

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer 2017 - 18 Examination**

**Semester: 3**  
**Subject Code: 03104203**  
**Subject Name: Structural Analysis - I**

**Date: 12/06/2018**  
**Time: 2.00 pm to 4.30 pm**  
**Total Marks: 60**

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) (15)**

1. In a truss, loads are applied only at the \_\_\_\_\_.
2. The section modulus of a circular section of diameter 'd' is \_\_\_\_\_.
3. The methods which are employed for finding out the forces in a truss are \_\_\_\_\_.
4. The value of Rankine's constant for mild steel is \_\_\_\_\_.
5. The formula for bending equation is \_\_\_\_\_.
6. In a cantilever beam, fibers above the neutral axis are in  
a)Tension b)Shear c)Compression d)None
7. For a circular section, the ratio of maximum shear stress to the average shear stress is  
a)1.13 b)1.23 c)1.33 d)1.5
8. A redundant frame/truss is also called as  
a)Perfect b) Imperfect c) Zero d)None of these
9. Maximum moment for a cantilever beam with uniformly distributed load 'w' over its entire span 'L' is  
a) $wL^2/8$  b) $wL^2/4$  c)  $wL^2/2$  d)None of these
10. Effective length of a column with one end hinged and other fixed is  
a) $L/2$  b)L c)2L d) $L/\sqrt{2}$
11. The horizontal distance between the longitudinal axis of column and line of action of load is known as an \_\_\_\_\_.
12. For a plane frame having 'm' number of members and 'j' number of joints, static determinacy is equal to \_\_\_\_\_.
13. In Eddy's theorem, the \_\_\_\_\_ at any section of an arch is equal to the vertical intercept between the linear arch and the centre line of the actual arch.
14. Conditions of static equilibrium are\_\_\_\_\_.
15. For a rectangular section, maximum shear stress is equal to \_\_\_\_\_.

**Q.2 Answer the following questions. (Attempt any three) (15)**

- A) Write assumption made in the theory of pure bending.

- B) Draw representative shear stress distribution diagrams for  
 a) Hollow rectangle, b) I section, c) Hollow circle
- C) Write down the difference between statically determinate structures and statically indeterminate structures.
- D) A simply supported beam AB has span 8m. Draw influence lines for  $R_A$ ,  $R_B$ ,  $V_X$  and  $M_X$  for a section X at 3m from left hand support.

**Q.3** A) A rectangular column of size 500 mm X 250 mm carries an eccentric load of 1000 kN on the axis bisecting the thickness at 150 mm from centroidal axis. Find maximum and minimum resultant stress and stress diagram. (07)

B) A rectangular column 400 mm wide and 300 mm deep is fixed at both the ends. The length of column is 6m.  $E = 1.2 \times 10^5 \text{ N/mm}^2$ . Find Euler's crippling load. (08)

**OR**

B) A three hinged parabolic arch has span 20 m and central rise 3 m. It carries a point load of 10kN at 7.5 m from the left hinge. Calculate normal thrust, shear and B.M at section 7.5 m from right end hinge. (08)

**Q.4** A) Derive the relationship of slope, deflection with radius of curvature, (07)

**OR**

A) A beam simply supported over a span of 6m is carrying a point load of 50kN at 1.20 m from right hand support. Find the position and amount of maximum deflection. (07)

B) At a point in a strained material the state of stress is as shown in Fig. Determine (08)

(i) location of principal planes

(ii) principal stresses and

(iii) maximum shear stress and location of plane on which it acts

