry. (10 Marks)
    b. A part of 25cm in diameter and 50cm length is to be turned down to 23.5cm for the entire length. Assume feed 1mm/rev and cutting speed as 135mpm. The maximum allowable depth of cut is 5mm. Determine the spindle rpm and cutting time. Take over travel as 12.5mm. (10 Marks)

Module-4

7 a. With a neat sketch, explain the mechanism of chip formation. (06 Marks)
   b. With neat sketches, explain the different types of chips in machining. (06 Marks)
   c. With a neat sketch, derive the relation between chip thickness ratio, shear angle and rake angle. (08 Marks)

OR

8 a. Differentiate between orthogonal cutting and oblique cutting. (06 Marks)
   b. In orthogonal turning of mild steel bar of 65mm diameter on a lathe a feed of 0.8mm was used. a continuous chip of 1.4mm thickness was removed at a rotational speed of 85rpm of work. Calculate the chip thickness ratio, chip reduction ratio, and shear angle. Take rake angle of tool = 15°. (06 Marks)
   c. In an orthogonal cutting operation, following observations were made :
      Cutting speed = 25m/min, Feed = 0.24mm/rev, chip thickness = 0.4mm, cutting force = 1400N, Thrust force = 400N, Tool rake angle = 5°. Calculate :
      i) Shear angle
      ii) Friction angle
      iii) Chip flow velocity
      iv) Shear strain. (08 Marks)

Module-5

9 a. Define tool wear. Explain the main causes of tool failure with neat sketches. (10 Marks)
   b. Write short notes on :
      i) Tools wear mechanisms
      ii) Factors affecting tool life. (10 Marks)

OR

10 a. The tool of a turning tool obtained was 40 minutes and 25 minutes at cutting speed of 80m/min and 100m/min respectively. Determine the tool life at 40m/min and 120m/min. (10 Marks)
   b. In a turning operation, it was observed that the tool life was 150 min. When the cutting speed was 20m/min. As the speed was increased to 25m/min, the tool life dropped to 25.2 minutes. If the time required to change the tool was 2 minutes and if cost of regrinding the tool was ten times the cost of turning per minute.
      Calculate :
      i) The most economical cutting speed
      ii) Tool life for maximum production. (10 Marks)

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