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**E Reg. No. :**

**Question Paper Code: 57P62**

Ph.D. COURSE WORK EXAMINATION, NOV 2017

Elective

Structural Engineering

15PSE506 - MECHANICS OF COMPOSITE MATERIALS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

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| 1. | (a) | (i) Briefly explain the historical background and review of  composites. | CO1- U | (16) |
|  |  | (ii) Define composites. | CO1- U | (2) |
|  |  | (iii) Write the short notes on application of composites. | CO1- U | (2) |
|  |  | Or |  |  |
|  | (b) | (i) Describe any one method of manufacturing polymer matrix  composites. | CO1- U | (16) |
|  |  | (ii) List out the classifications of composite materials. | CO1- U | (2) |
|  |  | (iii) Differentiate between simply laminate and hybrid laminate. | CO1- U | (2) |
|  |  |  |  |  |
| 2. | (a) | (i) Explain the Stress-Strain Relations for Specially Orthotropic  Lamina composites. | CO2- U | (16) |
|  |  | (ii) State generalized Hooke’s law. | CO2- U | (2) |
|  |  | (iii) Define lamina. | CO2- U | (2) |
|  |  | Or |  |  |
|  | (b) | (i) Calculate Ex, Gxy, vxy, mx, and myat 30°, 45°, and 60° for an  orthotropic lamina having the following properties:  EL= 14 GPa, ET*=* 3.5 GPa, GLT = 4.2 GPa, VLT = 0.4 | CO2- App | (16) |
|  |  | (ii) Define residual stresses. | CO2- U | (2) |
|  |  | (iii) Write the equation for Halpin-Tsai theory. | CO2- U | (2) |
|  |  |  |  |  |
| 3. | (a) | (i) Briefly explain the laminate strains with neat diagram. | CO3- Ana | (16) |
|  |  | (ii) Write the short notes on laminate process. | CO3- U | (2) |
|  |  | (iii) Draw a four ply laminates plate. | CO3- U | (2) |
|  |  |  |  |  |
|  |  | Or |  |  |
|  | (b) | (i) Discuss in details about the symmetric and quasi isotropic  laminates. | CO3- Ana | (16) |
|  |  | (ii) Differentiate between cross ply and angle ply laminates. | CO3- Ana | (2) |
|  |  | (iii) State the classical lamination theory. | CO3- Ana | (2) |
|  |  |  |  |  |
| 4. | (a) | (i) Explain the maximum stress theory and its application. | CO4- U | (16) |
|  |  | (ii) Write the short notes on netting analysis. | CO4- U | (2) |
|  |  | (iii) List out the methods used for laminate failure prediction. | CO4- U | (2) |
|  |  | Or |  |  |
|  | (b) | (i) Describe about the mode of failure of mechanical joints. | CO4- App | (16) |
|  |  | (ii) States the Tsai-Hill theory. | CO4- U | (2) |
|  |  | (iii) Write the short notes on sandwich construction. | CO4- U | (2) |
|  |  |  |  |  |
| 5. | (a) | (i) Explain the geometry and stress variation of adhesive joint with  a neat sketch. | CO5- U | (16) |
|  |  | (ii) What are the applications of composites in various fields? | CO5- U | (2) |
|  |  | (iii) Write the short notes on joints for composite structures. | CO5- U | (2) |
|  |  | Or |  |  |
|  | (b) | (i) Briefly explain the energy absorbing mechanisms and failure  models. | CO5- U | (16) |
|  |  | (ii) List out the various types of bonding. | CO5- U | (2) |
|  |  | (iii) List out the factors affecting for design of composite  structures. | CO5- U | (2) |
|  |  |  |  |  |