Reg. No.



I SEMESTER M.TECH. (AUTOMOTIVE ENGINEERING) MAKE-UP EXAMINATIONS, April 2022 SUBJECT: AUTOMOTIVE MATERIALS AND STRUCTURES (AAE 5172) REVISED CREDIT SYSTEM

(18/04/2022)

Duration: 3 Hours

Max. Marks: 50

Instructions to Candidates:

- ✤ Answer all the questions.
- ✤ Assume missing data if any.

QN	Question	Max marks
1a)	Determine the Atomic packing factor for Hexagonal Close-packed crystal Structure. Given: c/a = 1.633	(04)
1b)	Explain the concept of slip plane formation.	(03)
1c)	Discuss Strain hardening mechanism with schematic illustration in terms of stress-strain diagram	(03)
2a)	Discuss the properties required in selection of cylinder block material.	(02)
2b)	List the material selection process from all materials selection to final materials of choice. With an example explain the material section process.	(04)
2c)	Explain the shape memory effect with the stress-strain-temperature graph.	(04)
3a)	Differentiate and write a brief note dry liners based on 3 basic fits used.	(02)
3b)	Explain the purpose of forming limit diagram? With a strain graph explain the forming limit curve formation.	(04)
3c)	Construct the Iron-Carbon equilibrium diagram with all the important temperatures and phases involved also describe the 3 important invariant reactions involved	(04)
4a)	Determine [A], [B] and [D] matrices for $[0 90]$ angle-ply laminate. Each ply has the thickness of 0.125 mm. E ₁ = 140 GPa, E ₂ = 10 GPa, E ₆ = 5 GPa, v_{12} = 0.3	(05)

4b)	Evaluate Transverse modulus E_2 of a glass/epoxy composite lamina with	(02)
	properties $E_f = 15.8$ GPa, $E_m = 3.05$ Gpa, $V_f = 0.55$, $v_m = 0.36$ using Halpin-Tsai	
	relationship ($\xi = 1$)	
4c)	A glass/epoxy specimen weighing 0.98 gm was burnt and the weight of the	(03)
	remaining fibre found to be 0.49 gm. Densities of glassepoxy are 2.4 gm/ml	
	and 1.20 gm/ml, respectively. Determine the density of composites in the	
	absence of voids. The actual density of the composite was measured to be 1.50	
	gm/ml, what is the void fraction?	
5a)	Deduce the equation for longitudinal strength for fiber-reinforced composite	(06)
	lamina.	
5b)	Mention various hydroforming methods. With a neat sketch explain high	(04)
	pressure sheet hydroforming.	