

GBCS Scheme

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15AE34

Third Semester B.E. Degree Examination, June/July 2018

Mechanics of Materials

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Derive the equilibrium equations for a 3 dimensional stress system. (08 Marks)
b. Displacement field at the point on a body is given as follows:
$$u = [y^2i + 3yzj + (4 + 6x^2)k] * 10^{-2}$$
Determine strain components at (1, 0, 2) and express them in matrix form. (08 Marks)

OR

- 2 a. Write a note on strength design and stiffness design, along with its equation. (08 Marks)
b. A composite bar is shown in Fig.Q2(b). Determine the stress developed in each member.
Take $E_{al} = 0.7 \times 10^5 \text{ N/mm}^2$, $E_{steel} = 2 \times 10^5 \text{ N/mm}^2$.

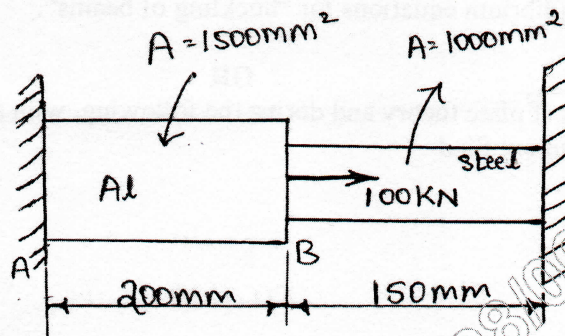


Fig.Q2(b)

(08 Marks)

Module-2

- 3 a. Explain Euler-Bernoulli assumption with its implications. Write the equations for the same. (08 Marks)
b. Derive the following expression for the "beam subjected to transverse load".
i) Kinematic description
ii) Axial force, shear force and bending moment (08 Marks)

OR

- 4 a. What is three dimensional beam theory? Give its kinematic description. (08 Marks)
b. What are the governing equation for a three dimensional beam? Explain. (08 Marks)

Module-3

- 5 a. Determine the rate of twist and shear stress distribution in a circular section bar of radius 'R'. Which is subjected to equal and opposite torque 'T' at each of its free end? (08 Marks)
b. Discuss the application of Von Mises criterion and Trescas criterion for a propeller shaft under torsion and Bending. (08 Marks)

OR

- 6 a. Explain the comparison of open and closed tube sections with required equations. (06 Marks)
 b. What is warping of thin-walled beam under torsion? Give its kinematic description. (10 Marks)

Module-4

- 7 a. Explain principle of virtual work for a particle and write the statement. (08 Marks)
 b. Define principle of virtual work for a rigid body and state the difference between principle of virtual work and principle of complementary virtual work. (08 Marks)

OR

- 8 a. What is conservative forces? Derive the expression for work done by conservative forces along any path joining two points. (06 Marks)
 b. Explain the procedure for the solution of truss problem using the principle of minimum total potential energy. (10 Marks)

Module-5

- 9 a. Explain Tresca's yield criterion for uniaxial and plane state of stress and pure shear state cases. (08 Marks)
 b. Derive the equilibrium equations for "buckling of beams". (08 Marks)

OR

- 10 Explain Kirchoff plate theory and derive the following, with assumptions:
 a. Total Displacement field
 b. Strain field (16 Marks)
