Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

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

MECHANICAL ENGINEERING
4th Semester
ME5402 & METAL CUTTING AND MACHINE TOOLS
(Regulation 2019)

Time:3 hrs Max. Marks: 100

CO1	To impart the knowledge, aspects and the significance of material removal processes.
CO2	To demonstrate the operations of turning and automatic machine tools.
CO3	To explain the principle of reciprocating, milling and gear cutting machines.
CO4	To illustrate the principles of abrasive and broaching processes.
CO5	To get familiarize with CNC machines and its programming.

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 are the variables affecting the tool life?	2	CO1	L1
2	What are the significant characteristics of high speed steels?	2	CO1	L1
3	What is the difference between the live and dead center?	2	CO2	L1
4	Write the advantages of Swiss type lathe machine.	2	CO2	L2
5	Write the advantages of shaper machine tools.	2	CO3	L2
6	What is need for counter boring?	2	CO3	L1
7	Differentiate between buffing and polishing.	2	CO4	L2
8	What is meant by abrasive machining?	2	CO4	L1
9	What is meant by linear interpolation?	2	CO5	L1
10	What are the various steps in Computer programming?	2	CO5	L1

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

Q. No.	Questions	Marks	CO	BL
11 (a)	In an orthogonal cutting operation, the following data have been observed: Uncut chip thickness, t= 0.127 mm, width of cut b = 6.35 mm, cutting speed v =2 m/s, Rake angle α = 10°, cutting force, F_c = 567 N, thrust force F_t = 227 N, chip thickness t_c = 0.228 mm. determine the shear angle, the friction angle, shear stress along the shear plane and the power for the cutting operation. Also find the chip velocity, shear strain in chip and shear strain rate.	13	CO1	L5
	OR			
11 (b)	Describe the functions of cutting fluids and write its properties of cutting fluids.	13	CO1	L3
12 (a) (i)	Differentiate the single spindle and multi spindle automatic lathe.	6	CO2	L4
12 (a) (ii)	Explain the working principle of bar feeding mechanism with a neat sketch.	7	CO2	L3
	OR			
12 (b)	Explain the following lathe operations with a neat sketches. 1. Knurling 2. Grooving 3. Parting 4. Chamfering 5. Eccentric Turning 6. Drilling	13	CO2	L4

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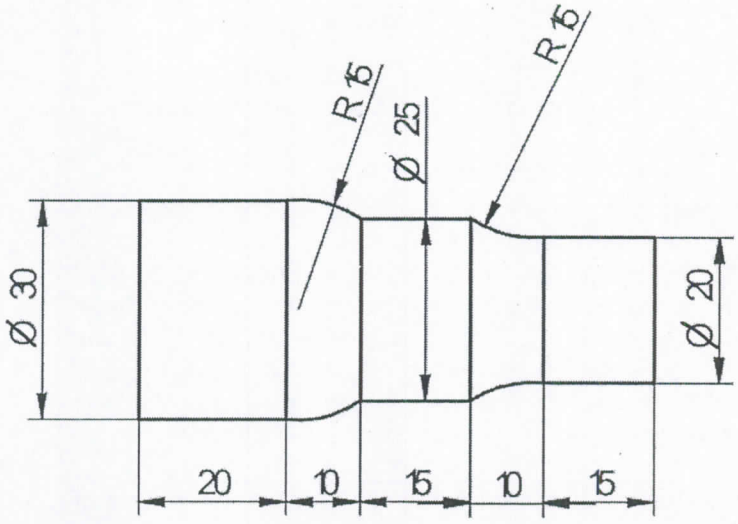
13 (a)	Explain the working principle of slotter mechanism with neat sketches, write its advantages and limitations.	**13**	CO3	L3
	OR			
13 (b)	Explain the following gear manufacturing processes with neat sketches. Write its advantages and limitations 1. Gear shaping operation 2. Gear hobbing operation	**13**	CO3	L3
14 (a)	Explain the various bonds used to held abrasive particles in grinding wheel and write its characteristics.	**13**	CO4	L4
	OR			
14 (b)	Explain the operations of centerless grinding machine with neat sketches. Write its advantages and limitations.	**13**	CO4	L4
15 (a)	What are the components used in Computer Numerical Controls machine tool and explain its functions with sketches?	**13**	CO5	L3
	OR			
15 (b) (i)	Explain the functions of Direct Numerical Control machine tools, write its advantages and draw backs.	**8**	CO5	L4
15 (b) (ii)	Describe the functions of machining center.	**5**	CO5	L3

PART- C (1x 15=15Marks)

(Q.No.16 is compulsory)

Q. No.	Questions	Marks	CO	BL
16. (i)	Explain the steps involved in selection of grinding wheels.	**7**	CO4	L4
16. (ii)	Write the CNC lathe programming for a FANUC controlled machine using canned cycles. Take the diameter of the work piece = 30mm, depth of cut = 0.5mm, speed = 1200rpm. Assume feed and other data suitably.  All the Dimensions are in mm	**8**	CO5	L6