B.Tech Sem - III (2007 Course) (Civil Engg.) : SUMMER - 2019

SUBJECT: MECHANICS OF MATERIALS

Day : Monday
Date : 13/05/2019
S-2019-2967
Time : 02.30 PM TO 05.30 PM
Max. Marks: 80

N. B.:

1) **Q.No.1** and **Q.No.5** are **COMPULSORY**. Out of the remaining attempt **ANY TWO** questions form section – **I** and Section – **II**.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in SAME answer books.
4) Draw neat and labeled diagrams **WHEREVER** necessary.
5) Assume suitable data, if necessary.

SECTION - I

Q.1 **a)** Derive of fundamental the relation for the deformation of a body, when it is subjected to a tensile force. **(05)**

b) Describe the assumption in the Euler's theory. **(05)**

c) Write short note on: **(04)**
i) Resilience
ii) Proof of resilience

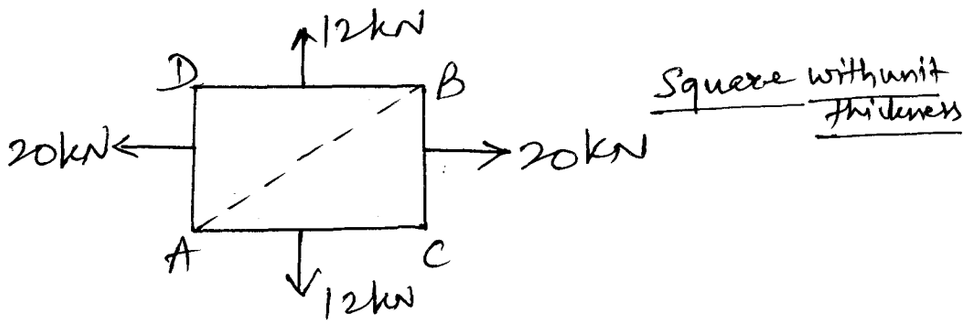
Q.2 **a)** A bar of 20mm diameter is subjected to a pull of 50KN. The measured extension over a gauge length of 200mm is 0.1 mm and the change in the diameter 0.0035 mm. Calculate the Poissons ratio, modulus of elasticity and bulk modulus. **(07)**

b) A Brass rod 2m long is fixed at both its ends. If the thermal stress is not to exceed 76.5Mpa. Calculate the temperature through which the rod should be heated. Take α and E as 17×10^{-6}/ k and 90 Gpa respt. **(06)**

Q.3 **a)** A Column of hollow circular cross section has external diameter of 120mm and internal diameter 80mm. The Column is 4 m long and hinged at both ends. Find the slenderness ratio of the column. **(07)**

b) A hollow circular steel column having external diameter 200mm and internal diameter 150mm carries a vertical load of 80 KN acting with an eccentricity of 50mm. Calculate maximum and minimum stress intensities in the section. **(06)**

Q4 **a)** A small block is subjected to uniformly distribution tensile force having the resultant values as shown in figure. Compute the stress components developed along the diagonal AB **(07)**



b) Explain the meaning of gradually applied and suddenly applied load on a member. Write expression for normal stresses induced in the member and state the relationship between them. **(06)**

(P.T.O.)

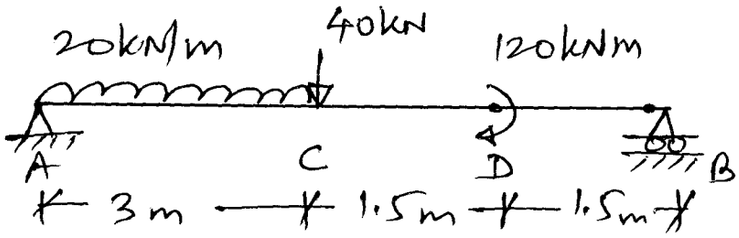
SECTION - II

Q.5 **a)** Explain relation between the shear force, Bending moment and intensity of loading. **(05)**

b) State Torsional formula and explain meaning of each term. **(05)**

c) State conditions of simple bending. **(04)**

Q.6 **a)** Draw S.F.D. and B.M.D. for the beam as shown in figure. **(07)**

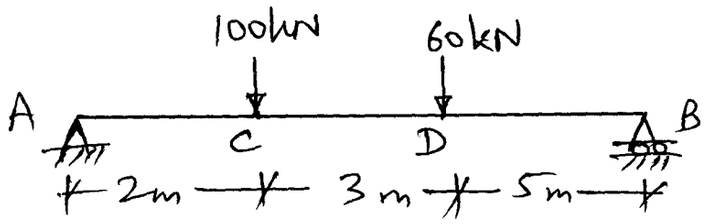


b) Calculate the maximum stress in round steel bar 12mm in diameter and 20m long due to its own weigh when it is simply supported at its ends. **(06)**

Q.7 **a)** Draw shear stress distribution diagram for T cross-section of beam flange 200mm x 50mm and web -200mm x 50mm. S.F. is 100KN. **(07)**

b) Determine the size of solid shafts to transmit 200KW each without exceeding an allowable shear stress of 70 Mpa. One of the shafts operates at 20 rpm while other at 20 000rpm. Comment on the result. **(06)**

Q.8 **a)** Calculate the deflection under each load as shown in figure I = $18X10^8$ mm^4 and E = 200 KN/mm^2 **(07)**



b) A shell 3.25m long, one meter in diameter is subjected to an internal pressure of 1 N/mm^2, if the thickness of the cell is10mm. Find the circumferential &longitudinal stresses. Find also the maximum shear stress of the shell. Take E=$2X10^5$ N/mm^2 and 1/m + 0.3. **(06)**

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