

Roll No

MI-5004 (CBGS)**B.E. V Semester**

Examination, December 2017

Choice Based Grading System (CBGS)**Mechanics of Solids and Fluids***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Attempt any five questions out of eight.
 ii) All questions carry equal marks.
 iii) Assume suitable missing data, if any.

1. a) A rod of square section of side D at one end tapers to a square section of side d at the other end. If its length is l . Find the increases in length l if it is subjected to an axial pull P .
 b) A bar of circular cross section is subjected to a pull of 1500kN . Find the diameter of the bar if the maximum allowable shear stress on any section is 5.9MN/m^2 .
2. a) Define principal stresses.
 b) Draw Mohr's circle for a plane element subject to the stresses $\sigma_x = 55.16\text{MPa}$ and $\sigma_y = -55.16\text{MPa}$. From Mohr's circle, determine the stresses on a plane inclined at 20° to the axis.
3. a) State the basic assumptions of theory of bending.
 b) A cantilever beam 3m long carries a concentrated load of 3kN at its free end. The material is structural steel and maximum bending stress is not to exceed 125MPa . Determine the required diameter of the beam if it is circular. Take $E_s = 200\text{GPa}$.

4. A simply supported beam of span l carries an eccentric concentrated load at a distance a from left end. Derive the general expression for slope and deflection.
5. a) What is viscosity. State the Newton's law of viscosity.
 b) A circular plate of 1.5m diameter is submerged in water vertically such that its top edge is 0.6m below free water surface. Determine the total pressure on the plate and position of centre of pressure.
6. a) Define metacentre and derive an expression for metacentre height. http://www.rgpvonline.com
 b) Open cylindrical tank of 15cm dia. and 35cm deep contains water upto the brim. Tank is rotated at 400rpm about its vertical axis. Determine the water left in the tank.
7. a) What are the conditions of equilibrium of a floating body and submerged body.
 b) Differentiate between free and forced vortex flow.
8. a) Define:
 i) Path line
 ii) Stream line
 iii) Streak line
 b) Obtain a stream function to the following velocity components
 $u = x + y$ and $v = x - y$
