KUMARAGURU college of technology
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Register Number:…….

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Third Semester

CIVIL ENGINEERING

U13CET303: Strength of Materials - I

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Relation between elastic constants is given by

   a) $E = \frac{9KN}{3K+N}$ b) $E = \frac{3K+N}{9KN}$

   c) $E = \frac{4KN}{2K+N}$ d) $E = \frac{9KN}{2K+N}$

2. Stiffness of spring is given by ……..

3. Bulk modulus is given by

   a) linear stress/linear strain b) shear stress / shear strain

   c) Lateral strain/linear strain d) direct stress/volumetric strain

4. The most economical section used for the shafts used in power transmission is …….

5. In a cantilever beam carrying downward transverse load the maximum compressive stress will be developed at ……

   a) top fibre of the section b) bottom fibre of the section

   c) Neutral axis d) None of the above

6. A truss is said to be a perfect frame when it satisfies the condition ……..

7. The shear stress developed in a neutral axis of a beam section is

   a) Minimum b) Maximum

   c) Zero d) None of the above

8. The tangential stress is zero along …….. plane

9. The maximum deflection produced in a simply supported beam of span length ‘L’ carrying an udl of intensity ‘w’ over its entire span length is given by

a) $\frac{wL^4}{8EI}$

b) $\frac{wL^3}{48EI}$

c) $\frac{5wL^4}{384EI}$

d) $\frac{5wL^4}{364EI}$

10. In a simply supported beam carrying a point load W at a distance L/3 from right support the maximum deflection is produced at ……..

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. The ultimate stress for a hollow steel column which carries an axial load of 2.0 MN is 450 N/mm^2. If the external diameter of the column is 200mm, determine the internal diameter. Take the factor of safety as 4.

12. A tensile load of 50 kN is applied to a circular bar of 50 mm diameter and 4m long, if the value of E = 200 GN/m^2. Determine the total strain energy stored in the bar.

13. What is meant by point of contraflexure?

14. Draw the shear force and bending moment diagram for the simply supported beam of span 'L' carrying a point load 'W' at its mid span.

15. State the Mohr's theorems for slope and deflections

16. Draw the conjugate beam for a cantilever beam carrying udl of intensity 'w' over its entire span 'L'.

17. What are the uses of springs?

18. Define Torsion.

19. List any 4 types of steel trusses.

20. What is meant by principal plane and principal stresses?

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. The tensile test was conducted on a mild steel bar. The following data was obtained from test :
(i) Diameter of the steel bar = 30 mm
(ii) gauge length of the bar = 200mm
(iii) Load at elastic limit = 250 kN
(iv) Load at yield point = 350 kN
(iv) Extension at a load of 150 kN = 0.21 mm
(v) Maximum load = 380 kN
(vi) Total extension = 60mm
(vii) Diameter of the rod at the failure = 22mm

Determine : (a) the Young's modulus (b) stress at elastic limit (c) yield stress (d) the percentage elongation (e) the percentage decrease in area

22. a) Draw the Bending moment and shear force diagram for a simply supported beam of total span length 10m and carrying a 50 kN point load, a 80 kN point load at a distance of 3m and 6m respectively from the left support and an udl of intensity 5 kN/m over the entire span length of the beam.

(OR)

b) State the assumptions made in Theory of bending and Derive the bending equation.

23. a) Determine the deflection under the point loads and also the maximum deflection in the beam shown in Fig.1.

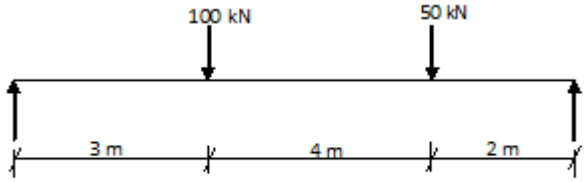

Fig. 1

(OR)

b) Find out the maximum deflection and maximum slope in a cantilever beam of span 'L' carrying a point load 'W' at its free end.

24. a) The stiffness of a close-coiled helical spring is 1.5 N/mm of compression under a maximum load of 60 N. The maximum shearing stress produced in the wire of the spring is 125 N/mm^2. The solid length of the spring when the coils are touching is given as 50 mm. Find (i) the diameter of wire (ii) mean diameter of the coils and (iii) number of coils required

(OR)

b) Determine the diameter of a solid shaft which will transmit 350 kW at 300 r.p.m. The maximum shear stress should not exceed 35 N/mm^2 and angle of twist should not be more than 1^o in a shaft length of 2.5 m. Take modulus of rigidity = 9×10^4 N/mm^2.

25. a) A truss of span 7.5m is loaded as shown in Fig.2. Find the reactions and forces in the members of the truss.

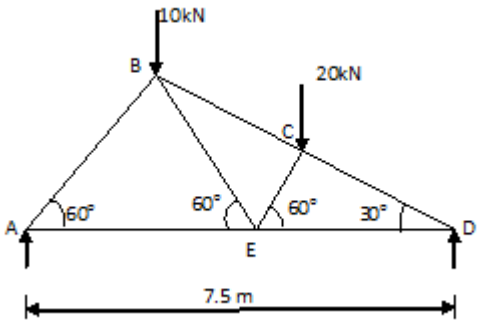

Fig.2

(OR)

b) Direct stresses of 120 N/mm^2 tensile and 100 N/mm^2 compression exist on two perpendicular planes at a certain point in a body. They are also accompanied by shear stress on the planes. The greatest principal stress at the point due to these is 150 N/mm^2.

a) What must be the magnitude of the shearing stresses on the two planes?

b) What will be the maximum shearing stress at the point?

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