



SE-8045

B. E. - II (Sem - III) (Chemical) Examination

May / June - 2011

Fluid Flow Operation

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दर्शावेव निशानीवाणी विगतो उत्तरवडी पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. - II (Sem - III) (Chemical)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Fluid Flow Operation"/>	<input type="text"/>
Subject Code No. : <input type="text" value="8"/> <input type="text" value="0"/> <input type="text" value="4"/> <input type="text" value="5"/>	Section No. (1, 2,.....) : <input type="text" value="1"/> <input type="text" value="2"/>
Student's Signature	

- (2) Figure to the right indicate full marks.
- (3) Assume the data wherever necessary.
- (4) Draw a neat sketch wherever necessary.
- (5) Attempt all the questions.

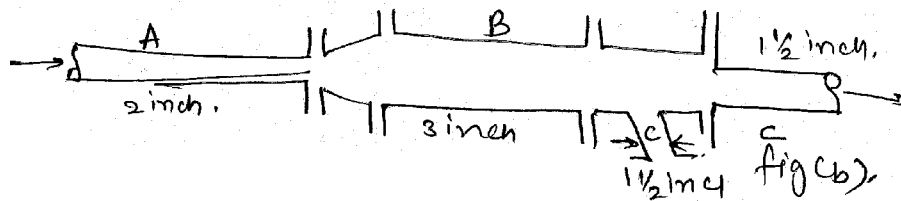
SECTION - I

- 1 (a) Answer the following : 1×10=10
- (i) What is compressible fluid ?
 - (ii) Write down the barometric equation.
 - (iii) Define boundary layer.
 - (iv) Give the examples of dilutant fluid.
 - (v) What is kinematic viscosity ?
 - (vi) What is wake formation ?
 - (vii) What is the meaning of flux volume ?
 - (viii) Write down the Euler's equation for constant density.
 - (ix) Explain Reynolds Number for the flow down a flat plate.
 - (x) Write down NR_e for annulus reactor.
- (b) Explain subsonic, sonic and supersonic fluid. 1×10=10
Discuss about the assumptions made for determining the overall energy balance for the compressible fluid. Derive energy balance equation.

2 Answer any two.

2×8=16

- (a) Discuss centrifugal decanter for the separation of immiscible liquids.
- (b) Crude oil, with Sp. gr=0.887, flows through a piping shown in fig (b).



Pipe (A) is 2-inch. Pipe B is 3-inch and each of pipe C

is $1\frac{1}{2}$ inch. An equal quantity of liquid flows through

each of pipe C. The flow through pipe A is 30 gal/min.

Calculate

- (i) the mass flow rate in each.
- (ii) the average linear velocity in each pipe and
- (iii) the mass velocity in each pipe.
- (c) Derive the equation for the liquid layer thickness for the flow of fluid with a flat surface.

3 Answer any two :

2×7=14

- (a) (i) In the flow system there are two globe valves, each equivalent to 200 pipe diameters and fittings equivalent to 100 pipe diameters. What will be the total equivalent length of the piping system, if the diameter of pipe is 40 mm and pipeline is 200 meters?
- (ii) Calculate the friction factor when the Reynolds no. 3 is 1600 flow of fluid through pipe.
- (b) A sugar syrup is flowing in a pipe of 55 mm i.d. at a flow rate of $66.67\text{cm}^3/\text{s}$. The viscosity is $0.15(\text{N}\cdot\text{s}/\text{m}^2)$ and density $1040\text{kg}/\text{m}^3$. Calculate the friction loss over the length of 10 meters.
- (c) Derive Hagen-Poiseuille equation for the incompressible flow.

SECTION - II

- 4 (a) Attempt the following. 10
- (i) Define : Drag.
 - (ii) What is Schedule No. for pipe ?
 - (iii) _____ valve is used for on/off service valve.
 - (iv) What must be provided to prevent the escape of toxic or corrosive fluid around the moving parts of the equipment ?
 - (v) _____ pump is employed in industry to handle high viscosity liquid.
 - (vi) Which of the following pumps is used for boiler feed water applications.
 - (a) Gear Pump (b) Plunger Pump
 - (c) Metering pump (d) None of these.
 - (vii) Overflowing stream of liquid in a weir is called jet. (True/False)
 - (viii) What is venacontracts in orifice meters ?
 - (ix) In venthrimeter, the converging cone angle is of the order of _____ degrees.
 - (x) For measurement of stack gas velocity _____ is used.
- (b) Discuss principle, construction and working of single and double acting reciprocating pump in detail. 8
- 5 Attempt the following. (any two) 16
- (a) Discuss the Principle, construction and working of a rotameter with neat sketch.
 - (b) A sharp-edged orifice with an apereture of 20 mm diameter is inserted in a 50 mm i.d. pipeline carrying a raw material from the neighbouring factory. What charges are to be paid per day to the factory for the chemical received, if the material costs Rs. 2 per kg.
Data : Average viscosity of raw material = 0.7 cp
Average density = 1.3 gm/cc
Manometer connected across the orifice reads 10 cm of Hg. Assume orifice coefficiant = 0.61.

6 Attempt the following. (any two)

16

- (a) What are different losses that occur in centrifugal pump? Discuss characteristic curves of centrifugal pump with plot.
- (b) Explain the principle and working of Coriolis meters.
- (c) What is fluidization ? Explain conditions for fluidization with plot of pressure drop and bed height v/s. superficial velocity for a bed of solids.
