COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)
SHIVAJI NAGAR, PUNE - 411 005

END Semester Examination

(CE-203) Strength of Materials (Th)

Course: SY B.Tech Branch: Civil Engineering

Semester: Sem III

Year: 2014-2015 Max.Marks:60

Duration: 3 Hours Time:- 10.00-1.00 **Date:30.11.14**

Instructions: **MIS No.** | | | | | | | | | | |

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper
7. Each question carry 5 marks.

Q 1. Solve any two

a) A steel rod 20 mm in diameter, 200mm long, is heated through 100^0K and at the same time subjected to a pull P. If the total extension of the rod is 0.3 mm, what should be the magnitude of P? Take $\alpha=12x10^{-6}$ per^o C, E=215 KN/mm^2.

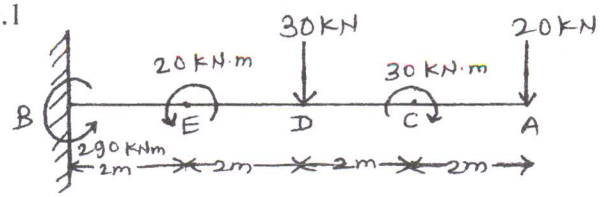
b) A load of 20 KN is applied on a short concrete column 450mmX450mm. The column is reinforced with four steel bars of 10 mm diameter, one in each corner. Find the stresses in the concrete and steel bars. Take E for steel as $2.1X10^5$ N/mm^2 and for concrete as $1.4X10^5$ N/mm^2.

c) A steel rod 3m long and 20mm in diameter is subjected to an axial tensile load of 50KN. Determine the change in length, diameter and volume of the rod. Take $E=2X10^5$ N/mm^2 and Poisson's ratio=0.25.

Q 2. Solve any two

a) Determine the dimensions of joist of a timber for span 10 m to carry a brick wall 230 mm thick and 6m high, if the density of brick work is 1850 kg/m^3 and the maximum permissible stress is limited to 7.5MN/m^2. Given that the depth of joist is twice the width.

b) Draw the Shear force and Bending moment diagrams for cantilever loaded as shown in Fig.1



c) A rectangular beam 200mm deep is simply supported over a span of 5 m. Determine the uniformly distributed load per meter which the beam may carry, if the bending stress should not exceed 120 N/mm^2. Take $I=8X10^6$ mm^4.

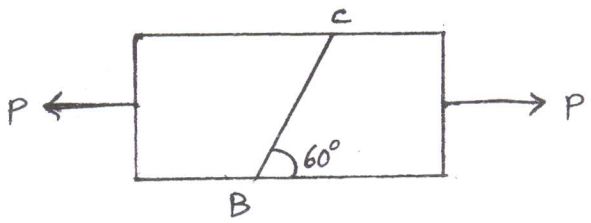
Q 3. Solve any two

a) What must be the length of a 6 mm diameter aluminium wire so that it can be twisted through one complete revolution without exceeding a shearing stress of 35 MN/m^2 ?.

b) What are the assumptions made in deriving torsion equation?

c) A beam of cross-section of an isosceles triangle is subjected to a shear force of 50KN at a section where base width=200mm and height =600 mm. determine horizontal shear stress at the neutral axis.

Q 4. A) A rectangular bar of cross-sectional area of 10000 mm^2 is subjected to a tensile load P as shown in Fig2.The permissible normal and shear stresses on the oblique plane BC are given 8 N/mm^2 and 4 N/mm^2 respectively. Determine the safe value of P.



B) At a point within a body subjected to two mutually perpendicular directions, the stresses are 100N/mm^2(Tensile) and 75 N/mm^2 (Tensile). Each of the above stresses accompanied by a shear stress of 75 N/mm^2. Determine the normal, shear and resultant stresses on an oblique plane inclined at an angle of 45^0 with the axis of minor tensile stress.

Q 5. A) A short hollow pier 1.5m square outside and 1m square inside, supports a vertical point load of 7 KN located on a diagonal 0.8 m from the vertical axis of the pier. Neglecting self weight of the pier, calculate the normal stresses at the four outside corner on a horizontal section of the pier.

B) Calculate the safe compressive load on a hallow cast iron column(one end fixed And the other hinged) of 125mm external diameter, 100 mm internal diameter and 12m length. Use Euler's formula with a factor of safety of 5 and E=95 GN/m^2.

Q 6. A) A beam AB of span 8m is simply supported at the ends. It carries a uniformly distributed load of 30 KN/m over its entire length and a concentrated load of 60 KN at 3m from the support A. determine the maximum deflection in the beam and the location where the deflection occurs. Take E=$200X10^6 KN/m^2$,I=$80X10^{-4}$ m^4.

B) A simply supported beam of 5m span has rectangular section 150mm wide and 250mm deep. The beam carries a point load of 10 KN at its centre and the deflection at the centre is 12.5mm. Neglecting the self-weight of the beam calculate: i) Young's modulus ii) Slope at supports.