GIET UNIVERSITY, GUNUPUR – 765022
M. Tech (Second Semester) Examinations, May – 2024
MPCMT2010 – Metal Cutting – Theory and Practice
(Manufacturing Technology)

Time: 3Hrs   Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A   (2 x 10 = 20 Marks)

Q.1. Answer all questions

		CO#	Blooms Level
a.	Name the seven elements of tool geometry for a single point cutting tool.	CO1	K1
b.	Explain the assumptions made by the Merchant circle in metal cutting processes	CO1	K2
c.	Mention the condition that induces the formation of built up edge	CO1	K1
d.	Explain the factors should be considered for selection of tool materials?	CO2	K1
e.	The useful tool life of an HSS tool, machining mild steel at 25m/min is 5 hours. Calculate the tool life when tool operates at 40m/min	CO2	K2
f.	Define the factors affecting the Machinability?	CO3	K1
g.	Classify the types of cutting fluids?	CO3	K2
h.	Express the rule for gear ratio in differential indexing.	CO4	K2
i.	Analyze the effects of drill geometry variations on drilling performance	CO4	K3
j.	Define the process of self sharpening of the grinding wheel?	CO4	K1

PART – B   (10 x 5=50 Marks)

Answer *ANY FIVE* questions

		Marks	CO#	Blooms Level
2. a.	How is metal removed in Metal cutting? Explain the process with simple sketch	5	CO1	K2
b.	With reference to orthogonal cutting, explain the following terms: Shear stress plane, shear strain, cutting ratio, shear angle. Shear Stress in Shear Plane	5	CO1	K4
3.a.	In an orthogonal cutting test with a tool of rake angle 8°, the following observations were made: Chip thickness ratio: 0.2 Horizontal component of the cutting force = 1190N Vertical component of the cutting force = 1450N From Merchant"s theory calculate the various components of the cutting forces and the coefficient of friction at the chip tool interface	10	CO1	K3
4. a.	Tool life test in turning yield the following data: (1) V=110 m/min,T=20 min; (2) V = 85 m/min, T = 40 min. (a) Determine the n and C values in the Taylor tool	5	CO2	K3

life equation. Based on the equation, compute (b) the tool life for a speed of 95m/min and (c) the speed corresponding to a tool life of 30 min.

b.	Explain in detail Tool Wear and also factors influencing tool wear	5	CO2	K2
5.a.	A manufacturing company is considering two different cutting tools for a milling operation on a batch of 1000 aluminium work pieces. The cutting parameters and tool data for each option are as follows: Tool life: 500 minutes, cost of tool: $50, Cutting speed: 200 m/min, Feed rate: 0.2 mm/tooth, Depth of cut: 2 mm, Total machining time per work piece: 10 minutes. Assuming an overhead cost of $50 per hour and a material cost of $0.50 per cubic centimetre, determine which cutting tool option is more economically viable for the company	10	CO2	K3
6. a.	Discuss any four cutting tool materials used in metal cutting.	5	CO3	K2
b.	Define machinability. What are the factors influencing machineability of a cutting tool	5	CO3	K1
7.a.	Detail on the desirable properties of cutting fluids	5	CO3	K2
b.	Explain the geometry of a drill bit and the mechanics involved in the drilling process.	5	CO4	K4
8. a.	Compare and contrast the mechanics of plunge grinding and surface grinding processes.	5	CO4	K5
b.	Explain the relationship between milling cutter geometry and the specific machining operations	5	CO4	K2

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