B.E DEGREE EXAMINATIONS: NOV/DEC 2012

Third Semester

CIVIL ENGINEERING

CEE103: Mechanics of Solids

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Unit of strain is

    a) Pa   b) MPa

    c) N/mm^2 d) No Unit

2. Yield stress is also known as

    a) Permissible Stress   b) Ultimate stress

    c) Working stress   d) Proof stress

3. The number of members are less than 2j-3 is

    a) Perfect frame   b) Redundant frame

    c) Deficient frame   d) Truss frame

4. In a thin shell, the ratio of longitudinal stress to the circumferential stress is

    a) 1/2   b) 3/4

    c) 1   d) 2

5. The negative bending moment which causes the beam to bend upward is called (simply supported beam)

    a) Hogging   b) Clockwise

    c) Sagging   d) Anticlockwise

6. The bending stress developed at neutral axis level is

    a) Compressive stress   b) Shear stress

    c) Tensile stress   d) No stress

7. Maximum deflection of a cantilever carrying a point load W at it's free end is

    a) $WL^4/2EI$ b) $WL^4/3EI$

    c) $WL^4/8EI$ d) $WL^4/16EI$

8. In a rectangular section, the maximum shear stress occurs at

    a) Apex of the triangle   b) Mid of the height

    c) 1/3 of the height   d) Base of the triangle

9. A shaft revolving at N rpm transmits torque T in N-M. The power developed is

a) $\dfrac{2\pi NT \text{ kW}}{60000}$

b) $(2\pi NT\ /30\ )\ kW$

c) $(2\pi NT\ -60\ )\ kW$

d) $(2\pi NT\ /120\ )\ kW$

10. The Deflection in a closely at the center of a leaf spring is

a) $\dfrac{64WR^3 cd^4}{cd^4}$

b) $\dfrac{cd^4}{64WR^3}$

c) $\dfrac{32cd^4}{WR^3 n}$

d) $\dfrac{64WR^3}{cd^4 n}$

PART B (10 x 2 = 20 Marks)

11. Define modulus of rigidity.

12. For a given material, the modulus of elasticity is 110kN/mm^2 and the modulus of rigidity is 43kN/mm^2. Find bulk modulus.

13. Differentiate determinate and determinate frame.

14. Find the change in volume of cylindrical vessel having volume is 392.7x10^6 mm^3. circumferential strain is 0.32x10^{-3}and longitudinal strain 0.075x10^{-3}.

15. A cantilever beam of span 2m is subjected to a UDL of 8kN/m. Determine the shear force and bending moment at mid span.

16. State any four assumptions of theory of simple bending.

17. What is conjugate beam?

18. Draw the variation of shear stress for a I - section.

19. What is the polar modulus of section for a hollow circular section?

20. What is the function of a spring?

PART C (5 x 14 = 70 Marks)

21. a) Determine the value P and total elongation of the steel bar as shown in fig.1. Take E = 210kN/mm^2.

Fig.1

(OR)

b) The state of stress at a point in a strained material is shown in fig 2. Determine
(i) the principle stresses (ii) inclination of principle planes and (iii) max shear
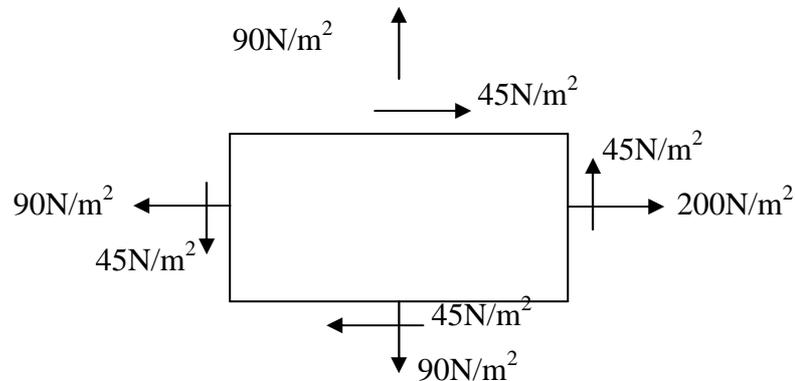stress.

$90N/m^2$

$45N/m^2$

$45N/m^2$

$90N/m^2$

$200N/m^2$

$45N/m^2$

$45N/m^2$

$90N/m^2$

Fig 2.

22. a) Analyse the truss shown in fig 3. any one method.

B   50kN

3 m

A   D   C

100kN

4m   4m
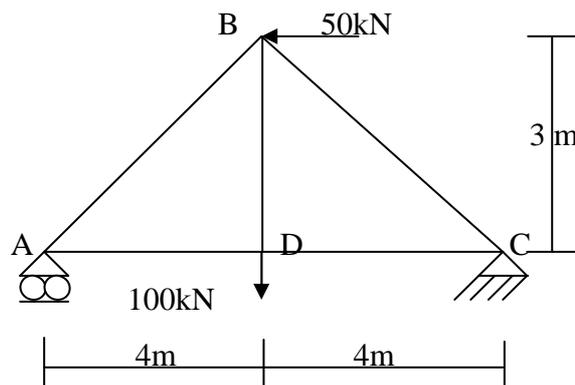
Fig 3.

(OR)

b) A steel cylinder with flat ends is 2m long and 1m diameter with metal thickness
10mm. It is filled with water at atmospheric pressure. The pressure has been
increased to 2MPa by pumping more water. An amount of $2.9x10^6 \, mm^3$ of water
has been collected at the outlet after releasing the pressure. If $E=2x10^5 MPa$ and
Poisson's ratio 0.3. Find out the bulk modulus.

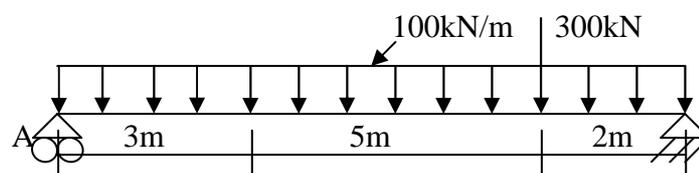23. a) Draw the shear force and bending moment diagrams for the loaded beam shown in
fig 4.

100kN/m   300kN

A   3m   5m   2m

Fig 4.

b) A beam of symmetrical has a depth of 450mm and moment of inertia of 275.36×10^6mm^4 about its axis of bending. Find the maximum permissible span of the beam. If simply supported at the ends, it has to carry a UDL of 25kN per metre run without exceeding a bending stress of 120MPa.

24. a) A cantilever beam AB 2m long is carrying a load of 20kN at free end and 30kN at a distance 1m from the free end. Find the slope and deflection at the free end. Take E= 200GPa and I = 150×10^6mm^4.

(OR)

b) An I section beam 350mm x 200mm has a web thickness of 12.5mm and a flange thickness of 25mm. It carries a shearing force of 200kN at a section. Sketch the shear stress distribution across the section.

25. a) A solid circular shaft is transmit 400kN power at 160rpm. Find the diameter of the shaft if the shear stress is not to exceed 50 N/mm^2.

(OR)

b) It is required to design a close coiled helical spring shall deflect 1mm under an axial load of 100N at a shear stress of 90MPa. The spring is to be made of round wire having shear modulus of 0.8×10^5MPa. The mean diameter of the coil is 10times that of the coil wire. Find the diameter and length of the wire.

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