Hall Ticket No | | | | | | | | | | | Question Paper Code: AAEB04

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

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

Regulation: IARE–R18

MECHANICS OF SOLIDS

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

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

PART – A

1. Classify the relationship between elastic modulus, bulk modulus, rigidity modulus and Poisson's ratio? **[5M]**
2. What is need of finding shear force and bending moment along the length of the beams. **[5M]**
3. Find the equation for variation of shear stress distribution at the junction of the flange and the web. **[5M]**
4. Compare and contrast between determinate and indeterminate structure. **[5M]**
5. Explain Airy's stress function for two dimensional problems in elasticity. **[5M]**
6. Explain the torsion? How the polar modulus is related to torsion? **[5M]**
7. Show the expression for the bending moment of cantilever at fixed end when it is subjected to a point load at its free end. **[5M]**
8. State the assumptions made in the analysis of pin jointed trusses. **[5M]**

PART – B

9. Develop an expression for the total elongation of a bar due to its own weight, when the bar is fixed at its upper end and hanging freely at the lower end. **[10M]**
10. A hollow circular shaft 20mm thick transmits 300kW power at 200rpm Determine the external diameter of the shaft if the shear strain due to torsion is not to exceed 0.00086. Take the modulus of rigidity as 80,000N/mm^2. **[10M]**
11. Summarize S.F.D and B.M.D for a SSB carrying uniformly varying load from zero at each end to w per unit length at the center. **[10M]**
12. A steel cantilever beam of span 4 m is subjected to a point load of 2kN at the free end. The cross section of the beam is 50 mm wide and 75 mm deep. Determine the maximum bending stress in the beam. **[10M]**
13. Deduce the slope and deflection of a simply supported beam carrying a point load 'W' at mid-point of the beam by double integration method **[10M]**
14. A hollow cylindrical column of 150 mm external diameter and 15 mm thick, 3 m long is hinged at one end and fixed at the other end. Find the ratio of Euler's and Rankine's critical load. Take E = 8×10^4 N/mm^2, f_c = 550 N/mm^2 and Rankine's constant = 1/1,600 **[10M]**
15. Explain the term 'slenderness ratio' and describe with mathematical expression, how it limits the use of Euler's formula for crippling load. **[10M]**
16. An I section joist 400 mm $\times$ 200 mm $\times$ 20 mm and 6 m long is used as a strut with both ends fixed. Identify the Euler's crippling load for the column? Take Young's modulus for the joist as 200 GPa. **[10M]**
17. At a certain point the stresses in a strained material acting on two planes at right angles to each other are 80 N/mm^2 and 60 N/mm^2, both tensile. They are accompanied by a shear stress of 20N/mm^2. Find graphically the location of principal planes and evaluate the principal stresses. **[10M]**
18. Show that sum of normal stresses in any two mutually perpendicular directions is constant in case of a general two dimensional stress. **[10M]**

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