USN ☐☐☐☐☐☐☐☐☐☐

15AE52

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Introduction to Composite Materials

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing
ONE full question from each module.**

Module-1

1 a. Define a composite material and give the detailed classification. **(08 Marks)**
   b. Write a note on metal matrix composites and give its advantages and applications. **(08 Marks)**

OR

2 a. Explain with a neat sketch stir casting and squeeze casting process. **(12 Marks)**
   b. Give the applications of $A\ell$, Mg, Ti based MMC. **(04 Marks)**

Module-2

3 Explain the following with a neat sketch :
   a. Hand layup process
   b. Filament winding. **(16 Marks)**

OR

4 Explain the following with a neat sketch :
   a. Extrusion process
   b. Injection moulding process. **(16 Marks)**

Module-3

5 a. Determine the longitudinal Young's modulus by strength of material approach. **(10 Marks)**
   b. Define the following :
      i) Volume fraction
      ii) Mass fraction
      iii) Density of a composite. **(06 Marks)**

OR

6 a. Determine the global and local stresses in an angle lamina. **(08 Marks)**
   b. For a graphite/epoxy unidirectional lamina, find the following :
      i) Compliance matrix
      ii) Minor Poisson's ratio
      iii) Strains in the $1 - 2$ co–ordinate system if the applied stresses are :
         $\sigma_1 = 2$ MPa, $\sigma_2 = -3$ MPa, $\tau_{12} = 4$ MPa
      [Use $E_1 = 181$ GPa, $E_2 = 10.3$ GPa, $\nu_{12} = 0.28$, $G_{12} = 7.17$ GPa]. **(08 Marks)**

Module-4

7 Explain the following :
   a. Tsai – Hill failure theory
   b. Tsai – WU failure theory. **(16 Marks)**

OR

8 Find the 3 stiffness matrices [A], [B] and [D] for a three–ply [0/30/–45] graphite/epoxy laminate as shown in Fig.Q8, use the unidirectional properties from given data of graphite/epoxy. Assume each lamina has a thickness of 5mm.
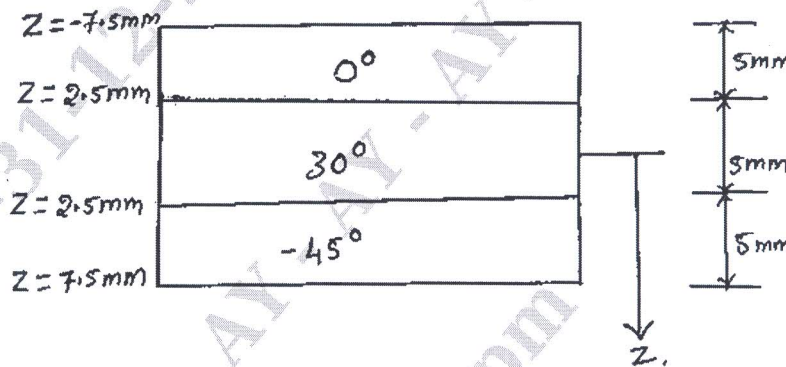   [Use : $E_1 = 181$GPa, $E_2 = 10.3$GPa, $v_{12} = 0.28$, $G_{12} = 7.17$GPa]. **(16 Marks)**

Fig.Q8

Module-5

9 a. Write a note on typical flaws in composite materials and classify according to stage of life cycle at which the fault occurs. **(08 Marks)**
   b. Explain A – B – C scan in ultrasonic testing. **(08 Marks)**

OR

10 Give the applications of composites materials in the following :
   a. Automobile
   b. Aircrafts
   c. Missiles
   d. Space hardware
   e. Electrical and Electronics
   f. Marine
   g. Sports equipment. **(16 Marks)**

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