24171

B. Tech. 4th Semester (ME) F. Scheme Examination, May–2014

STRENGTH OF MATERIALS–I

Paper–ME–206-F

Time allowed : 3 hours] *[Maximum marks : 100*

*Note : **Q. No. 1 is compulsory**. Attempt any **five** questions selecting at least **one** question from each section.*

1. (a) Explain Hook's law. 2.5×8=20

(b) Define modulus of resilience.

(c) What do you mean by positive shear force and negative shear force ?

(d) What is most important assumption in a composite beam ?

(e) What do you mean by equivalent length of a column ?

(f) What are the drawbacks of Euler's theory of bucking ?

(g) What is conjugate beam ?

(h) What are concentrated load ?

Section–A

2. There vertical wires in the same plane are suspended from a horizontal support. They all are of the same length and carry a load by means of a rigid cross for at their lower ends. One of the wire is of copper and the other two are of steel. The load is increased and temperature

changed so that the stress in each wire is increased by $10N/mm^2$. Find the change of temperature ?

$E_s = 205,000N/mm^2$, $E_c = 102,000N/mm^2$; $\alpha_2 = 11\times10^{-6}$ / °C; $\alpha_c = 18\times10^{-6}$/°C. 20

3. Draw and describe Mohr's circle.

If, at a point in a material, the minimum and maximum principal stresses are $30N/mm^2$ and $90N/mm^2$, both tensile, find the shear stress and normal stress on a plane through this point making an angle of $\tan^{-1} 0.25$ with the plane on which maximum principle stress acts. 20

Section–B

4. A beam ABC, 20m long is simply supported at A and B, 15m apart and carries a load of 18kN at 6m from A inclined at 60° towards A together with a distributed load which is increasingly linear from zero at A to 10 kN/m at B. Draw the SF and BM diagram and calculate the magnitude and location of the maximum bending moment. 20

5. Derive the relation for a circular shaft when subjected to torsion known as Torsion Equation and State clearly the assumptions made. 20

Section–C

6. A beam of I-section 400mm ×200mm has a web and flange thickness 20mm. Calculate the maximum intensity of the shear stress across this section and sketch the shear stress distribution across the section of the beam, if it carries a shearing force of 300 kN at a section. 20

7. A 3 m long steel bar of rectangular section of 30mm × 20 mm is used as a strut with both end hinged. Assuming that Euler's formula is applicable and the material attains its yield strength at the time of buckling, determine the central deflection E = 205,000N/mm^2. Yield strength of steel is 320 N/mm^2. 20

Section–D

8. Compare the crippling load given by Euler's and Rankine's formulae for a tubular steel strut 2.3m long having outer and inner diameter of 38mm and 33mm, loaded through pin joints at both ends. Take the yield stress as 320N/mm^2 and the Rankine constant as 1/7500 E = 2000.000 N/mm^2. For what length of strut does the Euler formula ceases to apply. 20

9. A simply supported beam has a span of 15m and carries two point loads of 4kN and 9kN at 6m and 10m respectively from one end. Find the deflection under each load and the maximum deflection.

Take $E = 200$ GPa and $I = 400 \times 10^{-6}$ mm^4. 20