Code: 20ME6502

III B.Tech - I Semester – Regular Examinations - DECEMBER 2022

ADVANCED METAL CASTING
(HONORS in MECHANICAL ENGINEERING)

Duration: 3 hours   Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level   CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	Describe the primary requirements of a moulding sand. How is each provided by the sand and additive aggregate?	L2	CO1	7 M
	b)	Discuss with a neat sketch of a typical mould and name its principle parts.	L2	CO1	7 M
		OR			
2	a)	With neat sketches describe the basic steps in Casting Process.	L2	CO1	7 M
	b)	Discuss the casting defects and the remedies that may be used to remove the defects from the casting products/materials.	L2	CO1	7 M
		UNIT-II			
3	a)	Discuss different types of Patterns. Briefly discuss about the pattern allowances.	L3	CO2	6 M
	b)	Show how to combine the following pairs of	L3	CO2	8 M

		allowances: (i) distortion and machining, (ii) draft and machining.			
		OR			
4	a)	Illustrate the design considerations leading to better venting of gases generated by burning of core binder during casting.	L3	CO2	7 M
	b)	Write a short notes on : i) Loose pieces ii) stop offs iii) Rapping and lifting operations iv) Colour coding of patterns	L3	CO2	7 M

UNIT-III

5	a)	Describe the solidification of a pure metal with a neat sketch.	L3	CO3	7 M
	b)	Illustrate directional solidification of casting. How can one achieve it?	L3	CO3	7 M
		OR			
6	a)	Design a top feeder for the last freezing region based on modulus principle. Assume feeder height to diameter ratio is 1.5 and the neck length is 10 mm. Assume no heat transfer from the entire bottom face of feeder. Recalculate the modulus of the last freezing region and correct the feeder dimensions through a second iteration.	L3	CO3	8 M

	b)	Explain the formation of casting from liquid metal poured in to the mold. What are the conditions that favor the formation of equiaxed grains?	L3	CO3	6 M

UNIT-IV

7	a)	How do you perform gating design? Explain Gating ratio.	L3	CO3	6 M
	b)	Calculate : i) Runner dimensions assuming height to width ratio is 1.5. ii) Ingate dimensions assuming height to width ratio as 0.5. Assume both have rectangular cross section.	L3	CO3	8 M

OR

8	a)	What is the purpose of runner expansion and what is its ideal shape.	L3	CO3	7 M
	b)	How is the volumetric contraction of a casting alloy compensated between these pairs of temperatures (i) pouring and liquidus, (ii) liquidus and solidus, and (iii) solidus and ambient.	L3	CO3	7 M

UNIT-V

9	a)	Discuss in detail the following: i) Tooling cost estimation ii) Material cost estimation	L2	CO4	7 M

	b)	List the key parameters for evolving the parametric equation for estimating the cost of pressure die casting dies.	L2	CO4	7 M
		OR			
10	a)	Estimate the different measures of shape complexity (volume ratio, surface area ratio, and number of cored features) of a cube with side 90 mm having a circular through hole of diameter 15mm.	L3	CO4	8 M
	b)	Discuss the main considerations in selecting a suitable casting process for a given product.	L2	CO4	6 M