Reg. No. : | | | | | | | | | | |

Question Paper Code: 41134

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Third Semester

Civil Engineering

14UCE304 - MECHANICS OF SOLIDS – I

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 1 = 10 Marks)

1. Within elastic limit in a loaded material, stress is_____

   (a) inversely proportional to (b) directly proportional to strain
   (c) equal to strain (d) not equal to strain

2. Strain energy is the

   (a) energy stored in a body when strained within elastic limits
   (b) energy stored in a body when strained up to the breaking of a specimen
   (c) maximum strain energy which can be stored in a body
   (d) proof resilience per unit volume of a material

3. A perfect frame should satisfy the relation_____

   (a) $m=2j+3$ (b) $m=3j-4$ (c) $m= 2j-3$ (d) $m=3j-2$

4. A fixed beam of length *(l)* carries a point load (*w*) at the centre. The number of points of contra flexure

   (a) is one (b) are two (c) are three (d) is none

5. If a cantilever beam of span (*L*) carries a point load (*W*) at free end of the beam then the shear force diagram will be

(a) rectangle (b) two equal and opposite rectangle
(c) right angled triangle (d) two equal and opposite triangle

6. The shear stess required to cause plastic deformation of solid metal is called

(a) proof stress (b) flow stress (c) rupture stress (d) ultimate stress

7. Strain energy is the

(a) energy stored in a body when strained within elastic limits
(b) energy stored in a body when strained up to the breaking of a specimen
(c) maximum strain energy which can be stored in a body
(d) proof resilience per unit volume of a material

8. A coil is having stiffness *k*. It is cut into halves, then the stiffness of the cut coils will be

(a) same (b) half (c) double (d) one-forth

9. In Mohr's circle of stress, the diameter represents

(a) maximum shear stress (b) deviator stress
(c) major principal stress (d) minor principal stress

10. Mohr's circle is used to determine the stresses on an oblique section of a body subjected to

(a) direct tensile stress in one plane accompanied by a shear stress
(b) direct tensile stress in two mutually perpendicular directions
(c) direct tensile stress in two mutually perpendicular directions accompanied by a simple shear stress
(d) all of the above

PART - B (5 x 2 = 10 Marks)

11. State the relationship between Young's modulus and Rigidity modulus.

12. Explain the concept of analysis of tresses carrying horizontal loads in method of joints.

13. Enumerate some statically indeterminate beams with examples.

14. Write the assumptions in the theory of pure torsion.

15. Define principal plane.

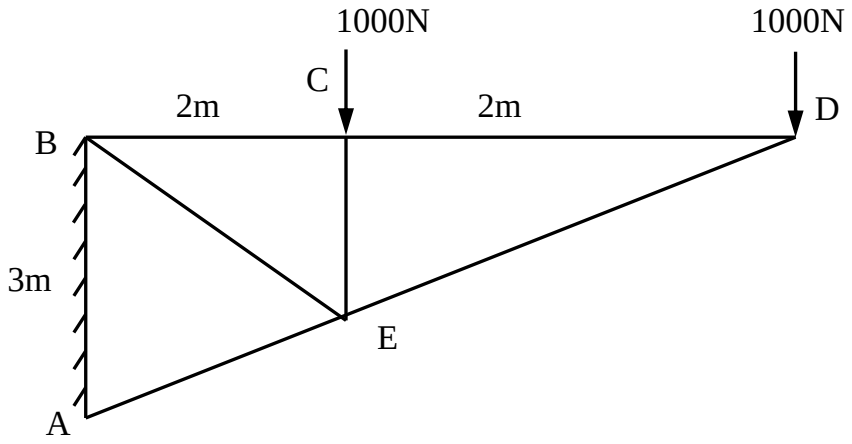
PART - C (5 x 16 = 80 Marks)

16. (a) A steel wire 2.5 *mm* dia is firmly held in a clamp which it hangs vertically. An anvil, the weight of which may be neglected is secured to the wire 1.8 *m* below the clamp. The wire is to be tested allowing a weight to slide over the wire to drop freely from 1 *m* above the anvil. Evaluate the weight required to stress the wire to 1000 N/mm^2, assuming the wire to be elastic up to this stress. Take E = 210 *Gpa*. (16)

Or

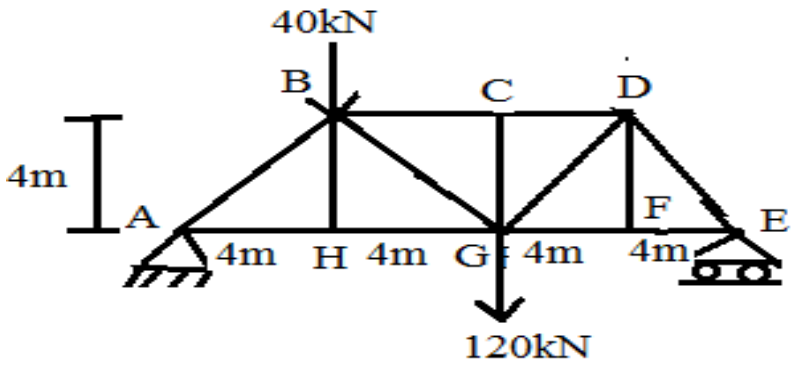
(b) A metallic bar 300*mm* x 100mm x 40 *mm* is subjected to tensile forces of 5*kN*, 4*kN* and 4*kN* along *x*, *y* and *z* directions respectively. Determine the change in volume of the block, Take Young's modulus as $2x10^5 N/mm^2$ and Poisson's ratio as 0.25. (16)

17. (a) Determine the member forces in a truss structure as shown in figure by any suitable method. (16)



Or

(b) Determine the forces in all members of a truss as shown in below figure. (16)



18. (a) A simply supported beam of span 7*m* is carrying a uniformly distributed load of10*kN/m* over 3*m* distance from left support of beam and another uniformly distributed of 5*kN*/*m* over 2*m* distance from right support. Draw the shear force diagram and bending moment diagram. Also determine the maximum bending moment value. (16)

Or

(b) A cantilever of length 2.0 *m* carries a uniformly distributed load of 1 *kN/m* run over a length of 1.5 *m* from the free end. Draw the shear force and bending moment diagram for the cantilever. (16)

19. (a) Two shafts of same material and same length are subjected to the same torque.If the first shaft is solid circular section and second shaft is hollow circular section, whose internal diameter is 2/3 of outside diameter and the maximum shear stress developed in each shaft is the same. Compare the weight of the shafts. (16)

Or

(b) (i) Derive the torsion equation for a circular shaft of diameter '*d*' subjected to torque '*T*'. (8)

(ii) Find the torque that can be transmitted by a thin tube of 6 *cm* mean diameter and wall thickness of 1 *mm* the permissible shear stress is 6000 N/cm^2. (8)

20. (a) A rectangular bar of cross sectional area 10000 mm^2 is subjected to an axial load of 20 *kN*. Determine the normal and shear stress on a section which is inclined at an angle of 30° with normal cross-section of the bar. (16)

Or

(b) An elemental cube is subjected to tensile stress of 30kN/mm^2 and 10kN/mm^2 acting on two mutually perpendicular planes and a shear stress of 10kN/mm^2 on these planes. Draw the Mohr's circle of stresses and determine the magnitudes and direction of principle stresses and also greatest shear stress. (16)

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