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

Question Paper Code: 43104

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Third Semester

Civil Engineering

14UCE304 - MECHANICS OF SOLIDS – I

(Regulation 2014)

Duration: One hour Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

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. Moment of inertia of a circle of diameter d about its centroidal X axis is _____

   (a) πd^4 /64 (b) πd^4 /50 (c) πr^4 / 64 (d) πr^4 / 35

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. In the torsion equation, the term J/R is called as

(a)shear modulus (b) section modulus (c) polar modulus (d) none of these

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

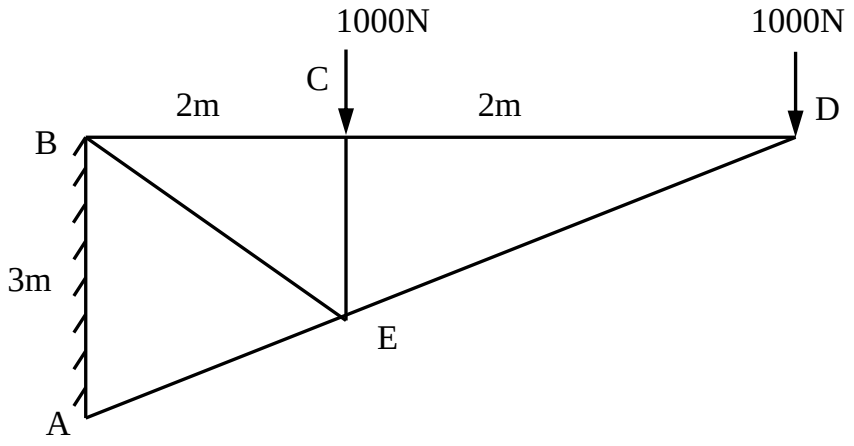
(a) direct tensile stress in one plane accompanied by a shear stress
(b) direct tensile stress in two mutually perpendicular directions
(c) direct tensile stress in two mutually perpendicular directions accompanied by a simple shear stress
(d) all of the above

PART – B (3 x 8= 24 Marks)

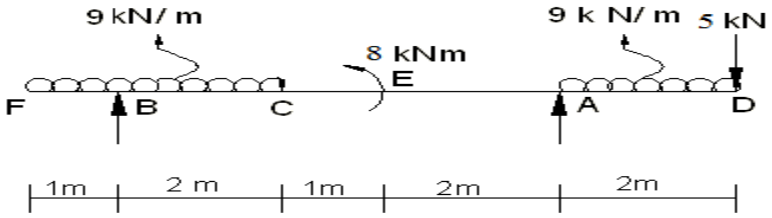
(Answer any three of the following questions)

11. A steel bar is placed between two copper bars each having the same area and length as t he steel bar at $16^{o}C$. At this stage, they are rigidly connected together at both the ends. When temperature raised to 316 ^{o}C, the length of the bar increases by 1.5 *mm*. Determine the final stress and strain in the bars. E_S = 210 GN/m^2, E_C = 110 GN/m^2, α_S = 0.000012 per°C, α_C = 0.0000175 per°C. (8)

12. Determine the member forces in a truss structure as shown in figure by any suitable method. (8)



13. Draw shear force and bending moment diagram for an overhanging beam shown in the figure. (8)



14. A solid shaft is subjected to a torque of 50 *kNm*. If angle of twist is 0.6^o per metre length of the shaft and the shear stress is not to be allowed to exceed 85 MN/m^2. Find suitable diameter of the shaft, Final maximum shear stress and maximum shear strain in the shaft. Modulus of rigidity of the material of the shaft is 80 GN/m^2. (8)

15. A body is subjected to stresses on two mutually perpendicular planes are 30 MN/m^2 (tensile) and 20 MN/m^2 (tensile). Shear stress across this planes are 8 MN/m^2. Using Mohr's circle method find the magnitude and direction of the resultant stress on the plane making an angle of 35^o with the plane of first stress and also find the normal and tangential stress on the plane. (8)