CBCS SCHEME

15MEB405/ME45B/MA45

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Machine Tools and Operations

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. Explain construction of Radial drilling machine, with a neat sketch. **(08 Marks)**
   b. Give specifications of : i) Lathe   ii) Milling Machine. **(08 Marks)**

OR

2 a. Explain Construction features of grinding machine for grinding cylindrical work pieces holding between centers. **(08 Marks)**
   b. Explain with a neat sketch, any one type of drive mechanism in a shaper. **(08 Marks)**

Module-2

3 a. Mention the various machining processes in :   i) Lathe   ii) Shaping machine
      iii) Milling machine   iv) Broaching machine. **(08 Marks)**
   b. Explain with neat sketches, any four machining operations in a Lathe. **(08 Marks)**

OR

4 a. Explain various parameters in machining and selecting these parameters. **(08 Marks)**
   b. Explain Centre less grinding operation, with neat sketches. **(08 Marks)**

Module-3

5 a. Mention the desirable properties of cutting tool materials and explain them briefly. **(06 Marks)**
   b. With neat sketches, show the geometry of single point cutting tool. **(10 Marks)**

OR

6 a. Find the time required for drilling 18mm hole of 50mm thick MS plate. Assume cutting speed of 12m/min and feed of 0.2mm per revolution. Also find the metal removal rate. **(06 Marks)**
   b. Estimate the machining time required to machine 5mm thick layer from a work piece of 200mm (wide) × 400mm (length) × 50mm (thick) MS method. The available stroke rates are 10, 20, 40 and 80 strokes per minute. The feed is 0.28mm per stroke.

   Assume $\dfrac{\text{Re turn stroke time}}{\text{Cutting stroke time}} = \dfrac{2}{3}$ and cutting of speed = 30m/min.

   Also determine the metal removal rate. **(10 Marks)**

Module-4

7 a. With a neat sketch of Merchant's circle diagram, derive an expression for horizontal cutting force in terms of shear force, rake angle, friction angle and shear plane angle. **(10 Marks)**
   b. In an orthogonal cutting process, the following data is considered :
   Chip thickness of 0.62mm , feed 0.2mm , rake angle 15°. Calculate Chip reduction coefficient and Shear angle. **(06 Marks)**

OR

8 a. Explain the types of chips formed during Machining process. **(06 Marks)**

b. In a plain milling operation on a mild steel block the following data is recorded :
Cutting speed = 30m/min , Feed rate 72mm/min , Diameter of cutter = 70mm ,
No. of teeth in cutter = 8 , Width of cut = 80mm , Depth of cut = 5mm. Average cutting of
pressure for the given material = 375 kg/mm². Calculate i) The rotational speed of cutter
ii) Maximum chip thickness   iii) Average area of chip cross – section
iv) Peripheral force   v) Power for cutting. **(10 Marks)**

Module-5

9 a. Define Tool Life and list out the factors affecting the tool life. Explain effect of cutting
speed on tool life. **(06 Marks)**

b. With neat sketches, explain types of Tool wear. **(10 Marks)**

OR

10 a. What are the various costs considered during production of a component in metal
machining? **(04 Marks)**

b. Show how the total cost varies with cutting speed, with a suitable sketch. **(04 Marks)**

c. During machining a component in lathe the data is as follows : Machining constant C = 80
Tool changing time = 5 minutes , Tool regrind time of 3 minutes , Tool depreciation cost
per required is Rs 1.20 , Machine operating cost 20 paise per minute. Calculate
i) Optimum cutting of speed for minimum cost.
ii) Tool life corresponding to above speed.
Assume n = 0.25. **(08 Marks)**

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