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

Question Paper Code: 31134

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

Third Semester

Civil Engineering

01UCE304 - MECHANICS OF SOLIDS - I

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. State Hooke's law.
2. What is compound bar?
3. Define frame.
4. What do you mean by redundant frame?
5. What is Cantilever beam?
6. What is shear force?
7. Define torsional rigidity.
8. State any two functions of springs.
9. Define principle stresses and principle plane.
10. What is the use of Mohr's circle?

PART - B (5 x 16 = 80 Marks)

11. (a) Three bars made of copper, zinc and aluminium are of equal length and have cross section 500, 700, and 1000 *sq.mm* respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250 *kN*, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10^{5} N/mm^2, for zinc = 1×10^{5} N/mm^2 and for aluminium = 0.8×10^{5} $N/mm.^2$ (16)

Or

(b) A bar of 25mm diameter is subjected to a pull of 40 *kN*. The measured extension on gauge length of 200*mm* is 0.085*mm* and the change in diameter is 0.003*mm*. Calculate the value of Poisson's ratio and the three moduli. (16)

12. (a) A cantilever truss is show in figure 1. Find the forces in the members of the truss by the method of joint. (16)

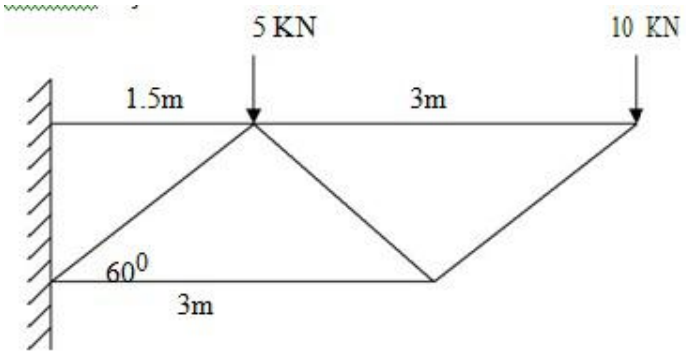

Figure 1

Or

(b) A truss of span 9*m* is loaded as shown in figure 2. Find the reaction and forces in the members marked 1, 2, and 3 by using method of section. (16)

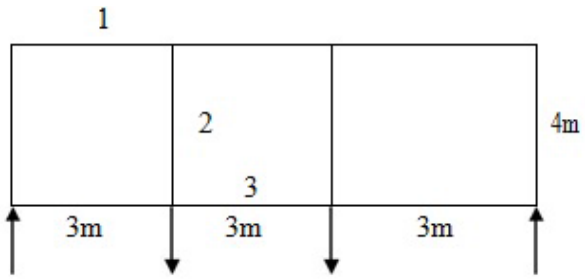

Figure 2

13. (a) A simply supported beam of length 10*m* carries the uniformly distributed load and two point loads as shown in Fig. Draw the S.F and B.M diagram for the beam as shown in figure 3 and also calculate the maximum bending moment. (16)

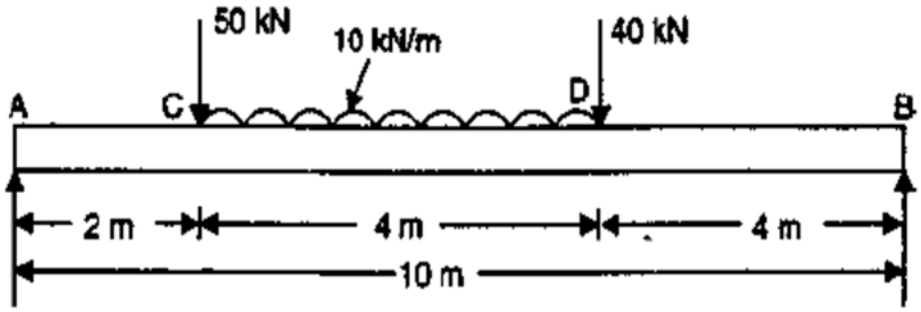

Figure 3

Or

(b) Draw shear force and bending moment diagram for the beam shown in Figure 4. (16)

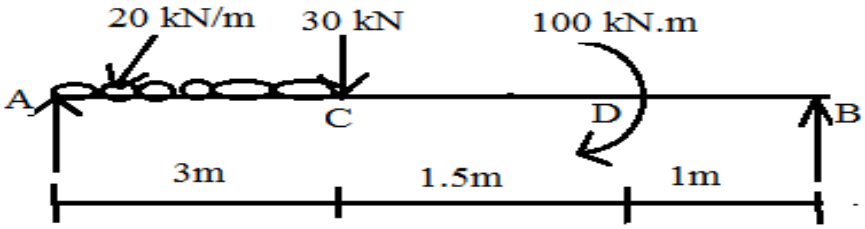

Figure 4

14. (a) A circular shaft of 1000*mm* diameter and 2*m* length is subject to a twisting moment which creates a shear stress of 20N/mm^2 at 30*mm* from the axis of the shaft. Calculate the angle of twist and the strain energy stored in the shaft. Take G=8x104 N/mm^2. (16)

Or

(b) A close coiled helical spring is made of a round wire having '*n*' turns and the mean coil radius *R* is 5 times the wire diameter. Show that the stiffness of the spring = 2.05 *R/n*. If the above spring is to support a load of 1.2*kN* with 120*mm* compression. Calculate mean radius of the coil and number of turns assuming G = 8200 N/mm^2 and permissible shear stress, λ allowable = 250 N/mm^2. (16)

15. (a) The principal stress in the wall of a container are 40 MN/m^2 and 80 MN/m^2. Determine the normal, shear and resultant stresses in magnitude and direction in a plane, the normal of which makes an angle of 30^o with the direction of maximum principal stress. (16)

Or

(b) At a point in a strained material the principle stress are 100N/mm^2 (T) and 60N/mm^2(C) .Determine the normal stress, shear stress, resultant stress on a plane inclined at 50˚ to the axis of major principle stress. Also find out the maximum shear stress at the point. (16)

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