B. E. Third Semester (Civil Engineering) / SoE – 2014-15 Examination

Course Code : CV 1201 / CV 201 **Course Name : Strength of Materials**

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All questions carry marks as indicated.
(3) Assume suitable data wherever necessary.

1. Solve the following :—

(A1) A steel wire 2 m long and 3 mm in diameter is extended by 0·75 mm when a weight W is suspended from the wire. If the same weight is suspended from a brass wire, 2·5 m long and 2 mm in diameter, it is elongated by 4·64 mm. Determine the modulus of elasticity of brass if that of steel be $2{\cdot}0 \times 1{\cdot}0^5$ N/mm^2. 6 (CO 1, 2)

(A2) Explain in short stress – strain curve for mild steel. 2 (CO 1)

(A3) State the Hooke's law and Elastic Module. 2 (CO 1)

OR

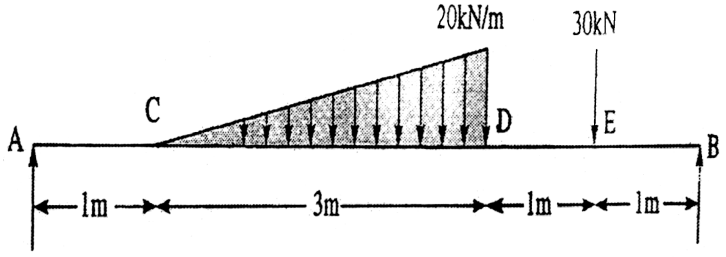
(B1) For a given material, Young modulus is 110 GN/m^2 and shear modulus is 42 GN/m^2. Find the bulk modulus and lateral contraction of a round bar of 37·5 mm diameter and 2·4 m length when stretched 2·5 mm. 6 (CO 1, 2)

(B2) What is ultimate stress and Factory of Safety ? Explain. 2 (CO 1)

(B3) Define longitudinal strain and lateral strain. 2 (CO 1)

2. Solve the following :—

(A1) Draw the SFD and BMD for the beam as shown in Figure.



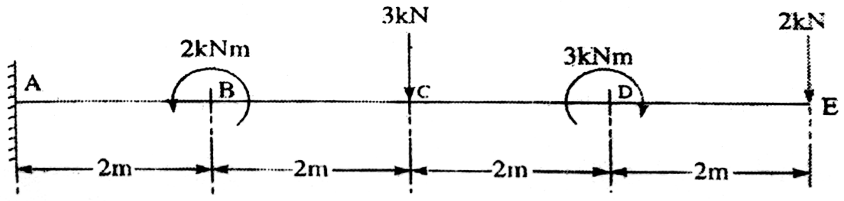
6 (CO 2, 3)

(A2) Write any two standard cases for shear force and bending moment diagram. 2 (CO 2, 3)

(A3) What is shear force and bending moment diagram ? 2 (CO 1)

OR

(B1) Draw the SFD and BMD for the beam as shown in Figure.



6 (CO 2, 3)

(B2) Draw a SFD and BMD for a cantilever beam carrying gradually varying load. 2 (CO 2, 3)

(B3) Draw a SFD and BMD for a simply supported beam with eccentric point loading. 2 (CO 2, 3)

3. Solve the following :—

(A1) Determine the dimension of joist of a timber for a span 8 m to carry a brick wall 200 mm thick and 5 m high, if the density of brick work is 1850 kg/m^3 and the maximum permissible stress is limited to 7·5 MN/m^2. Given that the depth of joist is twice the width. 6 (CO 2, 3)

(A2) A symmetrical section 200 mm deep has a MI $2{\cdot}26 \times 10^{-5}$ about its neutral axis. Determine the longest span over which, when simply supported, the beam would carry a UDL of 4 kN/m run without a stresses due to bending exceeding 125 MN/m^2. 2 (CO 2, 3)

(A3) What is Shear Stress and Bending Stress ? 2 (CO 1)

OR

(B1) The sheer force acting on a section of beam is 50 KN. The section of beam is of T section having top flange dimension 100 × 20 mm and web 20 × 80 mm. The moment of inertia about the horizontal axis is $314{\cdot}22 \times 10^4$ mm^4. Calculate the shear stress at the neutral axis and at the junction of web and flange. 6 (CO 2, 3)

(B2) Calculate the MI of T section with respect to NA having top flange 200×20 mm and with a web 8×300 mm. 2 (CO 2, 3)

(B3) What are the various assumptions made in the theory of simple bending ? 2 (CO 1)

4. Solve the following :—

(A1) Derive the equation of torsion giving meaning of each term used in it. 6 (CO 1, 4)

(A2) Define the term : Torsion, torsional rigidity and polar moment of inertia. 2 (CO 4)

(A3) What do you mean by the strength of shaft ? 2 (CO 4)

OR

(B1) A solid steel shaft has to transmit 65 kW at 300 rpm. Taking allowable shear stress as $60\ MN/m^2$. Find the suitable diameter of the shaft, if the maximum torque transmitted on each revolution exceeds the mean by 25%. 6 (CO 3, 4)

(B2) What are the various assumptions made in the theory of Pure Torsion ? 2 (CO 4)

(B3) Define the term polar modulus. 2 (CO 4)

5. Solve the following :—

(A1) Derive the differential equation for simply supported beam with point load at centre. 6 (CO 2, 3, 4)

(A2) Determine the deflection under the load and the maximum deflection of simply supported beam of length 5 m which carrying a point load of 5 KN at a distance of 3 m from left end. 2 (CO 2, 3, 4)

(A3) What is Macaulay's Method ? Where it is used ? 2 (CO 1)

OR

(B1) Derive the differential equation for simply supported beam with UDL over the entire span. 6 (CO 2, 3, 4)

(B2) A girder of uniform section and a constant depth is freely supported over a span of 3 m. If the point load at the mid span is 30 KN and $Ixx = 15{\cdot}614 \times 10^{-6}\ m^4$, Calculate the central deflection Take $E = 200\ GN/m^2$. 2 (CO 2, 3, 4)

(B3) Write the standard formula for slope and Deflection for simply supported beam with point load at centre and simply supported beam with UDL over the entire span. 2 (CO 2, 3, 4)

6. Solve the following :—

(A1) At a point in a strained body there are normal compressive stresses $50\ N/mm^2$ and $40\ N/mm^2$ acting on two mutually perpendicular planes together with shear stress of $20\ N/mm^2$. Locate the principal planes and calculate the principal stresses. 6 (CO 2, 3, 4)

(A2) Write short notes on :—

(i) Principle planes.

(ii) Principle stress. 2 (CO 1)

(A3) Write in short about Mohr's circle. 2 (CO 1)

OR

(B1) The point is subjected to perpendicular stresses of $50\ MN/m^2$ and $30\ MN/m^2$ both tensile. Determine the normal, tangential and resultant stresses and its obliquity on a plane making an angle of 30^0 with the axis of second stress. 6 (CO 2, 3, 4)

(B2) The Principle stresses at a point across the two mutually perpendicular planes are $75\ MN/m^2$ (tensile) and $35\ MN/m^2$ (tensile). Determine the normal stresses and its obliquity on a plane at 20^0 with the major principle plane. 2 (CO 2, 3, 4)

(B3) The principle tensile stresses at a point across two perpendicular planes are $120\ MN/m^2$ and $60\ MN/m^2$, Find tangential stress and its obliquity on a plane at 20^0 with the major principle plane, ii) The intensity of stress which acting alone can produce the same maximum strain. Take Poisson ratio = $^1/_4$. 2 (CO 2, 3, 4)