RollNo. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

B.E. MATERIALS SCIENCE AND ENGINEERING
Semester 07
ML5021 PRINCIPLES OF METAL CUTTING

(Regulation 2019)

Time :3hrs Max.Marks: 100

CO1 To give overview about the tool nomenclature and different nomenclatures used.
CO2 To provide knowledge on chip formation mechanism and forces during machining
CO3 To import knowledge on tool wear and tool life and how it is affected by temperature
CO4 To provide knowledge on different cutting tool materials used
CO5 To provide knowledge on modelling of metal cutting process

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	What is the use of machine reference system in the machining nomenclature ?	2	CO1	3
2	Draw the schematic diagram to represent the milling operation.	2	CO1	3
3	Differentiate between the Orthogonal and oblique cutting .	2	CO2	2
4	Write the use of merchant circle for the force analysis in the machining.	2	CO2	2
5	What are the three possible directions that the cutting fluid can applied in the metal cutting?	2	CO3	3
6	How the chatter in machining can be controlled?	2	CO3	3
7	Name any four requirements of tool materials.	2	CO4	2
8	Comment on the role of chip breakers in the machining process.	2	CO4	3
9	Why do you prefer models for the metal cutting?	2	CO5	3
10	State the use of empirical models for metal cutting.	2	CO5	2

PART- B(5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)	Illustrate the single point tool nomenclature. Discuss the significance of the various angles	13	CO1	3
	OR			
11 (b)	Illustrate the nomenclature of twist drill nomenclature. Discuss the significance of drilling operations in the machining process.	13	CO1	3

12 (a)	Summarize the different types of chip formation with the neat sketches.	13	CO2	3
	OR			
12 (b)	Summarize the construction and principle of operation of tool dynamometers for turning, drilling and milling	13	CO2	3
13 (a)	Discuss the sources of heat generation in machining heat in primary and secondary deformation zones.	13	CO3	3
	OR			
13 (b)	Discuss the type of tool failure that occur during the machining process. Illustrate the ways to minimize the failures.	13	CO3	3
14 (a)	Suggest any four cutting tools for the milling and grinding process. Analyze the characteristics of the cutting tool used.	13	CO4	4
	OR			
14 (b)	Suggest any four cutting tool inserts used in the machining process. Analyze their characteristics.	13	CO4	4
15 (a)	Why the FEA based models for turning, milling and drilling are suggested? If so illustrate the procedure for any one of the machining operation.	13	CO5	4
	OR			
15 (b)	Enumerate the use artificial intelligence based models for turning, milling and drilling.	13	CO5	4

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	A manufacturing industry A is using single pint cutting turning tools obeying the Taylor's tool life equation as follows: $VT^{0.5} = 350$, V is the cutting velocity in m/min,T is the tool life in minutes. Another industry B employs single point turning tools obeying the Taylor's tool life equation as follows: $VT^{0.3} = 200$,			
	i. If both the industries are running the tools at 65.38 m/min cutting speed , Which industry would obtain the higher tool life obtained by either A or B? or the tool life would be same for both. Solve and find the solution for the same.	6	CO3	L5
	ii. In the case ,if both the industries needs to obtain the same tool life, what would be the cutting speed in m/min?	4		
	iii. If the tools of both A and B industries have to be run at a speed of 105 m/min, Which industry seems to have higher tool life? If so state the reasons of it	5		