NAME: ELENWOKE OBINNA MICHAEL

MATRIC NO: 18/ENG06/020

DEPARTMENT: MECHANICAL ENGINEERING

1. Solution. Given: Sp. gravity = 0.8, D1 = 150mm = 0.15m; D2 = 75mm = 0.075m; z2 – z1 = 150mm = 0.15m, Qact = 40 liters/sec. = 0.04m3/s, Cd = 0.96.

 Pressure difference (P1 – P2):

 A1 = $\frac{π}{4}$D12 = $\frac{π}{4}$ x 0.152 = 0.01767m2

 A2 = $\frac{π}{4}$ D22 = $\frac{π}{4}$ x (0.075)2 = 0.00442m2

Qact = Cd x ((A1A2)/$√$(A12  - A22)), we get: h = ((0.04)/(0.96x0.004565x4.429))2 = 4.247m

Also, h = (P1/w + z1) – (P2/w + z2)

 (P1 – P2) = pg (4.247 + 0.15)

 = (0.8 x 1000 x 9.81) (4.247+0.15) N/m2

 = 34.51 KN/m2

 2. Solutions: Diameter at inlet, D1 = 300mm = 0.3m

 Area of inlet, A1 = $\frac{π}{4 }$x 0.32 = 0.07m2

 Diameter at throat, D2 = 150mm = 0.15m

 Area at throat, A2 = $\frac{π}{4}$ x 0.152 = 0.01767m2

 Specific gravity of heavy liquid (mercury) in U-tube manometer, Shl = 13.6

 Specific gravity of liquid (oil) flowing through pipe, Sp = 0.9

 Reading of differential manometer, y = 250mm = 0.25m

 The differential ‘h’ is given by: h = (P1/w + z1) – (P2/w + z2)

 = y [ SW/SP – 1] = 0.25 [13.6/0.9 – 1] = 3.53m of oil

1. Discharge of oil, Q:

Using the relation, Q = Cd x A1A2/$√$(A21 – A22) X $√2gh$, we have:

 Q = 0.98 x (0.07 x 0.01767/$√$(0.072 – 0.017672) x $√$2x9.81x3.53

 = 0.001212/0.0677 x 8.32 = 0.1489 m3/s.

1. Pressure difference between entrance and throat sections, P1-P2

We know that, h = (P1/w + z1) – (P2/w + z2) = 3.53

Or, (P1/w – P2/w) + (z1-z2) = 3.53

But, z2 – z1 = 300mm or 0.3m

(P1/w – P2/w) – 0.3 = 3.53 or (P1 – P2)/w = 3.83

Or, P1 – P2 = (9.81 x 0.9) x 3.83 = 33.8 KN/m2