



RN-6725

B. E. III (Sem. V) (Chemical) Examination

May / June - 2010

Fluid Flow Operations

Time : Hours]

[Total Marks :

Instructions :

(1)

नीचे दृष्टावैव निशानीवाणी विगतो उत्तरवडी पर अवश्य लखवी.
Fillup strictly the details of signs on your answer book.

Name of the Examination :
B. E. 3 (Sem. 5) (Chemical)

Name of the Subject :
Fluid Flow Operations

Subject Code No. : 6 7 2 5 Section No. (1, 2,.....): 1&2

Seat No. :

Student's Signature

- (2) Figures to the right indicate full marks.
(3) Assume the data wherever necessary.
(4) Answer each section in a separate answer books.
(5) Draw neat sketches whenever necessary.

SECTION - I

- 1 (a) Answer the following : 5×2=10
(i) Define sonic, subsonic and supersonic flow.
(ii) What is transition length, and what fully developed flow?
(iii) Write the "Hagein-Poiselluie" equation and state its different uses.
(iv) Define compressible and incompressible fluid.
(v) State "Newton's law of viscosity".
(b) What is principle involved in hydrostatic equilibrium? 8
Derive barometric equation.
- 2 Answer any two : 8×2=16
(a) Explain in detail "Flow in boundary layer."
(b) Discuss pump work in Burnoulli equation. What will be the change in burnoullie equation considering pump work for the flow of incompressible fluids.

- (c) Determine the cost of pumping 300,000 ltr. per hour of an oil having sp. gr. of 0.90 and viscosity 30 c.p. through a pipeline, 25.0 cm. diameter and 50 km. long. It may be assumed that the efficiency of pump together with motor is 50% and the power costs 40 paise per kwh. The pipe line is horizontal 1 hp = 0.736 kwh

$$\text{and } f = \frac{0.04b}{R_e^{0.20}}$$

3 Answer any two : 8×2=16

- (a) Crude oil having sp.gr 0.93 and viscosity of 4 CP is draining by gravity from the bottom of a tank. The depth of liquid above the draw off connection in the tank is 6 m. The line from drawoff is 3-in. Its length is 45 meter and contains two gate valve oil discharge in atmosphere. 9m below the flow expected through line find.
- (b) Define friction factor and explain friction factor chart.
- (c) Explain friction loss from sudden expansion and sudden contraction of cross section of pipe.

SECTION - II

4 (a) Attempt the following : (Q. 1 and 2 carry two marks each) 12

- (i) What is vena contracta in orificemeter?
- (ii) State various means of fluid transport.
- (iii) In case of _____ meter, pressure drop over it is constant.
- (iv) The pitot tube is used to measure local or point _____.
- (v) In venturimeter, the converging cone angle is of the order of _____ degrees.
- (vi) BWG number for tubing ranges from 24 to 7. State which of these numbers represent very heavy tubing?
- (vii) In rotary pumps, the chamber moves from _____ to _____ and back to inlet.
- (viii) Which of the following pumps is used for boiler feed water applications :
- (a) Gear pump
- (b) Plunger pump
- (c) Metering pump.

- (ix) The _____ pumps are commonly employed in industry for handling high viscosity liquids.
 (x) _____ valve is used for throttling services.

- (b) Write principle, construction and working of rotometer with neat sketch. Also discuss advantages and disadvantages of rotometer. 8

5 Attempt the following : 8×2=16

- (a) Show by the method of dimensions that the resistance R to the motion of G sphere of diameter ϕ moving with uniform velocity V through a fluid having density ρ and Viscosity μ may be expressed as

$$R = \rho d^2 V^{-2} \phi (\mu / \rho \bar{V} d)$$

- (b) An orificemeter consisting of 10 cm diameter orifice in a 25 cm diameter pipe has coefficient of 0.65. The pipe delivers oil of 0.8 specific gravity. The pressure difference on the two sides of the orifice plate is measured by a mercury oil differential manometer. If the differential gauge reads 80 cm of mercury, calculate the rate of flow in litre/sec.
- (c) Write principle, construction and working of pitot tube with neat sketch. Discuss advantages, disadvantages and application of pitot tube.

6 Attempt the following : 7×2=14

- (a) A pitot static tube having a coefficient of 0.98 is placed at the center of pipeline in which benzene is flowing. A manometer attached to the pitot tube contains mercury and benzene and shows a reading of 10 cm. Calculate the velocity at the centerline of the pipe. Specific gravity of benzene is 0.88.
- (b) Give detailed classification of pump. Discuss rotary pump in detail.
- (c) Differentiate :
 (i) Centrifugal pump and reciprocating pump
 (ii) Pipe and tube.