Register Number:……..

B.E DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Third Semester

MECHANICAL ENGINEERING

U18MEI3201: Metal Cutting and Computer Aided Manufacturing

COURSE OUTCOMES

CO1: Apply the fundamentals of metal cutting and cutting tool materials
CO2: Study the types and working principles of machine tools
CO3: Apply surface integrity principles in finishing processes and study gear manufacturing techniques
CO4: Apply manufacturing activities in relation to computers for plant operations
CO5: Apply the concept of Group Technology in computer-aided manufacturing
CO6: Apply system modeling tools in CIM and the fundamental concepts of data communications

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Differentiate between orthogonal and oblique cutting in metal cutting processes.	CO1	[K_2]
2.	Describe the significance of the Merchant Circle Diagram in metal cutting.	CO1	[K_2]
3.	List the different work-holding devices used in a lathe machine.	CO2	[K_2]
4.	Write the importance of cutting fluids in machining.	CO2	[K_2]
5.	What is gear hobbing, and where is it used?	CO3	[K_2]
6.	Define the term "Computer Integrated Manufacturing (CIM).	CO4	[K_2]
7.	What are the key features of numerical control (NC) systems?	CO4	[K_2]
8.	Explain the DCLASS coding system in Group Technology.	CO5	[K_2]
9.	What is process planning in a manufacturing setup?	CO5	[K_2]
10.	Discuss the role of data communication in CIM systems.	CO6	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. You are tasked with improving the productivity of a machining operation in a factory. The current setup uses high-speed steel tools, and the operation

		involves turning a 50 mm diameter steel rod at 200 RPM. The tool wear rate is high, and tool life is short. The factory is considering shifting to carbide tools. The cost of HSS tools is Rupees 500 per tool, and carbide tools are Rupees 2000 per tool, but they last four times longer. You need to calculate the economics of this switch, considering that labor costs are Rupees 200 per hour, and the total machining time is 3 hours per tool replacement.			
	a)	Explain the factors affecting tool life and wear rate in machining operations. How do HSS and carbide tools compare in these aspects?	7	CO1	[K_3]
	b)	Recommend whether to switch to carbide tools or not, what other factors, besides cost, should be considered when deciding to switch tool materials in a machining operation?	7	CO2	[K_3]
	c)	Discuss the potential quality improvements that could result from switching to carbide tools.	2	CO3	[K_2]
12.		A company manufactures spur gears using gear hobbing. They have encountered an issue with surface roughness, which is impacting the performance of the gears in high-speed applications. The current surface roughness average (Ra) is 6.3 µm, and the target is to achieve an Ra of 3.2 µm. The factory has access to advanced surface finishing processes such as lapping and super finishing.			
	a)	What factors during gear hobbing can contribute to higher surface roughness?	7	CO2	[K_3]
	b)	Compare lapping and super finishing processes. How do they differ in terms of material removal and surface finish?	7	CO3	[K_3]
	c)	Explain the significance of the surface roughness average (Ra) in machining operations.	2	CO1	[K_2]
13.	a)	Explain the working principle of a milling machine and describe two operations that can be performed on it.	7	CO3	[K_3]
	b)	Discuss the effect of cutting speed and feed rate on tool wear in a milling operation.	7	CO1	[K_3]
	c)	List the types of cutting tool materials used in milling machines.	2	CO2	[K_2]
14.	a)	What are the key features of CIM systems? Explain their importance in modern	7	CO4	[K_3]

		manufacturing.			
	b)	Explain the Role of Group Technology with a suitable example in CAD/Cam integration.	7	CO5	[K_3]
	c)	Explain the role of process planning in the integration of CAD and CAM systems.	2	CO6	[K_2]
15.	a)	Explain the importance of using Group Technology in automated manufacturing.	7	CO5	[K_3]
	b)	Discuss the differences between variant and generative approaches in Computer Aided Process Planning (CAPP).	7	CO6	[K_3]
	c)	Define the term plant operations in the context of CIM.	2	CO4	[K_2]
16.	a)	Discuss the main components and steps involved in the generative process planning system.	7	CO6	[K_3]
	b)	Explain the OPITZ classification system for parts in manufacturing, highlighting its main features and advantages.	7	CO5	[K_3]
	c)	What are the advantages of using open systems in a CIM setup?	2	CO5	[K_2]

****