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Matric: 18/ENG01/001

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1.)Sp. gravity = 0.8, D1 = 150 mm = 0.15 m; D2 = 75 mm = 0.075 m; Z2 – Z1 = 150mm=0.15m

Qact = 40 litres/sec. = 0.04 M³/secs Cd = 0.96.

Pressure difference (P1 – P2):

A1 = πr²/4

A1=π×(150/1000)²/4 =0.01767m²

A2=π×(75/1000)²/4 = 0.00442m²

Qact=Cd × A1×A2×√2gh/√A²1-A²2

0.04=0.96 ×0.01767 × 0.00442 × √2 × 9.81 × h/√0.01767² - 0.00442²

h= (0.04/0.96 × 0.004565 × 4.429)²

h=4.247m

4.247= (P1/W -P2/W) +(Z1 - Z2)

(P1 -P2/pg) -0.15

(P1-P2)= pg(4.247 + 0.15)

(0.8×1000×9.81)(4.247+0.15)N/m²

= 34.51kN/m²

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

∴ Diameter at Throat D2 =150mm= 0.15m

(i)

A1=πr²/4

A1=π×(300/1000)²/4= 0.07m²

A2=π×(150/1000)²/4 = 0.01767m²

h=0.25(13.6/0.9 –1)= 3.5m of oil

Q=Cd × A1 × A2 × √ 2gh/√A1² —A2²

Q=0.98 × 0.07×0.01767 × √2 × 9.81×3.53/√0.07²—0.01767²

Q= 0.1489m³/s

(ii)(P1/W – P2/W) + ( Z1 – Z2) = 3.53

Z1–Z2=0.3m

P1/W–P2/W= 3.53 + 0.3= 3.83m

P1–P2/W = 3.83

W=pg

P1—P2= 3.83×0.9×9.81=33.8kN/m²

∴ P1–P2= 33.8kN/m²