Hall Ticket No | | | | | | | | | | |  Question Paper Code: AAEB14

# INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

B.Tech V Semester End Examinations (Regular), February – 2021

**Regulation: IARE–R18**

## ANALYSIS OF AIRCRAFT STRUCTURES

**Time: 3 Hours** **(AE)** **Max Marks: 70**

**Answer any Four Questions from Part A**
**Answer any Five Questions from Part B**

### PART – A

1. What are the causes of stress concentration? Define the methods of reducing stress concentration? **[5M]**
2. What are the major roles of the surface energy and the stored elastic energies in a crack growth situation? **[5M]**
3. Explain any two methods of glass fiber manufacturing with neat sketch. **[5M]**
4. What are the advantages of composite material? And write its area of application? **[5M]**
5. What do you understand by thin walled beams and how thin walled beams differes from solid beams? **[5M]**
6. What is the dependence of a stress concentration factor on a length and curvature of an elliptical notch? **[5M]**
7. What does happen to the elastic strain energy when crack growth occurs? **[5M]**
8. Explain Compression molding along with its advantages and disadvantages. **[5M]**

### PART – B

9. Explain about low cycle fatigue and high cycle fatigue with proper example **[10M]**
10. A polished steel bar is subjected to axial tensile force that varies from zero to $P_{max}$. It has a groove 2 mm deep and having a radius of 3 mm. The theoretical stress concentration factor and notch sensitivity factor at the groove are 1.8 and 0.95 respectively. The outer diameter of the bar is 30 mm. The ultimate tensile strength of the bar is 1250 MPa. The endurance limit in reversed bending is 600 MPa. Find the maximum force that the bar can carry for $10^5$ cycles with 90% reliability. **[10M]**
11. Explain briefly about crack tip plasticity and Irwin approach? **[10M]**
12. Is Resistance "R" of a cracked material and fracture toughness are they same? Explain. **[10M]**
13. Describe the role of composite materials in the field of
    i) Aerospace and Military
    ii) Automobile **[10M]**
14. Obtain the expressions to $E_{11}$, $E_{22}$, $_{12}$ and $G_{12}$ in terms of constituent properties using micromechanics principles. **[10M]**
15. Is shear lag appears in four boom idealized thin walled beams? Justify your answer. **[10M]**

16. The panel shown in Figure 1 is idealized into a combination of direct stress carrying booms and shear stress carrying plates; the boom areas are shown and the plate thickness is t=2mm. Calculate the direct load P in each boom, take A=B, d=250mm,Area of boom=500$mm^2$, L=1m. **[10M]**

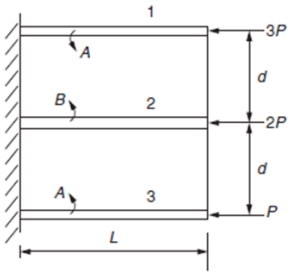


Figure 1

17. Determine the equation of $\Gamma_R$ for I-section beam of depth h and flange width w **[10M]**

18. The column shown in Figure 2 carries a vertical load of 100 kN. Calculate the angle of twist at the top of the column and the distribution of direct stress at its base. E = 200,000 N/$mm^2$ and G/E=0.36. **[10M]**

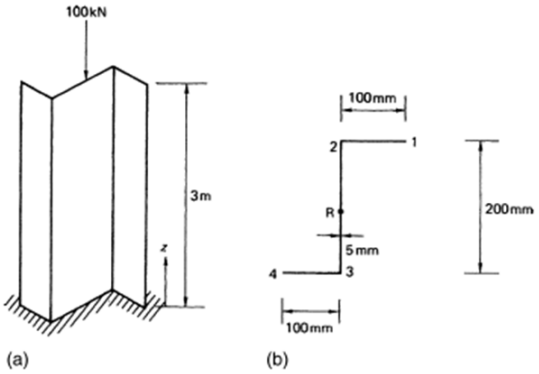


Figure 2

– ○ ○ ◯ ○ ○ –