



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (CHE(O))/SEM-4/CHE-405/2012

2012

FLUID MECHANICS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) At a given mass flow rate doubling the pipe diameter

a) reduce N_{Re} by $\frac{1}{2}$ b) doubles N_{Re}

c) reduces N_{Re} by $\frac{1}{4}$ d) none of these.

ii) Stokes law is valid, when the particle Reynolds No. is

a) < 1 b) > 1

c) < 5 d) none of these.

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- iii) For a properly designed orifice meter, the orifice coefficient can be
- a) 0.60 b) 1.05
- c) 0.8 d) 0.98.
- iv) If the ratio of the diameter of the two sphere is 1.5, the ratio of strokes drug on the two sphere should be
- a) 1.5 b) 4.5
- c) $\frac{1}{4.5}$ d) none of these.
- v) A $\frac{1}{3}$ decrease in the pipe dia will result in change in average velocity by
- a) $\frac{4}{5}$ time decrease b) $\frac{3}{2}$ time increase
- c) $\frac{5}{4}$ time increase d) none of these.
- vi) Which of the following valves permit flow of slurry material ?
- a) Gate valve b) Globe valve
- c) Plunger d) Diaphragm.

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- GROUP – B**

Answer any *three* of the following. $3 \times 5 = 15$

- 4



GROUP – C

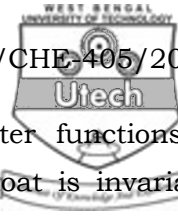
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) A U-tube manometer with mercury reads 12 cm water is in the pipeline. Express the pressure in N/m^2 . Density of mercury = 13600 kg/m^3 , density of water = 1000 kg/m^3 .
- b) Write the Bernoulli's equation with friction and explain the significance of its each term.
- c) A town delivers its water supply from a river pumping it with a standard pipe. The inlet to the pump is 5 m above the river and the water level in the pipe kept constant at 100 m above the pump discharge. The frictional loss is 1800 gmf cm/gm of water through the 2500 m of 25 cm I.D pipe which includes the total equivalent length of all piping from river to water tower. If the pump capacity is 20000 L/hr and pump is 80 efficient, then what should be the hourly pumping cost if electricity costs Rs. 4 per k watt-hr ? $4 + 3 + 8$
8. a) With neat diagram give the difference between suction head and suction lift. Also write the mathematical expression for NPSH. $3 + 2$
- b) With neat diagram show the characteristic curves of a centrifugal pump. 3



- c) Drops of oil 15 micron in dia are to be settled from their mixture with air. The sp gravity of the oil is 0.9 and the air is at 21°C and 1 atm pressure. A settling time of 1 min is available. How high should be chamber be to allow settling of a particle ? (Viscosity at 21°C = 0.018 cp) 7
9. a) Find out an expression for a friction loss coefficient for sudden expanded cross section.
- b) Water flows through a 200 mm dia pipe with an average velocity of 3.6 m/sec. There is a certain enlargement to a 400 mm dia pipe
- i) What is the power loss due to the certain enlargement ?
- ii) What will be power loss if water flows into opposite direction with the same average velocity in the smaller pipe ? 7 + 8
10. a) "The pressure drop across a fluidized bed always remain constant." Explain the statement.
- b) Establish Kozeny-Carman equation to find out pressure drop in a packed bed.
- c) What do you mean by minimum fluidization velocity ? Calculate the minimum fluidization velocity from the given data. Porosity = 0.40, Particle diameter = 1.25 mm (spherical), Density difference = 0.25 g/cc, Fluid viscosity = 1 cp. 2 + 6 + 2 + 5



11. a) With a diagram explain how Rotameter functions ?
Show that pressure drop across the float is invariant
with flow rate.
- b) "The permanent pressure loss in a venturimeter is
relatively small than that in a orifice meter." Elaborate
the statement.
- c) Flow of a liquid in a 75 mm diameter pipe is measured
by an orifice. Maximum flow rate is limited to 10 litres
in a second. The mercury manometer gives a reading of
35 cm at this flow rate. Estimate orifice size. Liquid
density = 1200 kg/m^3 . 6 + 3 + 6

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