

B039315(039)

B.Tech. (Third Semester) Examination

Nov.-Dec. 2020

MECHANICS of SOLIDS and FLUID MECHANICS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) is compulsory & Attempt any two parts from (b), (c) and (d) of each questions.

Unit-I

1. (a) Define Thermal Stress. 2
- (b) Derive an expression for the Young's modulus, Modulus of rigidity and Poisson's ratio. 9

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- (c) A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1 mm, and change in diameter is 0.004 mm calculate the Poisson's ratio and the values of the three moduli. 9
- (d) A bar of uniform cross section 'A' and length 'L' is suspended from top. Find the expression for extension of the bar due to self-weight only if Young's modulus is 'E' and unit weight of material (Specific weight or weight per unit volume) is ' γ '. 9

Unit-II

2. (a) Define pure bending. 2
- (b) Derive the formula of simple bending giving assumptions. 9
- (c) A timber beam of rectangular section of length 8 m is simply supported. The beam carries a U.D.L. of 12 kN/m run over the entire length and a point of 10 kN at 3 metre from the left support. If the depth is two times the width and the stress in the timber is not to exceed 8 N/mm², find the suitable dimensions of the section. 9

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- (d) Define Point of contra-flexure and derive the relation between load, Shear Force and Bending Moment. 9

Unit-III

3. (a) Define conjugate beam. 2
- (b) A simply supported beam of span l carries an eccentric load P (distance a from left hand support). Derive the general expression for slope and deflection. 9
- (c) Cantilever of length l carrying a uniformly distributed load of w per unit run for a distance of a from the free end. Calculate the deflection at free end. 9
- (d) (i) State Mohr's theorem (Moment area theorem). 9
- (ii) Derive the relationship of slope and deflection with radius of curvature.

Unit-IV

4. (a) Define Buoyancy. 2
- (b) What is Continuity Equation? Derive continuity equation for three dimensional cartesian coordinate. 9

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- (c) Discuss the following : 9
- (i) Stream function
 - (ii) Velocity potential
- (d) What is Meta centre? Discuss the stability of floating body. 9

Unit-V

5. (a) Define absolute pressure and guage pressure. 2
- (b) Derive the formula of total pressure and centre of pressure of a horizontal body at a depth of h meter. 9
- (c) Write notes on flow net and its applications. 9
- (d) A tank contains water upto a height of 0.5 m above the base. An immiscible liquid of specific gravity 0.8 is filled on the top of water upto 1 m height, Calculate 9
- (i) Total pressure on one side of the tank.
 - (ii) The position of centre of pressure for one side of the tank, which is 2 m wide.