rgpvonline.com rgpvonline.com

Total No. of Questions : 8] *[Total No. of Printed Pages : 4*

Roll No .....

CE-3003 (CBGS)

B.E., III Semester

Examination, May 2018

Choice Based Grading System (CBGS)

Strength of Materials

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

iii) Assume missing/misprint data suitably if required.

1. a) Derive the relationship between modulus of elasticity, modulus of rigidity and Poisson's Ratio of an elastic body. 7

b) Two vertical rods one of steel and the other of copper are each rigidly fixed at the top and 50cm apart. Diameters and lengths of each rod are 2cm and 4m respectively. A cross bar fixed to the rods at the lower ends carries a load of 5000N such that the cross bar remains horizontal even after loading. Find the stress in each rod and the position of the load on the bar. Take E for steel = 2×10^5N/mm^2 and E for copper = 1×10^5N/mm^2. 7

rgpvonline.com rgpvonline.com

rgpvonline.com rgpvonline.com

2. a) If a tension bar is found to taper uniformly from (D-a) cm diameter to (D+a) cm, prove that the error involved in using the mean diameter to calculate Young's modulus is $(10a/D)^2$ percent. 7

b) A steel tube of 4.5cm external diameter and 3mm thickness encloses centrally a solid copper bar of 3cm diameter. The bar and the tube are rigidly connected together at the ends at a temperature of 30°C. Find the stress in each metal when heated to 180°C. Also find the increase in length if the original length of the assembly is 30cm. Take $\alpha_S = 1.08\times10^{-5}$/°C, $\alpha_C = 1.7\times10^{-5}$/°C, E_S= 210 GPa, E_C = 110 GPa. 7

3. a) What is principal stress and principal strain? 4

b) At a point in a strained material the principal stress are 120N/mm^2 (tensile) and 80N/mm^2 (compressive). Determine the normal stress, shear stress and resultant stress on a plane inclined at 50° to the axis of major principal stress. Also determine the maximum shear stress at the point. 10

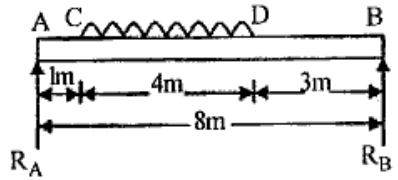
4. a) Derive an expression for bending stress at a layer in a beam. 7

b) A rectangular beam is to be cut from a circular log of wood of diameter D, find the dimensions of the strongest section in bending. 7

rgpvonline.com rgpvonline.com

rgpvonline.com rgpvonline.com

5. A beam of length 8m is simply supported at its ends. It carries a uniformly distributed load of 40kN/m as shown in figure. Determine the deflection of the beam at its mid-point and also the position of maximum deflection and maximum deflection. Take $E = 2\times10^5$ N/mm^2 and $I = 4.3\times10^8$mm^4. 14



6. a) What do you mean by strength of shaft. 4
   b) A hollow steel shaft is made to replace a solid wrought iron shaft of the same external diameter, the material being 35 percent stronger than the iron. Find what fraction of the outside diameter the internal diameter may be. Also neglecting the couplings, find the percentage saving in weight by this substitution, assuming that steel is 2% heavier than wrought iron. 10

7. a) Determine Euler's crippling load for an I-section joist 40cm×20cm×1cm and 5m long which is used as a strut with both ends fixed. Take Young's modulus for the joins as 2.1×10^5N/mm^2. 7
   b) A boiler shell is to be made of 15mm thick plate having a limiting tensile stress of 120 MPa. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively. Determine: 7
      i) The maximum permissible diameter of the shell for an internal pressure of 2MPa and
      ii) Permissible intensity of internal pressure when the shell diameter is 1.5m

rgpvonline.com rgpvonline.com

8. a) Define thin cylinders. Name the stresses, setup in thin cylinder subjected to internal load pressure. 6
   b) Write short notes on any two: 8
      i) Equivalent length of column
      ii) Curved beam
      iii) Castiglione theorem of these moment

rgpvonline.com

******

rgpvonline.com rgpvonline.com