B.TECH SEM - III (2007 COURSE) (CIVIL ENGG.) : SUMMER - 2018

SUBJECT :MECHANICS OF MATERIALS

Day: **Wednesday** Time : **02.30 PM TO 05.30 PM**
Date : **23/05/2018** **S-2018-2564** Max. Marks : 80

N.B.:

1) **Q. No. 1** and **Q. No. 5** are **COMPULSORY.** Out of 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 **SEPARATE** answer books.
3) Draw neat and labeled diagrams **WHEREVER** necessary.
4) Assume suitable data, if necessary.

SECTION - I

Q.1 **a)** Define stress, strain & elasticity. Derive a relation between stress & strain of an elastic body. **(05)**

b) What do you understand by the terms 'Column and Strut'? **(05)**

c) From first principle, derive an equation for the energy stored in a strained body. **(04)**

Q.2 **a)** A circular bar 2.5m long tapers uniformly from 25mm diameter to 12mm diameter .Determine extension of the rod under a pull of 30KN. Take E for a bar as 200 GPa. **(07)**

b) A reinforced concrete column 400mm x 400mm is provided with 4 bars of 20mm diameter with proper cover. Determine the safe load the column can carry without exceeding the stress in steel 130Mpa and in concrete 4Mpa. Take Est/Eco = 20 **(06)**

Q.3 **a)** In neat separate sketches, Show equivalent length of column for 4 types of standard end conditions (do not explain). **(07)**

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

Q.4 **a)** The principle stresses at a point in a bar are 200N/mm^2 (T) and 100N/mm^2. Determine the resultant stress in magnitude and direction on a plane inclined at 60^0 to the axis of the major principle stress. Also determine the maximum shear stress. **(07)**

b) A load of 5 KN falls from a distance of 1m on to a timber pole (E = 200GPa) of 300mm diameter and 6m height. Determine instantaneous stress induced in the pole neglecting the self weight. **(06)**

P.T.O.

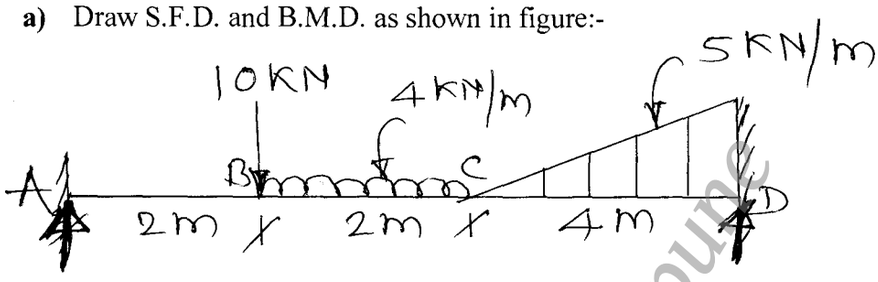
SECTION - II

Q.5 **a)** State Torsional formula and explain meaning of each term. **(05)**

b) State conditions of simple bending. **(05)**

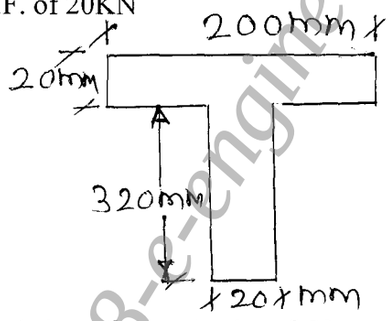
c) Derive Lame's equation of stress. **(04)**

Q.6 **a)** Draw S.F.D. and B.M.D. as shown in figure:- **(07)**



b) A rectangular beam 300 deep is simply supported over a span of 4m. What udl the beam may carry if the bending stress is not to exceed 120Mpa? Take I = 8 x 10^6 mm^4. **(06)**

Q.7 **a)** Draw the profile of shear stress distribution over the cross-section. As shown in fig. Take S.F. of 20KN **(07)**



b) A shaft consisting of a steel tube of 50mm outside diameter is to transmit 100 KW of power while rotating at a frequency of 20 Hz. Determine the tube thickness and shearing stress is not to exceed 60Mpa. **(06)**

Q.8 **a)** A beam of 10m long is simply supported at the ends. If carries two point loads of 150 KN and 65KN at a distance of 2.5m and 5.5m respt. from the left end. Calculate the max. deflection. **(07)**

b) A thin spherical shell of 1.5m diameter is 10mm thick. It is filled with liquid at internal pressure of 30 MPa. Find hoop stress, change in diameter and change in volume Take E = 200GPa, μ =0.3 **(06)**

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