

The Assam Royal Global University, Guwahati

Royal School of Architecture  
Bachelor of Architecture, 3<sup>rd</sup> Semester  
Semester End Examination, December 2018  
Course Title : Theory of Structures III  
Course Code : ARC132G306

172131012

Time: 3 Hours

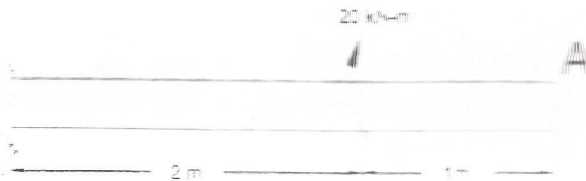
Maximum Marks: 50

Note: Attempt all questions as per instructions given.

The figures in the right-hand margin indicate marks.

Section - A

- Q.1. Attempt all questions. (Maximum word limit 50) 2 x 8
- a. What are the differences between a brittle and ductile material? 2
  - b. What do you mean by Moment of Resistance and Section Modulus of a member? 2
  - c. Draw the Plane of Loading, Principal Axis, Neutral Axis and Neutral Plane of a trapezoidal prismatic beam subjected to pure bending. 2
  - d. Draw the schematic diagram showing shear stress distribution of Rectangular, Circular, I and T sections. 2
  - e. What is Torsion? When a member is said to be in pure torsion? 2
  - f. A circular shaft of diameter 30 mm having shear modulus  $G = 80$  GPa is subjected to a moment as shown below. Calculate the maximum shear stress developed at the periphery of shaft at A. 2



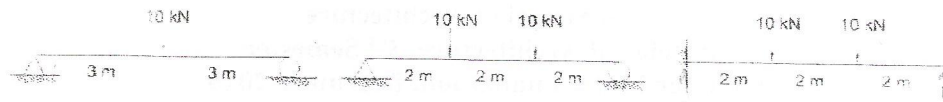
- g. What is a column? What is the different classification of columns based on failure modes? 2
- h. What do you mean by overturning and sliding of a structure? 2

Section - B

- Q.2. Attempt any one question. 8 x 1
- a. Write the assumptions of Pure Bending Theory and derive the Flexure Formula. 8
  - b. Describe the Four points load test with neat diagrams. Find the moment carrying capacity of a trapezoidal section of 400mm depth and width varying from 200mm to 600mm. The permissible stress is 80 MPa. 8
- Q.3. Attempt any two questions. 4.5 x 2
- a. Describe the shear stress distribution of rectangular section with diagram. 4.5
  - b. Find the shear force carried by the upper 1/3rd cross-section of a rectangular beam subjected to vertical shear force  $V$ . 4.5

Draw the shear force diagrams of the following beams:

4.5



**Q.4. Attempt any two questions.**

4 x 2

- a. Write the basic assumptions in deriving the Torsion Formula. 4
- b. Derive the Pure Torsion Formula. 4
- c. A solid circular shaft is subjected to a torque of 20 kN-m. If the maximum permissible shear stress is 50 MPa, find a suitable diameter for the shaft. 4

**Q.5. Attempt any one question.**

9 x 1

- a. Write the assumptions of Euler's Theory on column. Find the Critical Load P for the column having hinged-hinged supports and length L. 9
- b. What are the benefits using of Rankine's Theory? Find the critical stresses using Rankine's formulae for the struts with slenderness ratios 50 and 100. Assume that both the ends are hinged,  $E = 200$  GPa, Rankine's Constant =  $1/7500$  and Yield Stress = 300 MPa. 9