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RM-6501

B. E. - II (Electrical) (Sem. IV) Examination

May / June – 2010

Mechanics of Solids & Fluids

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 3 (Electrical) (Sem. 4)**

Name of the Subject :

☛ **Mechanics of Solids of Fluids**

☛ Subject Code No. : **6 5 0 1** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answer to two sections must be written in **separate** answer books.
(3) Figures to the **right** indicate full marks.
(4) Assume any additional data wherever it is required.

SECTION - I

1 (a) Match the following : **5**

Group A	Group B
(i) Elasticity	(a) Fatigue test
(ii) Rigidity	(b) Mild Steel
(iii) Ductile Material	(c) Tension test
(iv) Brittle Material	(d) Cast Iron
(v) S.N. diagram	(e) Torsion test

(b) Define following : **5**
(i) Elasticity
(ii) Neutral axis
(iii) Point of contraflexure
(iv) Poisson's ratio
(v) Modulus of rupture.

(c) A bar of 20 mm diameter is tested in tension : It is observed that when a load of 37.7 kN is applied the extension measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.00366 mm. Determine Poisson's ratio, and elastic constants E, G, K. **6**

2 (a) Draw SFD and BMD for the beam shown in **Fig. 1.** Also determine maximum value of shear force and bending moment. Locate point of contraflexure if any : **10**

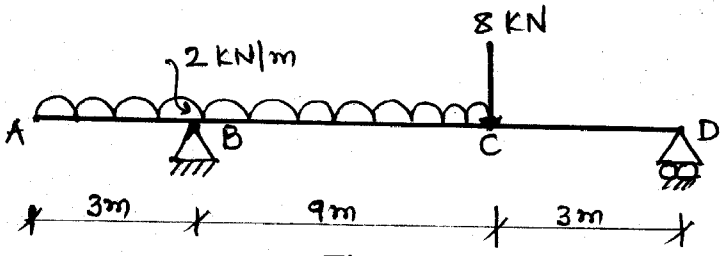

Fig. 1.

(b) The bar shown in **Fig. 2** tested in U.T.M. It is observed at a load of 40 kN the total extension of the bar is 0.285 mm. Determine the Youngs modulus (E) of the material. **6**

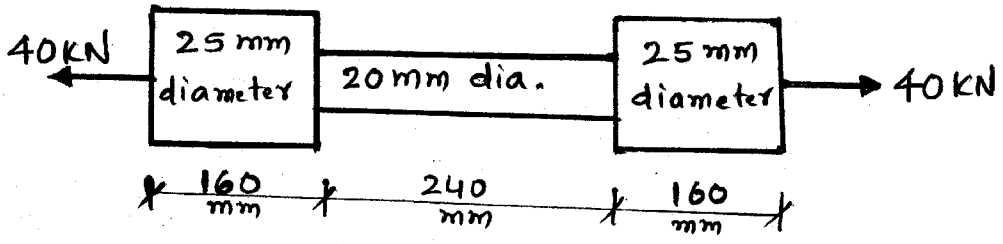

Fig. 2

3 Attempt any two : **18**

(i) A composite shaft consists of a steel rod 10 cm diameter surrounded by a closely fitted tube of brass fixed to it. Find the outside diameter of the tube so that when a torque is 20 kN-m, calculate the maximum shearing stress in each material and angle of twist in a length of 4m. ($G_s = 2G_b$).

(ii) A 25 cm × 7.5 cm simply supported timber beam of span 2m having U.D.L. over full length. If permissible bending stress is 80 kg/cm^2. Calculate safe value of U.D.L. what will be the shear stress in the section near supports? (B=7.5 cm, D = 25 cm, L = 2m).

(iii) A cantilever T beam shown in **Fig. 3**. Determine value of bending stresses in the section and draw stress distribution diagram. Bending moment induced in section is 500 kN-m.

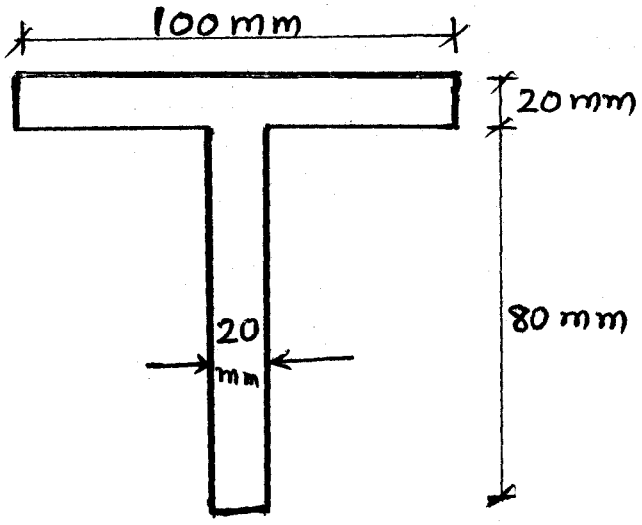

Fig. 3

SECTION - II

4 (a) State Pascal's law and define pressure. With a neat sketch show the relationship between absolute pressure gauge pressure and vacuum pressure. Define each pressure in detail. 8

(b) In **Fig. 4**, below an inverted differential manometer is connected to two pipes A and B which convey water. The fluid in manometer is oil of sp gravity 0.8. For the manometer readings shown in figure 4, find the pressure difference between A and B. 8

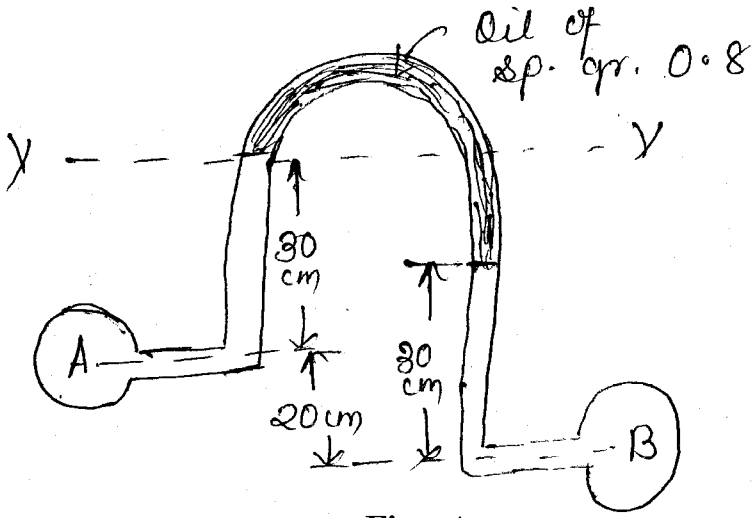

Fig. 4

5 (a) Explain the following with examples. **10**

(i) Steady and unsteady flow

(ii) Uniform and non-uniform flow

(iii) Laminar and Turbulent flow

(iv) Compressible and incompressible flow

(v) One, two and three dimensional flows.

(b) A 30 cm diameter pipe, conveying water branches into two pipes of dicemeter 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in the pipe. Also determine the velocity in 15 cm pipe if the velocity in 20 cm diameter pipe is 2 m/s. **Fig. 5** **10**

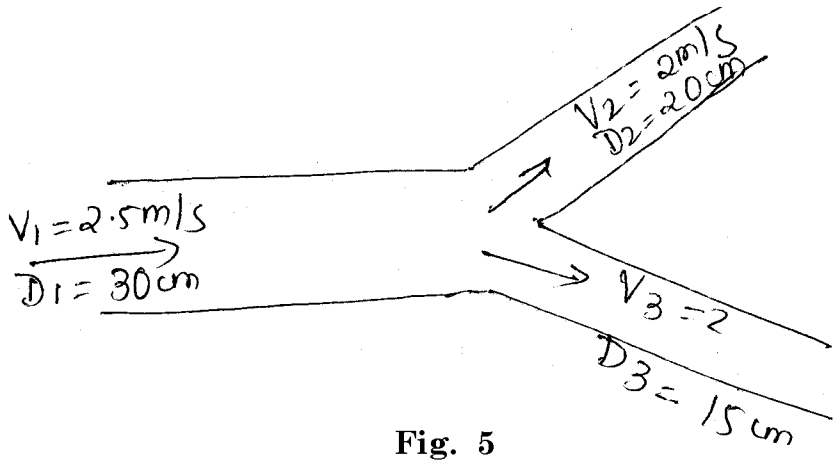

Fig. 5

OR

5 (a) Derive the expression for discharge over a triangular notch or weir. **10**

(b) Water flows through a triangular right angled weir first and then over a rectangular weir of 1 m width. The discharge coefficient of the triangular and rectangular weirs are 0.6 and 0.7 respectively. If the depth of water over the triangular weir is 360 mm, find the depth of the water over rectangular weir. **10**

6 Write short note on the following : (any **four**) **16**

(i) Classification of hydraulic turbine

(ii) Main parts of centrifugal pump

(iii) Classification of notches and weirs

(iv) Draft tube

(v) Pelton turbine

(vi) Operating characteristics curve of hydraulic turbine.
