

Code: 20ME3502

**III B.Tech - I Semester – Regular / Supplementary Examinations  
NOVEMBER 2023**

**METAL CUTTING AND MACHINE TOOLS  
(MECHANICAL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.  
2. All parts of Question must be answered in one place.

BL – Blooms Level

CO – Course Outcome

			BL	CO	Max. Marks
<b>UNIT-I</b>					
1	a)	Explain the significance and functions of different tool angles associated with the geometry of a single point cutting tool with a neat sketch.	L2	CO1 CO2	7 M
	b)	Distinguish between orthogonal and oblique cutting.	L2	CO1 CO2	7 M
<b>OR</b>					
2	a)	What is chip? Discuss different types of chips in metal cutting process with a neat sketch.	L2	CO1 CO2	6 M
	b)	In an orthogonal cutting operation on a material with shear yield strength of 250MPa, the following data is obtained. Rake angle of the tool = 15deg., Uncut chip thickness = 0.25mm, Width of chip = 2mm,	L3	CO1 CO2	8 M

		Chip thickness ratio = 0.46, Friction angle = 40deg. Determine the shear angle, shear force component and resultant force on the tool.			
<b>UNIT-II</b>					
3	a)	Equation for tool life is given by $VT^{0.13} \cdot f^{0.6} \cdot d^{0.3} = C$ . The tool life of 60 min. is obtained by using following cutting conditions; $V = 40\text{m/min}$ , $f = 0.25\text{mm/rev}$ , $d = 2.0\text{mm}$ . Calculate the effect on tool life if speed, feed and depth of cut increased by 25% individually.	L3	CO1 CO2	8 M
	b)	What are the parameters affecting the tool wear?	L2	CO1 CO2	6 M
<b>OR</b>					
4	a)	What are the desirable properties of cutting tool materials?	L2	CO1 CO2	7 M
	b)	Using Taylor's tool life equation for $n = 0.5$ and $C = 400$ . Calculate the percentage increase in tool life when cutting speed is reduced by 50%.	L3	CO1 CO2	7 M
<b>UNIT-III</b>					
5	a)	What are the different types of the lathes? Discuss their importance.	L2	CO1 CO3	7 M
	b)	Explain the Crank and slotted link mechanism of a shaper with a neat sketch.	L2	CO1 CO3	7 M
<b>OR</b>					

6	a)	Explain the advantages and disadvantages of a turret lathe.	L2	CO1 CO3	7 M
	b)	What are the key differences between shaper and planer machine?	L2	CO1 CO3	7 M
<b>UNIT-IV</b>					
7	a)	Discuss the applications of different types of cutters used in milling operations.	L2	CO2 CO4	7 M
	b)	Differentiate between counter boring, counter sinking and spot facing.	L2	CO2 CO4	7 M
<b>OR</b>					
8	a)	What are the common operations that can be performed on a drilling machine? Explain any four of them with a neat sketche.	L2	CO2 CO4	8 M
	b)	Explain different types of indexing methods with an example.	L2	CO2 CO4	6 M
<b>UNIT-V</b>					
9	a)	Discuss the effect of abrasive grain size, grade, structure and bonding on the performance of a grinding wheel.	L2	CO2 CO5	8 M
	b)	Differentiate between lapping and honing operations.	L2	CO2 CO5	6 M
<b>OR</b>					
10	a)	Why truing and dressing are necessary in grinding wheels? Explain.	L2	CO2 CO5	7 M
	b)	What are the advantages, limitations and applications of centreless grinding?	L2	CO2 CO5	7 M