Exam.Code:0945
Sub. Code: 7102

1078
B.E. (Civil Engineering)
Third Semester
CIV-302: Solid Mechanics

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions from each Section B-C. Any missing data can be suitably assumed clearly stating the same. Support your answer with labelled sketches wherever possible.

x-x-x

SECTION A

1

i. Define modular ratio
ii. Define Poisson's ratio
iii. Writetherelationshipbetweenbulkmodulus,rigiditymodulusandPoisson's ratio.
iv. Whatisshear forceinabeam?
v. WriteTorsionalequation.
vi. Define elastic strain energy
vii. Give the expression for major principal stress in a two dimensional system
viii. What do you meant by point of contraflexure?
ix. What is meant by moment of resistance of a beam?
x. What are the methods for finding out theslope and deflectionat a section?

(1*10)

SECTION B

2. a) Three bars made of copper; zinc and aluminium are of equal length and have cross section 500, 700, and 1000 sq.mm respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250 kN, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10 5 N/mm2, for zinc = 1×105 N/mm2 and for aluminium = 0.8×105 N/mm^2.

(5)

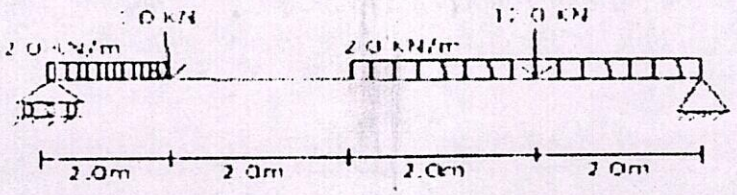
(b) Write short notes on (5)

i. Elasticity
ii. Plasticity
iii. Ductility
iv. Brittleness
v. Free body diagram

P.T.O.

3. At a point in a material, there are two normal tensile stresses of magnitude 200 N / mm^2 acting mutually perpendicular to each other. There is also a positive shear stress of 50 N / mm^2 acting at that point. Determine the normal and shear stresses on a plane whose normal is inclined at 60° to 200 N / mm^2 stress. Also determine the direction and magnitude of the principal stresses in the material. (10)

4. Draw the SFD and BMD for the beam loaded as shown in the figure.



(10)

SECTION C

5. a) State the assumptions made in the theory of simple bending. (2)

b) A flitched beam consists of two timber joist 100mm wide and 240mm deep with a steel plate 180mm deep and 10mm thick placed symmetrically between the timber joists and well clamped. Determine

i) The maximum fibre stress when the maximum fibre stress in wood is 8 N/mm2.

ii) The combined moment of resistance if the modular ratio is 18. (8)

6. Two shafts, first one of solid circular section and second of hollow circular cross-section with a ratio of internal and external diameters of 0.9, are considered for the use in the application that has to transmit a maximum torque Tmax=10kN.m. Which of these shafts will be economical for equal strength condition? Determine: (a) the percent saving in the material and (b) the dimensions of the shafts if the shearing stress is limited to 60 MPa. (10)

7.a) What is the necessity of theory of failure? Explain in detail any two theories. (3)

b) A simply supported beam of span 3m has to resist a shear force of 140 KN. The cross section of the beam is a T-section with flange width of 120mm, web and flange thicknesses of 20mm each and overall depth of 160mm. Determine the maximum shear stress induced in the beam and draw the shear stress distribution for the beam section. (7)

x-x-x