Code: 13A01409

R13

B.Tech II Year II Semester (R13) Supplementary Examinations December/January 2015/2016

FLUID MECHANICS & STRENGTH OF MATERIALS

(Electronics and Instrumentation Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
*****

1   Answer the following: (10 X 02 = 20 Marks)
   (a)   What is Poisson's ratio? What is the range of its value?
   (b)   What do you mean by a point of contraflexure?
   (c)   How the shear stress distributed over the circular cross section of a shaft, when subjected to a torque?
   (d)   Differentiate between open coiled and close coiled helical springs.
   (e)   State Newton's law of viscosity.
   (f)   Define Reynolds number.
   (g)   Give mathematical representation for hydraulic gradient line.
   (h)   What is friction factor?
   (i)   Define unit power.
   (j)   Compare pumps and turbines.

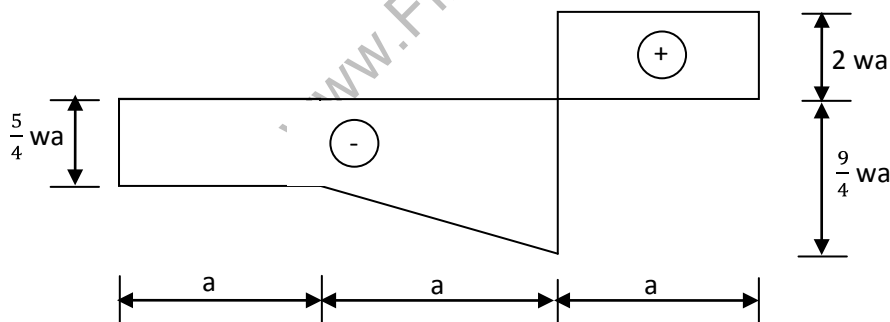### PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   A pressure bar is fastened between two rigid walls at A and B and subjected to loads as shown in figure below. Determine the reactions at supports.
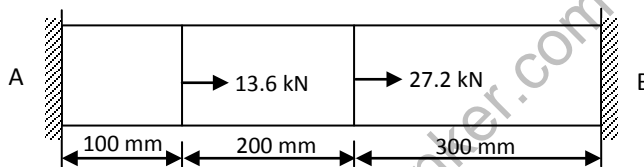
OR

3   For the SFD of a loaded beam shown in the figure below, draw the corresponding loading and BMD.

UNIT – II

4   A solid shaft transmits 250 kW at 100 rpm of the shear stress is not to exceed 75 N/mm^2, what should be the diameter of the shaft?

OR

5   A horizontal shaft 12 m in length is fixed at ends when viewed from its left end axial couples of 50 kN-m clockwise and 75 kN-m counter clockwise act at 5 m and 9 m from the left end respectively. Determine the end fixing couples.

UNIT – III

6 (a) Define fluid. Explain the following fluid properties: (i) Mass density. (ii) Specific gravity. (iii) Specific volume. (iv) Surface tension. (v) Capillarity.
   (b) A vertical cylinder of diameter 180 mm rotates concentrically inside another cylinder of diameter 181.2 mm. Both cylinders are 300 mm high. The space between the cylinders is filled with a liquid of unknown viscosity. Determine the viscosity of fluid if a torque of 20 N-m is required to rotate the inner cylinder at 120 rpm.

OR

7 (a) Derive Euler's equation of motion.
   (b) Water is flowing through to different pipes to which an inverted differential manometer having an oil of specific gravity 0.8 is connected. The pressure head in the pipe A is 2 m of water. Find the pressure in the pipe B for manometer readings as shown in figure below.
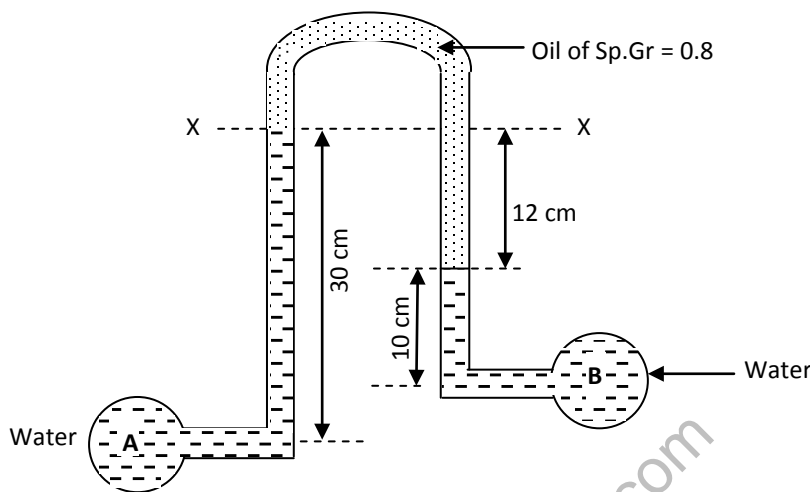
UNIT – IV

8 (a) State Bernoulli's equation for steady flow of an incompressible fluid. Derive an expression for Bernoulli's theorem from fist principle. State the assumptions made.
   (b) The inlet and throat diameter of a horizontal venture meter are 150 mm and 75 mm and the meters is used to measure the discharge of oil of specific gravity 0.8. If the discharge through the meter is 45 liters/sec, find the reading of the mercury oil differential manometer. Take $C_d = 0.98$.

OR

9 Three pipes of 400 mm, 200 mm and 300 mm diameters have lengths of 400 m, 200 m and 300 m respectively. They are connected in series to make a compound pipe. The ends of this compound pipes are connected with two tanks whose difference in water levels is 16 m. If coefficient of friction of these pipes is same and equal to 0.005, determine the discharge considering minor losses.

UNIT – V

10 (a) Derive an expression for specific speed of a turbine.
    (b) What are the functions of draft tube? Show that the pressure at the exit of the turbine is less than atmospheric pressure when a conical draft tube is attached at the end.

OR

11 (a) Describe the principle and working of a single acting reciprocating pump.
    (b) What is an air vessel? What are the uses of air vessel?

*****