BT MRE–III(R/S)–12-21-1041 Reg. No. | | | | | | | | | |

A

B.Tech. Degree III Semester Regular/Supplementary Examination in Marine Engineering December 2021

19-208-0305 FLUID MECHANICS

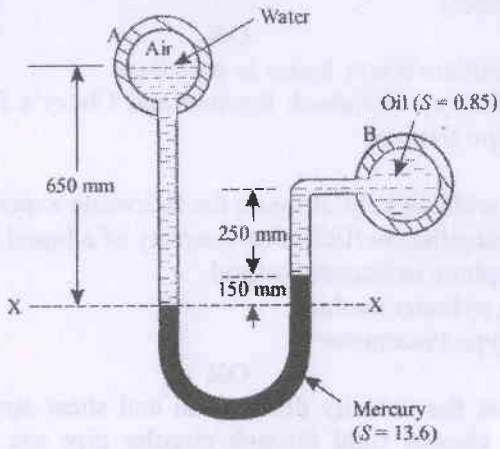
(*2019 Scheme*)

Time : 3 Hours Maximum Marks : 60

(5 × 15 = 75)

I. (a) Explain the stability of a floating body. (4)

(b) Following figure shows a differential manometer connected at two points A and B. At A air pressure is 100 kN/m^2. Find the absolute pressure at B. (11)

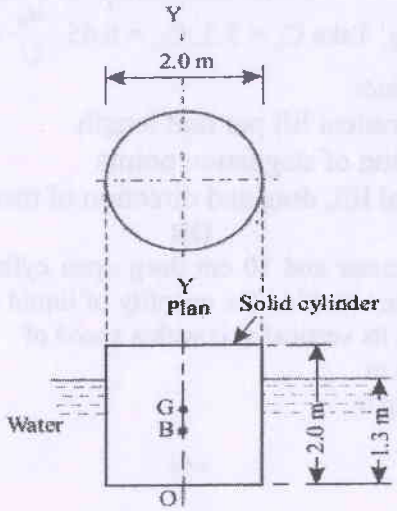


Differential Manometer

OR

II. (a) Differentiate between dynamic viscosity and kinematic viscosity. (4)

(b) A solid cylinder 2 m in diameter and 2m high is floating in water as shown in figure. If the specific gravity of the material of cylinder is 0.65. Find its metacentric height and state whether the equilibrium is stable or unstable. (11)



Floating Cylinder

III. (a) Explain hydraulic coefficients. (4)

(b) Calculate the convective acceleration at the middle of a pipe which converges uniformly from 0.4 m to 0.2 m diameter over 2 m length. The rate of flow is 20 lit/s. (11)

OR

(P.T.O.)

IV. (a) What are the advantages of triangular notch over rectangular notch? (4)

(b) The velocity component of an incompressible flow field along x,y,z direction are $U\left(\frac{x}{L}-\frac{y}{L}\right), \frac{Uy}{L}$ and 0 respectively, where U and L are constants. If they exist, find the stream function and velocity potential. (11)

V. Two reservoirs with difference of 20 m water level are connected by 600 mm diameter and 4000 m length pipe line. At a distance of 1000 m from the upper reservoir, a small pipe is connected to the pipe line. The water can be taken from the small pipe. Find the discharge to the lower reservoir, if

(a) No water is taken from the small pipe (4)

(b) 100 l/s of water is taken from the small pipe. (Take $f = 0.005$ & neglect minor losses) (11)

OR

VI. (a) Briefly explain minor losses in pipe flow (4)

(b) Derive Darcy - Weisbach formula and Chezy's formula for loss of head due to pipe friction. (11)

VII. Explain with the help of figure the following experimental methods of determining the coefficient of viscosity of a liquid.

(a) Falling sphere resistance method (5)

(b) Rotating cylinder method (5)

(c) Orifice type viscometer (5)

OR

VIII. (a) Show that the velocity distribution and shear stress distribution across a flow of viscous fluid through circular pipe are parabolic and linear in nature respectively. (10)

(b) Show that the maximum velocity is twice the average velocity in a viscous flow through circular pipe. (5)

IX. A cylinder, whose axis is perpendicular to the stream of air having a velocity of 20 m /s, rotates at 300 r.p.m. The cylinder is 2 m in diameter and 10 m long. Take $C_L = 3.3$, $C_D = 0.65$, $\frac{u_\theta}{U} = 1.57$ and density of air is 1.24 kg/m^3. Find: (15)

(i) Theoretical lift per unit length

(ii) Position of stagnation points

(iii) Actual lift, drag and direction of resultant force

OR

X. A 12 cm diameter and 30 cm deep open cylindrical vessel is filled with water up to the top. Find the quantity of liquid left in the vessel, when it is rotating about its vertical axis with a speed of (15)

(i) 30 r.p.m

(ii) 600 r.p.m

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