Total No. of Questions : 6]

SEAT No. :

P4192

[Total No. of Pages : 2

[4960]-53

M.E. (Civil Structure)

MECHANICS OF MODERN MATERIALS

(2008 Pattern) (Semester - II) (Elective - IV)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of nonprogrammable pocket Calculator is allowed.***
6) ***Assume Suitable data if necessary.***

SECTION - I

Q1) a) Explain and enlist various fiber matrices used in FRP. **[8]**

b) What is piezoelectric material. What are its effect and applications. **[5]**

c) What is direct and converse effect. **[4]**

d) Explain classification of materials used in FRC and situations where these class of materials are advantageous. **[8]**

Q2) a) Write short note on shape memory alloys(SMA) and Functionally graded materials(FGM). **[10]**

b) Explain Generalized Hookes Law for orthotropic material in 1-2-3 coordinates. **[8]**

c) Write compliance and stiffness matrices for plane stress for cross ply laminate material. **[7]**

Q3) a) Explain Tsai-Hill theory of failure applicable for FRC. **[12]**

b) Explain stress strain behavior of FRC. **[13]**

P.T.O.

SECTION - II

Q4) a) Explain force moment resultant with neat diagram for a typical laminate. **[10]**

b) Explain and sketch : **[15]**

i) Unidirectional laminate

ii) Symmetric Laminate

iii) Symmetric Cross-ply Laminate

iv) Symmetric Angle - Ply laminate

v) Antisymmetric Laminate

Q5) a) Write constitutive relation of a lamina subjected to hydrothermal expansion in plane stress condition. **[10]**

b) The lamina of size 60mm × 60 mm in direction 1-2-3 material direction are: **[15]**

$\alpha_1 = -0.018\times10^{-6} \ / c^0, \ \ \alpha_2 = 24.3\times10^{-6} \ / c^0$

Find transformed thermal expansion coefficient α_x, α_y, α_{xy}, and free thermal strains along 45° relative to x- axis.

Q6) a) Explain manufacturing of composite. **[8]**

b) List tests carried out for determination of properties of composite, Explain Biaxial testing and inter laminar fracture toughness of composite material. **[17]**