

22409

**11920**

**3 Hours / 70 Marks**

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1. Attempt any FIVE of the following :**

**10**

- (a) Define Fluid static and Fluid dynamics.
- (b) List out examples of Newtonian & Non-Newtonian fluid. (Two eq. each)
- (c) Give SI units of volumetric flow rate, mass flow rate, density, Reynolds number.
- (d) List out different flow meter. (Any four)
- (e) Define the term NPSH.
- (f) Name the parts of pumps. (Any four)
- (g) Name any two vacuum generating equipments.

**2. Attempt any THREE of the following :****12**

- (a) State Newton's law of viscosity & the principle of Hydrostatic equilibrium.
- (b) Draw a labelled diagram of venturimeter.
- (c) Write the purpose of fitting :
  - (i) Tee
  - (ii) Cross
  - (iii) Plug
  - (iv) Bend
- (d) Give detailed classification of pumps.

**3. Attempt any THREE of the following :****12**

- (a) Derive the equation of continuity.
- (b) Draw neat sketch of pitot tube & write its construction, working and application.
- (c) A fluid is flowing through 5 cm diameter pipe at velocity 2 m/sec, that pipe is connected to larger diameter of 10 cm. Calculate the frictional loss due to sudden expansion.
- (d) Compare fan and compressor on basis of following points :
  - (i) Speed
  - (ii) Pressure developed

**4. Attempt any THREE of the following : 12**

- (a) Derive the equation  $(p_1 - p_2) = h(\rho_m - \rho)g$ .
- (b) An oil kinematic viscosity 30 stokes is flowing through a pipe 200 mm diameter, if the flow rate of oil through pipe is 25 L/sec. determine type of flow.
- (c) Explain procedure of calibration of Rotameter with graph.
- (d) Explain characteristic curves of centrifugal pump with sketch.
- (e) Compare reciprocating compressor & centrifugal compressor on basis of :
  - (i) Speed
  - (ii) Rate of flow

**5. Attempt any TWO of the following : 12**

- (a) Water is flowing through 25 mm ID pipe at a rate of 1 (kg/sec). Calculate pressure drop over length of 100 m.  
Data :  
 $f = 0.0001$   
 $\rho$  of water = 1000 kg/m<sup>3</sup>  
 $\mu$  of H<sub>2</sub>O =  $8.0 \times 10^{-4}$  Pa. S.
- (b) Orifice meter is installed in a pipe line for measurement of flow rate of H<sub>2</sub>O. Pressure drop across orifice meter is 11 cm of Hg.  
Calculate volumetric flow rate in m<sup>3</sup>/sec.  
Coefficient of orifice = 0.62  
Diameter of orifice = 25 mm  
Diameter of pipe = 50 mm  
Density of mercury = 13600 kg/m<sup>3</sup>.
- (c) Describe with neat sketch working of single acting reciprocating pump.

**6. Attempt any TWO of the following :****12**

- (a) Draw a sketch of steam jet ejector & explain working of it.
- (b) 1.3 kg/sec. of 98% sulphuric acid is to be pumped through 25 mm diameter pipe, 30 m long, to a tank 12 m higher than its reservoir.

Calculate the actual power required. If the efficiency of pump is 55%.

Data – Density of acid =  $1840 \text{ kg/m}^3$ .

Viscosity of acid =  $0.025 \text{ (Ns/m}^2\text{)}$

- (c) A 250 mm diameter pipe carries oil of specific gravity 0.8 at a rate of 120 l/sec and pressure at point (A) (Station 1) is  $120945 \text{ (N/m}^2\text{)}$  Pa. If the point (A) is 3.5 m above the datum line calculate the total energy at (A) in metres of oil and joules per kg.
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