

# 17411

16117

**3 Hours / 100 Marks**

Seat No.

--	--	--	--	--	--	--	--	--	--

- 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. a) **Attempt any SIX of the following:** **12**
- (i) Define surface tension and dynamic viscosity.
  - (ii) Define compressibility and vapour pressure.
  - (iii) Define gauge pressure and atmospheric pressure.
  - (iv) State types of fluid flow.
  - (v) State uses of air vessels.
  - (vi) List any four functions of draft tubes.
  - (vii) Define cavitation in centrifugal pump.
  - (viii) Define slip of pump. What is negative slip.

P.T.O.

b) **Attempt any TWO of the following:****8**

- (i) An isosceles triangular plate base 1.4 m and height 2.3 m is immersed in water vertically in such a way that apex is in downward direction and side of base is parallel and 40 cm below free water surface level. Determine total pressure and centre of pressure.
- (ii) List types of manometers and explain any one of them with neat sketch.
- (iii) Explain how Bernoulli's theorem can be applied to pitot tube.

**2. Attempt any FOUR of the following:****16**

- a) The pressure of fluid of specific gravity 0.8 flowing in a horizontal pipeline is determined with a simple U-tube manometer. The level of mercury surface in the right limb open to atmosphere is 90 mm above the centre of pipe. The level of mercury in the left limb, which is connected to pipe is 65 mm below centre of pipe. Determine absolute pressure of fluid in pipe in  $\text{N/m}^2$ .
- b) Explain what is total pressure and centre of pressure acting on an immersed body.
- c) Explain phenomenon of capillary rise.
- d) Draw neat labelled sketch of Bourdon pressure gauge and explain in brief how it works.
- e) Define density, specific gravity, specific volume and specific weight.
- f) Explain with neat sketch principle of working of orifice meter.

**3. Attempt any FOUR of the following:****16**

- a) State laws of fluid friction for turbulent flow.
- b) Write Darcy's formula for head loss due to friction. State meaning of each term.
- c) Explain with neat diagram hydraulic gradient line and total energy line.

- d) A pipe 800 m long connects two reservoirs whose level difference is 60 m. Find the discharge in pipe in Liters/sec, if diameter of pipe is 0.5 m. Take all losses into account. Assume  $f = 0.01$ .
- e) Derive an equation to find force of impact of jet which strikes on a flat plate at right angle which is fixed.
- f) A jet of water 95 mm diameter is moving with a velocity of 25 m/s, strikes a stationary plate. Find the normal force on plate when.
- (i) Plate is normal to jet.
- (ii) The angle between jet and plate is  $30^\circ$ .

4. Attempt any TWO of the following:

16

- a) Explain with neat sketch the construction and working of multistage pump with application.
- b) A reaction turbine works at 400 rpm under a head of 125 m. Its diameter at inlet is 1.2 m and flow area is  $0.4 \text{ m}^2$ . The angle made by absolute and relative velocities at inlet is  $20^\circ$  and  $60^\circ$  respectively, with tangential velocity.
- Determine:
- (i) Flow rate
- (ii) Power developed
- (iii) Hydraulic efficiency.
- c) A  $300 \text{ mm} \times 150 \text{ mm}$  venturimeter is inserted in a vertical pipe carrying water flowing in upward direction. A differential mercury manometer connected to inlet and throat gives reading of 200 mm. Find discharge through pipe. take  $C_d = 0.98$ .

**5. Attempt any FOUR of the following:****16**

- a) State and explain minor losses in pipes fittings and valves.
- b) A jet of water diameter 8 cm strikes on a curved plate at its centre with velocity of 25 m/sec. The curved plate is moving with a velocity of 9 m/sec in the direction of jet. The jet is deflected through an angle of  $165^\circ$ . Assuming plate smooth, Find:
  - (i) Force exerted on plate.
  - (ii) Power of jet in kW.
- c) Give classification of hydraulic turbines.
- d) Draw inlet and outlet velocity triangles for bucket in pelton wheel with the meaning of terms.
- e) Draw neat labelled sketch of vortex casing.
- f) Explain with neat sketch construction and working of double acting reciprocating pump.

**6. Attempt any TWO of the following:****16**

- a) With the help of neat indicator diagram, explain separation and cavitation in the reciprocating pump. What are its effects and how to minimize it?
  - b) Explain with neat sketch construction and working of francis turbine.
  - c) A centrifugal pump works against 12 m head at 900 r.p.m. The vanes are curved back at an angle of  $30^\circ$  to the tangent at the outer periphery. The impeller diameter is 30 cm and has width 5 cm at outlet. Determine the discharge, if manometric efficiency is 95%. Also determine the power required to operate the pump, if overall efficiency is 65%.
-