Total No. of Questions : 6]

SEAT No. :

P3981

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## M.E. (Civil Structures) (Semester - II)

## MECHANICS OF MODERN MATERIALS

## (2008 Pattern) (Elective - IV (b))

*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 in detail the various types of fibers used for FRPC and give brief information about the matrix of FRPC. **[10]**

b) What are the different types and classification of composite materials? **[8]**

c) What are advantages of composite materials over the conventional materials? **[7]**

***Q2)*** a) Explain in detail the longitudinal and transverse elastic properties of composite lamina. **[10]**

b) Explain two dimensional stress-strain relations for a thin composite lamina. **[8]**

c) Write in detail about piezoelectric materials and piezoelectric strain matrix for Quartz. **[7]**

***Q3)*** a) Explain energy based interaction theory (Tsai-Hill) for failure of composite lamina. **[13]**

b) Write the comparison between the various failure theories for composite lamina. **[12]**

***P.T.O.***

## SECTION - II

***Q4)*** a) Obtain Naviers equation for orthotropic laminate with two opposite side fixed. **[9]**

b) Explain and sketch **[16]**

i) Orthotropic, Anisotropic laminate.

ii) Symmetric, balanced laminate.

iii) Antisymmetric and cross ply laminate.

***Q5)*** a) Explain laboratory tests to determine mechanical properties of composite laminate. **[10]**

b) Find coefficient of thermal expansion for a 90 degree orthotropic laminate.

$E_1 = 62$ Gpa, $E_2 = 15$ Gpa, $E_3 = 16$ Gpa

$\mu_{12} = 0.29 = \mu_{21}$

$\alpha_1 = 0.95*10^{-6}/c^0$ , $\alpha_2 = 27*10^{-6}/c^0$. **[15]**

***Q6)*** a) Explain manufacturing process of composite. Sketch important details. **[8]**

b) Explain in details one experimental tests carried out for determination of properties of composite. **[9]**

c) What are high performance of composites, State its future as emerging material. **[8]**