PVP 19

Code: 19ME3501

III B.Tech - I Semester – Regular Examinations – JANUARY 2022

METAL CUTTING AND MACHINE TOOLS
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) In orthogonal cutting of mild steel component if the rake angle of the tool is 10˚ and shear angle is 30˚. Find the chip thickness ratio?
   b) What are the advantages of diamond tools?
   c) State the various parts mounted on the carriage.
   d) What are the various types of end mills used in milling?
   e) How is grinding different from other machining process.

PART – B

UNIT – I

2. a) What is a chip? Describe the mechanism of chip formation in orthogonal cutting. 6 M

   b) Derive the expression for shear angle in orthogonal cutting in terms of rake angle and chip thickness ratio. 6 M

OR

3. a) Draw Merchant's force diagram and also resolve the forces related to it, derive the different forces in machining. 6 M

b) In an orthogonal cutting operation on a lathe the following data were obtained. Cutting force = 120kg, Feed force = 30 kg, Back rake angle = 15^0, Feed rate = 0.2 mm/rev, chip thickness = 0.3 mm, cutting speed is = 100mm/min, work piece diameter =120 mm. Depth of cut = 0.4 mm, calculate chip thickness ratio, shear angle, coefficient of friction and shear strain. 6 M

UNIT – II

4. a) List the various tool materials used in industry. State the optimum temperature of each of the tool materials. 6 M

b) The Taylor's tool life equation for machining C-40 steel with a 18-4-1 HSS cutting tool at a feed of 0.8 m/min and a depth of cut 4 mm. The following V and T observations have been noted i.e., V (m/min) 35, 25 and T (min) 80, 30. Calculate n, C and also recommend the cutting speed for a desire tool life of 60 min. 6 M

OR

5. a) List various types of tool wear and discuss the factors affecting them. 6 M

b) Write down the various functions of cutting fluids and discuss various theories of metal cutting. 6 M

UNIT-III

6. a) What are the various operations of lathe? Discuss any of four operations with neat sketch. 6 M

   b) Explain with a diagram of whit worth quick return mechanism used in a shaper machine. 6 M

OR

7. a) Estimate the machine time to turn a MS bar of 40mm diameter down to 35mm for a length of 150mm in a single cut. Assume cutting speed as 20 m/min and feed as 0.5 mm/rev. 6 M

   b) Compare a shaper and planer in terms of their operation and type of workpieces. 6 M

UNIT – IV

8. a) Describe the construction of a column and knee type milling machine with a neat diagram. 6 M

   b) Explain with a neat sketch the nomenclature of a milling cutter and label the required units. 6 M

OR

9. a) Explain briefly the following operations performed in milling machine with neat sketch. 6 M

   i) plain milling, ii) Face milling and iii) End milling

   b) What is indexing? Discuss any two types of indexing methods used in milling. 6 M

UNIT – V

10. a) Explain the three methods of external cylindrical centreless grinding with neat sketch. 6 M

    b) List down the various features of CNC machines. 6 M

OR

11. a) Explain with simple sketches the working principles and process parameters of honing process. 6 M

    b) Describe the main features of CNC machines, which distinguish them from conventional machine tools. 6 M