REG NO | | | | | | | | | | | |

QP.CODE 27104

B.E./B.Tech. DEGREE EXAMINATION,NOVEMBER/DECEMBER 2015

Fourth Semester

Civil Engineering

CE 6402---STRENGTH OF MATERIALS

(Common To Fourth Semester Petrochemical Engineering And Third Semester Plastic Technology And Polymer Technology)

(Regulation 2013)

Time:Three hours **Maximum : 100 marks**

Answer ALL questions

PART A **(10×2=20 marks)**

1. Define strain energy.
2. Write the expression for strain energy due to shear.
3. Define degrees of freedom.
4. Define bending length of a column?
5. What is equivalent length of a column?
6. Define slenderness ratio.
7. Define the term obliquity.
8. Define principal plane.
9. Define shear centre.
10. Distinguish between curved beam and a straight beam.

PART B **(5 × 16 = 80 marks)**

11.(a) A tension bar 6 m long is made up of two parts,3 metre of its length has a cross-sectional area of 100 mm^2 while the remaining 3 metre has a cross-sectional area of 200 mm^2. An axial load of 100 kN is gradually applied. Fine the total strain energy produced in the bar and compare this value with that obtained in a uniform bar of the same length and having the same volume when under the same load. Take E = 2 x 10^5 N/mm^2.

(Or)

(b) Determine mid span deflection and end slopes of a simply supported beam of span 'L' carrying a uniformly distributed load 'w' per unit length.

12.(a) A fixed beam AB of length 6 m carries point loads of 150 kN and 120 kN at a distance of 2 m and 4 m from the left end A. Find the fixed end moments and the reactions at the supports. Draw bending moment and shear force diagrams.

(Or)

(b) A continuous beam ABC covers two consecutive span AB and BC of length of 4 m ,6 m carrying uniformly distributed loads of 6 kN/m and 8 kN/m respectively. If the ends A and C are simply supported find the support moments at A,B and C. Draw also bending moment and shear force diagrams.

13.(a) A hollow cylindrical cast iron column is 4 m long with both ends fixed.Determine the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the internal diameter as 0.8 times the external diameter. Take f_c= 550 N/mm^2 and α=1/1600 in Rankine's formula.

(Or)

(b) Determine the maximum and minimum hoop stress across the section of a pipe of 500 mm internal diameter and 100 mm thick, when the pipe contains of fluid, at a pressure of 10N/mm^2.

14. (a) Direct stresses of 120 N/mm^2 tensile and 80 N/mm^2 compression exist on two perpendicular planes at a certain point in a body. They are also accopmpanied by shear stress on the planes. The greatest principal stress at the point dur to these in 160 N/mm^2.

(i) What must be the magnitude of the shearibg stresses on the two planes?
(ii) What will be the maximum shearing stress at the point?

(Or)

(b) Find the diameter of a shaft according to the distorsion energy theory if the shaft is subjected to a maximum torque of 12 KNm and a maximum bending moment of 10 KNm at a particular section. Take allowable equivalent stress in simple tension as 180 MN/m^2.

15 (a) A beam of rectangular section,80 mm wide and 120 mm deep is subjected to a bending moment of 10 kN-m. The trace of the plane of loading is inclined at 45^o to the Y-Y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced in the section.

(Or)

(b) A curved beam, rectangular in cross-section is subjected to pure bending with couple of 400 N-m. The beam has width of 20 mm,and depth of 40 mm and is curved in a plane parallel to the depth. The mean radius of curvature is 5 mm. Find the position of the neutral axis, and the ratio of the maximum to the minimum stress. Also, plot the variation of the bending stress across the section.