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Bengaluru

Mid Term Examinations - October 2026

Date: 06/10/2026 **Time:** 02:00 PM - 03:30 PM

Course Code: MEC3049 **Course Name:** Mechanics of Composite Materials

Semester: Seventh Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2
Marks	46	44

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	What are the two primary constituents of a composite material? State the basic function of each.	2	CO1	BT2
2	What is the iso-strain condition? Where is it used in the analysis of a unidirectional composite?	2	CO2	BT2
3	Differentiate between thermoplastic and thermoset matrix materials based on their behaviour on heating.	2	CO1	BT2
4	List any four factors that affect the properties of a composite material.	2	CO1	BT2
5	Define fibre volume fraction and matrix volume fraction. State the relationship between them.	2	CO2	BT2

PARTB: Answer Any 1 Following Questions. 20 M

Q.N.	Questions	M	CO	BT
06.A	Define composite materials and explain the need for developing composite materials. Discuss the major constituents of a composite and explain the functions of reinforcement and matrix materials in detail.	10	CO1	BT2
06.B	Explain the different types of advanced fibres used in composite materials. Discuss the characteristics and applications of any four of the following: carbon/graphite, glass, alumina, aramid, boron and silicon carbide fibres.	10	CO1	BT2
07.A	Compare thermoplastic and thermoset matrix materials with respect to processing, heating behaviour, repairability, curing, shelf life and mechanical behaviour. Also discuss the advantages and disadvantages of metal matrix materials.	10	CO1	BT2
07.B	Discuss the major advantages and disadvantages of composite materials. Explain how fibre material, fibre volume fraction, fibre orientation, fibre length, cross-sectional shape, distribution and stacking sequence can be used to tailor the properties of a composite.	10	CO1	BT2

PARTC: Answer Any 1 Following Questions. 20 M

Q.N.	Questions	M	CO	BT
08.A	Derive the expression for the longitudinal modulus E_L of a unidirectional fibre-reinforced composite using the iso-strain condition. Clearly state all assumptions made in the derivation and explain the Rule of Mixtures.	10	CO2	BT3

08.B	Derive an expression for the fraction of the total longitudinal load carried by the fibres in a unidirectional composite. Explain how the fibre modulus, matrix modulus and fibre volume fraction influence load sharing.	10	CO2	BT3
09.A	Derive the expressions for the minimum fibre length and critical fibre length of a discontinuous fibre composite. Differentiate between the two and explain the significance of $l_f < l_c$, $l_f = l_c$ and $l_f > l_c$ for effective reinforcement.	10	CO2	BT3
09.B	Explain the Halpin-Tsai method for predicting the elastic properties of aligned short-fibre composites. Write the expressions for longitudinal modulus, transverse modulus, shear modulus and Poisson's ratio, and explain the significance of the parameters η_L , η_T and η_G .	10	CO2	BT3