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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.

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

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/mm<sup>2</sup>. 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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