

**II B. Tech II Semester Regular Examinations, August/September - 2021**  
**METAL CUTTING & MACHINE TOOLS**  
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit  
All Questions carry **Equal** Marks

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- 1 a) What is machinability? What are the criteria for evaluating machinability? What is machinability Index? [8M]
- b) In an orthogonal cutting of a steel component with carbide tool, the following data was obtained: [7M]  
Tool rake angle =  $10^\circ$  Chip width = 6 mm  
Uncut chip thickness = 0.10 mm  
Chip thickness ratio = 0.33  
Horizontal cutting force = 1290 N  
Vertical cutting force = 1650 N  
Sketch the force diagram and calculate the mean shear stress on the shear plane.
- Or
- 2 a) In an orthogonal cutting operation, given the rake angle is  $10^\circ$ , what is the percentage change in the chip thickness when the friction angle changes from  $30^\circ$  to  $50^\circ$ ? Do not use the shear angle relationship derived by the Merchant's minimum energy principle. [8M]
- b) List the conditions favourable for the formations of different types of chips? [7M]
- 3 a) Estimate the actual machining time required for the component (C40 steel) with 40 mm diameter and 120 mm length. The available spindle speeds are, 70, 110, 176, 280, 440, 700, 1100, 1760 and 2800. Use a roughing speed of 30 m/min and finish speed of 60 m/min. The feed for roughing is 0.24 mm/ rev while that for finishing is 0.10 mm/rev. The maximum depth of cut for roughing is 2 mm. Finish allowance may be taken as 0.75 mm. Blank to be used for machining is 48 mm in diameter [8M]
- b) While turning a taper using taper turning attachment, the setting was done for  $4^\circ$ , but the tool is set 3 mm below the centre. If the work piece diameter at the small end is 40 mm, calculate the actual taper produced. [7M]
- Or
- 4 a) Explain the process of taper turning by attachment on a lathe. What are the other methods available? [8M]
- b) What are the different methods of holding tools in a lathe? Explain about one with sketch. [7M]
- 5 a) Explain with neat sketch any one type of shaper feed mechanisms [8M]
- b) What is the main difference between a vertical shaper and slotter? [7M]
- Or
- 6 a) Sketch any one quick return motion mechanism of a shaper and explain. [8M]
- b) Explain any three slotter operations in detail. [7M]



- 7 a) Explain with a sketch what you understand by the words 'helix angle' and 'direction of cut' in the case of milling. What is their importance with respect to machining performance? Explain the basis on which these are selected. [8M]
- b) A grey cast iron casting plane surface, which is 150 mm wide and 450 mm long is to be finished by milling. It can be machined using a face mill of 200 mm diameter with 10 teeth made of cemented carbide. The cutting speed is 70 m/min and feed per tooth is 0.25 mm. Calculate the machining time for finishing the job if all the stock is removed in a single cut. [7M]
- Or
- 8 a) How the milling machine is specified? Discuss the important constructional details of a milling machine. [8M]
- b) Calculate the following indexing requirements: [7M]  
(i) 41 divisions (ii) 76 divisions (iii) 187 divisions
- 9 a) Specify the honing parameters to be considered for good honing practice. [8M]
- b) Using a horizontal axis surface grinder a flat surface of C65 steel of size 100 X 250 mm is to be ground. The grinding wheel used is 250 mm in diameter with a thickness of 20 mm. Calculate the grinding time required. Assume a table speed of 10 m/min and wheel speed of 20 m/s. [7M]
- Or
- 10 a) What are the factors influencing grinding wheel selection? Discuss about each in brief. [8M]
- b) Differentiate between dressing and truing along with their definitions. [7M]

