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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013

CIVIL ENGINEERING

Third Semester

CE271 Mechanics of Solids / CE9201 Strength of Materials -I

(Regulation 2004/2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. State Hooke's Law
2. Define Poisson's ratio.
3. What is meant by a redundant frame?
4. In what way method sections are better than method of joints?
5. A cantilever beam of 4 m long carries a uniformly distributed load of 6 kN/m. Sketch the shear force diagram.
6. Derive the relationship between shear force and bending moment.
7. What is the section modulus of a hollow circular section?
8. Define spring constant
9. A beam 6 metres long, simply supported at the supports, is carrying a point load W at its centre. If the slope at the ends of the beam is not to exceed 1° , find the deflection at the centre.
10. Write the procedure for finding the slope at a point on a beam using conjugate method.

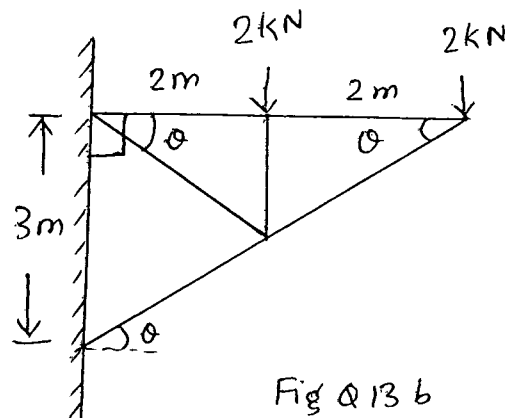
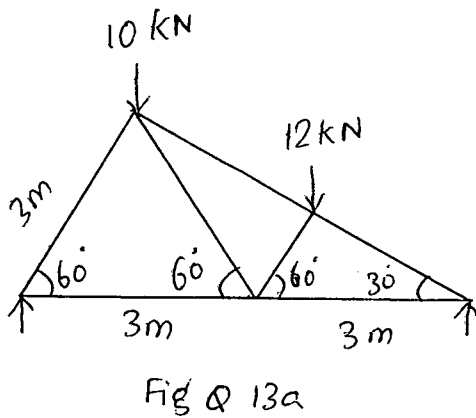
Part – B (5 x 16 = 80 marks)

11. Compare the weight of solid shaft with that of a hollow one having the same length to transmit a given power at a given speed, if the material used for both the shaft is the same. Take the inside diameter of the hollow shaft as 0.75 times the outer diameter.
12. a) Two circular bars A and B of the same material are subjected to the same pull (P) and are deformed by the same amount. What is the ratio of their length, if one of them has a constant diameter of 60mm and the other uniformly tapers from 80mm at one end to 40mm at the other?

(OR)

- b) An element in a stressed material has tensile stress of 560MPa and a compressive of 450MPa acting on two mutually perpendicular planes and a shear stress of 200MPa on these planes. Find the principal stresses and position of the principal planes. Also find the maximum shear stress.

13. a) A truss is loaded as shown in fig.Q.13.a. Find the forces in the members using method of joints.



(OR)

- b) A truss is loaded as shown in fig.Q.13.b. Find the forces in the members using method of sections.

14. a) A simply supported beam AB of span 9 m carries a gradually varying load of zero at support A and 6 kN/m at the other support B. Draw SFD and BMD. Calculate the position and magnitude of maximum bending moment.

(OR)

- b) A cast iron pipe of external diameter 200 mm, 20 mm thickness and 9 m long is simply supported at its ends. The pipe carries a uniformly distributed load of 6 kN/m (excluding the self weight) over the full length. Calculate the maximum flexural stress induced. Assume the unit weight of material of a pipe as 90 kN/m³.

15. a) A simply supported beam AB of span 4m , carrying a load of 120kN at its mid span C ,has cross sectional moment of inertia $24 \times 10^6 \text{ mm}^4$ over the left half of the span and $48 \times 10^6 \text{ mm}^4$ over the right half. Find the slopes at the supports and the deflection under the load. Take $E=210\text{GPa}$. Use Conjugate beam method.

(OR)

- b) A cantilever beam of 4 m carries uniformly distributed load of 18 kN/m over its entire span and a point load of 40 kN at its mid span. Calculate the slope and deflection at the free end. Assume $E = 210 \text{ kN/m}^2$ and $I = 4.5 \times 10^{-4} \text{ m}^4$. Use Moment-Area method.