

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID-SEMESTER EXAMINATION MO/2023)

CLASS: BTECH
BRANCH: PIE

SEMESTER : V
SESSION : MO/2023

SUBJECT: PE329 MACHINING SCIENCE AND MACHINE TOOLS

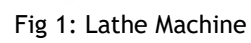
TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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		CO	BL
Q.1(a)	State the assumptions of orthogonal cutting.	[2] CO1	1
Q.1(b)	In orthogonal metal cutting, what is shear plane? Discuss how the shear plane angle may be manipulated for reducing the cutting forces.	[3] CO1	4
Q.2(a)	With the help of Merchant's circle diagram, derive an expression of frictional force in terms of cutting force and thrust force.	[2] CO1	3
Q.2(b)	Determine the shear plane angle, the resultant force on the tool, and the cutting force component for the orthogonal cutting operation of a material with a shear yield strength of 200 N/mm ² . The machining data is as follows: Uncut chip length = 100 mm, Length of chip = 50 mm, Rake angle of tool = 10°, Width of cut = 1.5 mm, Uncut chip thickness = 0.2 mm, Coefficient of friction = 0.8	[3] CO1	3
Q.3(a)	Under what conditions one would use a negative rake angle on a cutting tool?	[2] CO1	3
Q.3(b)	Discuss the properties that are required of a good tool material.	[3] CO2	2
Q.4(a)	If in a metal machining process, continuous chips with BUE are being produced, what changes do you suggest are required in the machining parameters to produce continuous chips without BUE?	[2] CO2	4
Q.4(b)	A machinability rating is to be determined for a new work material using the cutting speed for a 60min tool life as the basis of comparison. For the base material, test data resulted in Taylor's equation parameter values of n=0.27 and C= 450, where speed is in m/min and tool life is min. For the new material the parameter values were n=0.22 and C= 420. These results were obtained using cemented carbide tooling. (a) Compute a machinability rating for the new material using cutting speed for a 30 min tool life as the basis of comparison. (b) If the machinability criterion were a tool life for a cutting speed of 150m/min, what is the machinability for the new material?	[3] CO2	3
Q.5(a)	Identify at least 4 ways in which a workpiece can be held in a lathe.	[2] CO2	3
Q.5(b)	Identify the components A, B, C, D, E, F as marked in Fig 1.	[3] CO2	3



22/09/2023 M