Total No. of printed pages = 3

CT-403/FM/4th Sem/2017/M

FLUID MECHANICS

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions :

(a) If the equation of a velocity distribution over a plate is given by $v = 2z - z^2$ in which v is the velocity in m/s at a distance z measured in meters above the plate, then what is velocity gradient at the boundary at 7.5 cm and 15 cm from it ? Also determine the shear stress at these points if dynamic viscosity is 8.60 poise. 10

(b) Pipe A contains carbon tetrachloride of specific gravity 1.594 under a pressure of $1.05 \frac{kg(f)}{cm^2}$ and pipe B contains oil of specific gravity 0.8. If the pressure in pipe B is

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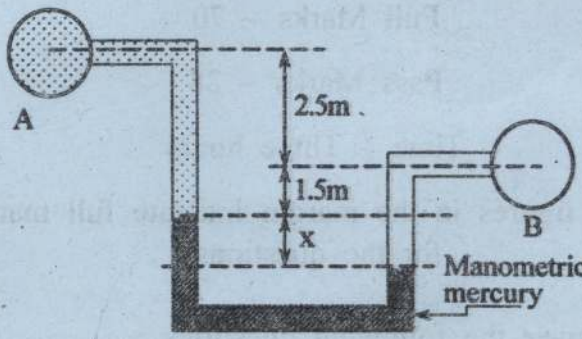
$1.75 \frac{kg(f)}{cm^2}$ and manometric fluid is mercury (G=13.6), then find difference 'x' between the levels of mercury. 10



(c) Derive a mathematical expression for loss of head due to sudden contraction of pipe. If coefficient of contraction of pipe is 0.62, then what will be head loss ? 10

(d) Write down in details about hydraulic efficient channel. Calculate hydraulic efficient channel for rectangular section. 10

(e) Find the bed slope of trapezoidal channel of bed width 4m, depth of water 3m and side slope of 2H : 3V, when the discharge through the channel is 20 m^3/s. Take Manning's roughness coefficient (n) = 0.03. 10

(f) The head of water over an orifice of diameter 100 mm is 10m. The water is coming out from orifice is collected in a circular tank of diameter 1.5m. The rise of water level in this tank is 1.0m in 25 seconds. Also the co-ordinates of a point on the jet, measured from vena contracta are 4.3m horizontal and 0.5m vertical. Find coefficient of discharge and coefficient of velocity and coefficient of contraction. 10

2. Answer the following questions : 2×5=10

(a) What do you mean by fluid kinematics and fluid dynamics ?

(b) What do you mean by total pressure ?

(c) What do you mean by laminar and turbulent flow ? Draw the velocity profile for both cases in pipe flow.

(d) What do you mean by hydraulic grade line and energy grade line ?

(e) Write a short note with figure on inverted u-tube manometer.