

BACHELOR OF ARCHITECTURE 2ND YR 1ST SEM. EXAM. 2019Subject: **THEORY OF STRUCTURES-I** TIME: 3 Hours

Full Marks: 100

Assume any necessary data if required

No. of questions	Answer any Five questions.	Marks (20x5=100)
1.	Prove the basic equation of shear stress distribution at a point of a rectangular beam section i.e. $q = \frac{F Q}{I b}$. q = shear stress. F = shear force. Q = first moment of the area. I = moment of inertia. b = width of the section.	20
2. a) b)	a) Construct Mohr's circle for the case of biaxial stress where $\sigma_x = 8 \text{ N/mm}^2$ and $\sigma_y = 4 \text{ N/mm}^2$. b) The principal tensile stresses at a point across two perpendicular planes are 75 N/mm^2 and 25 N/mm^2 . Find the normal and tangential stresses on a plane at 30 degree with the major principal plane.	10+10=20
3. a) b)	a) A beam of rectangular section 250 mm by 400mm carries a uniformly distributed load of 30kN/m over the whole span of 5m (simply supported). Find the maximum bending stress. b) Show that maximum shear stress of a circular beam section is $\frac{4}{3}$ times the average shear stress of that section with neat sketch.	10+ 10 =20

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4.	<p>a) Show that maximum shear stress of a rectangular beam section is 1.5 times the average shear stress of that section i.e. $\tau_{\max} = 1.5 \tau_{\text{av}}$ with neat sketch.</p> <p>b) Draw the shear stress distribution diagram of a standard equal I section.</p>	15+5=20
5.	<p>a) What do you mean by short column and long column?</p> <p>b) Derive the Euler's formula for column buckling for a column with both end hinged condition</p>	5+15=20
6.	<p>a) Write down the assumptions and limitations of Euler's theory of column buckling.</p> <p>b) A solid round bar 60 mm dia and 2.5 m long is used as column, one end of which is fixed while other end hinged. Find the safe compressive load for the column using Euler's formula. Assume $E = 200 \times 10^9 \text{ N/m}^2$ and factor of safety 3.</p>	10+10=20