DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter End Semester Examination – 2019

Course: B. Tech in Chemical/Petrochemical Engineering **Sem: III**

Subject Name: Fluid Flow Operation(BTCHC303) **Marks: 60**

Date: 14/12/2019 **Time: 3 Hrs.**

Instructions to the Students:

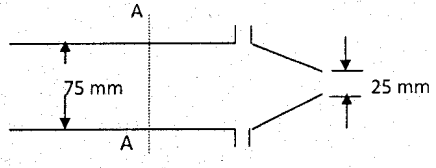
1. Solve ANY FIVE questions out of the following.

2. The level question/expected answer as per OBE or the Course Outcome (CO) on which
the question is based is mentioned in front of the question.

3. Use of non-programmable scientific calculators is allowed.

4. Assume suitable data wherever necessary and mention it clearly.

		(Level/CO)	Marks
Q. 1	Solve the following.		2x6=12
A)	State Bernoulli equation without friction. Explain corrections made to this equation for its practical use.	Remember	
B)	Determine the discharge through the nozzle fitted at end of pipe, through which water is discharged into atmosphere. Pressure at plane AA is 1.2 M Pa, neglect friction loss.	Apply	



Q. 2	Solve the following.		2x6=12
A)	Derive the Hagen Poiseuolli Equation and prove that $f = 16 / (NRe)$, for laminar flow.	Remember	
B)	Water is to be pumped from pond to top of the hill 30m above the water level in pond It is desired to deliver water at rate 0.35 m3/min.and at a pressure 2.0 Kg/cm2.The pipe line consists of 750m length of straight pipe having dia.7.5cm in the pipeline there are 8 elbows 10 bends 2 globe valves and 2 gate valves calculate hp of pump required if efficiency of pump is 65% Data: Equivalent length for one elbow = 30xD Equivalent length for one bend = 8xD Equivalent length for one gate valve=7xD Equivalent length for one globe valve=250xD	Apply	

Q. 3 Solve Any One of the following. 1x12=12

A) i) Explain the flow of incompressible fluid through sudden contraction and derive equation for head loss — Remember

ii) Define friction factor and with sketch explain friction factor chart i.e. Moody's diagram. — Remember

B) i) What is fluidization? State applications of fluidization. — Apply

ii) A tubular catalytic reactor is to be back washed with water. The bed height of spherical catalytic particles is 250 cm. the diameter of particles is 6 mm and density is 1400 kg/m3 . Calculate the Reynolds Number and minimum fluidization velocity. — Analyzing

Data: $\mu = 0.86$ cp, $\Phi s = 1.0$, $\varepsilon m = 0.4$

Q. 4 Solve the following. 2x6=12

A) What are Positive displacement and Centrifugal pumps? Explain with sketch Reciprocating pump. — Remember

B) A solution of specific gravity 1.5 is drawn from a large storage tank through a pipe of 70 mm ID. The average velocity in suction line is 1.25 m/s the pump discharges through 50 mm ID pipe. The end of discharge line is at 30 m above the level of solution in feed tank. Friction loss in entire piping system amounts to 7.5 m head of solution. If efficiency of pump is 60% — Apply

a. Calculate power required
b. Calculate pressure required to develop by the pump.

Q. 5 Solve the following. 1x12=12

A) i) Differentiate between variable head meter and variable area meter. Explain with sketch working of Rotameter. — Understand

ii) A sharp edged orifice having diameter of 0.0566 m is inserted in a 0.1541m I.D. pipe carrying oil having density 878 kg/m3. Measured pressure difference across orifice is 93.2 KN/m2 Evaluate Volumetric flow rate, assume Co = 0.61 — Analyzing

Q. 6 Solve Any One of the following. 1x12=12

A) i) State Power number, Froud number and Reynolds Number in agitation. — Remember

ii) A tank 1 m diameter and height 1.5 m is filled to a depth 1.1m with latex having viscosity 9 cp. and density 800 kg/m3. A three blade propeller 300 mm diameter is installed in which turns at 250 RPM. Determine power required for agitation. — Apply

Data : At NRe = 30000 , Np = 4.2
NRe = 31875 , Np = 4.0
NRe = 33750 , Np = 3.6

B) i) What is NPSH? Why NPSH (Available) should be greater than NPSH (Required)? — Remember

ii) A differential pressure is measured by a simple U tube manometer across an orifice. Manometer is filled with CCl4 and through the orifice water is flowing. If manometer reads 27cm , calculate ΔP. (ρ CCl4 = 1600 Kg / m3). If pressure in upstream leg of manometer is 1.8 atm, calculate downstream leg pressure in Pascal. — Apply

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