RDR/2KNT/OT – 10068

B. E. Third Semester (Civil Engineering) / SoE – 2018 Examination

Course Code : CV 2201 **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) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Diagrams should be given wherever necessary.
(6) Illustrate your answers wherever necessary with the help of neat sketches.

1. Solve the following :—

(A1) A tension test was conducted on a mild steel specimen with the following result obtained. Initial diameter of specimen = 40 mm, Gauge length = 400 mm, Tensile load = 64 KN, Extension of specimen = 0·115 mm, Reduction in diameter = 0·00466 mm. Determine E, K, G, μ. 6

(A2) Define Hook's Law and Factor of safety. 2

(A3) Explain stress – strain curve for ductile material in short. 2

OR

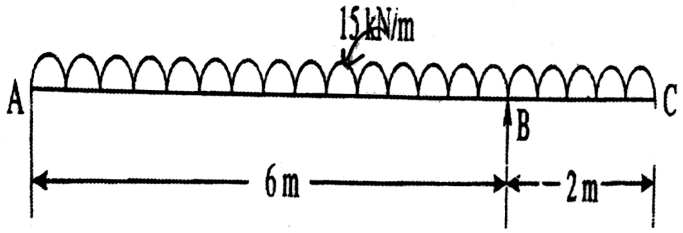
(B1) A steel bar 800 mm long, its two ends are 50 mm and 40 mm in diameter and the length of each rod is 300 mm. The middle portion of the bar is 20 mm in diameter and 400 mm long. If the bar is subjected to an axial tensile load of 25 KN, Find its total extension. 6

(B2) Define linear strain and lateral strain. 2

(B3) Explain stress – strain curve for brittle material in short. 2

2. Solve the following :—

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



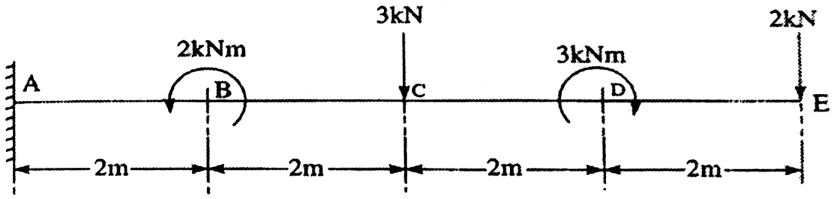
6

(A2) Write the standard case for simply supported beam with point load at centre. 2

(A3) What is SFD and BMD ? Explain. 2

OR

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



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(B2) Write the standard case for simply supported beam with UDL over the entire span. 2

(B3) Write short note on point of contra shear and point of contra flexure. 2

3. Solve the following :—

(A1) Prove that the basic equation of bending i.e. $M/I = 6/Y = E/R$. 6

(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

(A3) What are the various assumptions made in the theory of simple bending. 2

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

(B2) Define Moment of Inertia with neat sketch. 2

(B3) Write short note on Parallel Axis Theorem. 2

4. Solve the following :—

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

(A2) Define the term : Torsion, Torsional rigidity and Polar moment of interia. 2

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

OR

(B1) A hallow shaft is to transmit 400 kW at 90 rpm, if the shear stress is not allowed to exceed 60 MN/m^2 and the internal diameter is 0·6 of the external diameter, find the external and internal diameter assuming that the maximum torque is 1·4 times the mean. 6

(B2) What is torsion of shaft ? Explain. 2

(B3) What is the practical example of torsion ? Where it acts ? 2

5. Solve the following :—

(A1) Derive the differential equation for simply supported beam with point load at centre. 6

(A2) What are the steps in double integration method. 2

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

OR

(B1) 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 (1) The central deflection, (2) The slope at the ends of beams. Take $E = 200\ GN/m^2$. 6

(B2) Write strength and stiffness criteria for a beam. 2

(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

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

(A2) Write short note on :

(i) Principal planes.

(ii) Principal stress. 2

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

OR

(B1) The principal tensile stresses at a point across two perpendicular planes are $120\ MN/m^2$ and $60\ MN/m^2$, Find (i) The normal and tangential stress and the resultant stress and its obliquity on a plane at 20^0 with the major principal plane. (ii) The intensity of stress which acting alone can produce the same maximum strain. Take Poisson ratio = $^1/_4$. 6

(B2) The point is subjected to perpendicular stresses of $50\ MN/m^2$ and $30\ MN/m^2$ both tensile. Determine resultant stresses. 2

(B3) Write in short note on Mohr's circle. 2