U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January 2024 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 20ME7DEADM / 16ME7DEADM **Max Marks: 100**
Course: Additive Manufacturing

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Explain some applications of additive manufacturing as a new age manufacturing process.	CO1	PO1	**05**
	b)	Compare between additive and subtractive manufacturing process.	CO1	PO1	**05**
	c)	Discuss the process benefits and drawbacks of photo polymerization process.	CO1	PO1	**10**
		OR			
2	a)	Explain the concept of reverse engineering.	CO1 CO4	PO1	**05**
	b)	Classify the various additive manufacturing processes.	CO1	PO1	**05**
	c)	Discuss the working of a mask projection based Vat Polymerization system.	CO1 CO4	PO1	**10**
		UNIT – II			
3	a)	Calculate the Applied Energy Density for the given variables during a PBF method for a unit layer thickness: Scan speed is 2mm/s, Hatch spacing is 0.045mm and the laser uses 20% of the maximum power that is 6 kW.	CO2 CO3	PO1	**04**
	b)	Discuss about counter crafting and rep rap technology.	CO1 CO4	PO1	**06**
	c)	Discuss the important process parameters of powder bed fusion process.	CO1 CO4	PO1	**10**
		OR			
4	a)	Explain the key features of extrusion based systems in additive manufacturing.	CO1 CO4	PO1	**10**
	b)	Discuss the process benefits and drawbacks of powder bed fusion process	CO1	PO1	**10**

			UNIT - III			
	5	a)	Calculate the smallest diameter nozzle that could be used to print (using MJ) a ceramic-wax material that has the following properties. Viscosity=6cP; Density=1600kg/m^3; surface tension=0.035 N/m	*CO2* *CO3*	*PO1*	**05**
		b)	Explain the technical challenges of Material Jetting.	*CO1* *CO4*	*PO1*	**05**
		c)	Draw the schematic of the Binder Jetting process and explain it in detail.	*CO1* *CO4*	*PO1*	**10**
			UNIT - IV			
	6	a)	Explain the applications of Ultrasonic additive manufacturing process.	*CO1*	*PO1*	**04**
		b)	Explain Form-Then Bond process in Sheet Lamination	*CO1* *CO4*	*PO1*	**08**
		c)	Discuss the Ultrasonic additive manufacturing process parameter.	*CO1* *CO4*	*PO1*	**08**
			UNIT - V			
	7	a)	If an AM machine is that your investor is investing on costs Rs. 4,00,00.000/- and is covered with an warranty for 5 years, Calculate the hourly rate of the machine that you would setup for making a 12% profit annually. Consider labor cost is Rs. 78,000/month, material cost is Rs. 20/kg and power and consumables cost at 500/hr. The machine has a deposition rate of 500gm/hr. Rental at Rs.40,000/month. Consider straight line depreciation for making a fair evaluation for the warranty period. Taxation and other charges which is omitted can be ignored.	*CO2* *CO3*	*PO1*	**05**
		b)	Explain the liquid phase direct deposition process with a neat sketch.	*CO1*	*PO1*	**05**
		c)	Explain the post processing concepts of support removal and surface texture and accuracy improvements.	*CO1*	*PO1*	**10**

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