17411

15116

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 weight density and kinematic viscosity.

(ii) State the units of discharge and dynamic viscosity.

(iii) Specific gravity of an oil is 0.80. Find its weight density.

(iv) State atleast two devices to measure fluid pressure.

(v) State Bernoulli's equation and state the meaning of each term used in it.

(vi) Classify turbines according to:

1) type of energy at inlet and

2) direction of flow through runner.

(vii) Define slip and negative slip in case of reciprocating pump.

(viii) Draw neat labelled sketch of vortex and volute casing.

Marks

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

(i) Find the pressure of a liquid in pipe of specific gravity 0.8 as shown in Fig. No. 1. (Specific gravity of manometric fluid is 13.6)

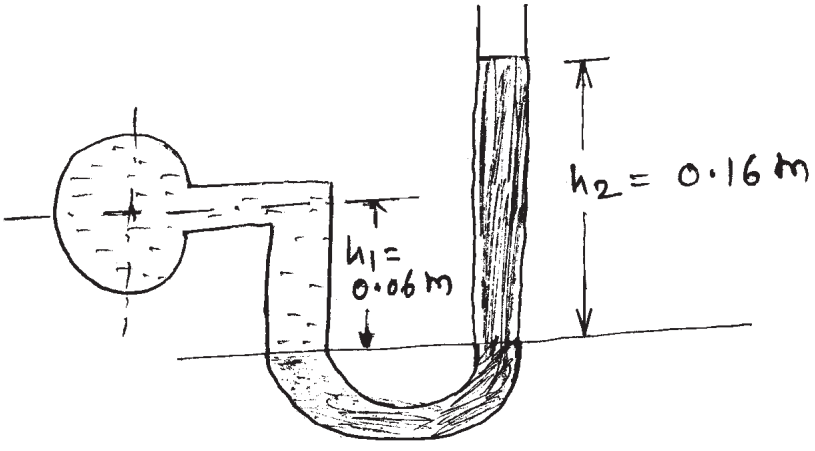

Fig. No. 1

(ii) Explain concept of absolute vacuum, gauge pressure and atmospheric pressure with neat sketch.

(iii) State atleast four points of comparison between Pelton wheel and Francis turbine.

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

a) A triangular lamina is immersed vertically in water in such a way that its 6 m wide horizontal base is 8 m below the free surface of water and the apex is 4.5 m above the base. Find:

(i) total pressure force and

(ii) position of centre of pressure.

b) Explain working principle of pitot tube with neat sketch.

Marks

c) Define the following terms:

(i) steady flow

(ii) non uniform flow

(iii) laminar flow

(iv) rotational flow

d) Find maximum power that can be transmitted by a power station through a pipe 3 km long and 200 mm diameter. The pressure of water at power station is 1500 kPa. (take f = 0.01)

e) Write Darcy's equation and Chezy's equation. State the meaning of each term.

f) State the laws of fluid friction for turbulent flow.

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

a) Find the losses of head when a pipe diameter 200 mm is suddenly enlarged to diameter 400 mm. The rate of flow of water through the pipe is 0.250 m^3/sec.

b) A force of 1.8 kN exerted by a jet of water of diameter 80 mm on stationary flat plate. Find the velocity of jet.

c) Draw a neat sketch for impact of jet on a moving vertical flat plate and write the formula to determine the work done.

d) State the different types of draft tubes. Explain any one with neat sketch.

e) A pelton wheel working under a head of 50 meters developes 8×10^3 watts power at 240 rpm. Calculate the diameter of jet if the overall efficiency is 78%. (Assume Cv = 0.98).

f) Explain the effect of cavitation in turbine and write methods to prevent it.

Marks

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

a) A centrifugal pump delivers water at a rate of 0.03 m^3/sec to a height of 18 meters through a pipe of 100 mm diameter and 90 m long. If the overall efficiency of the pump is 75%, find the power required to drive the pump. (take f = 0.012)

b) Draw a neat labelled diagram of centrifugal pump. Show following labels on it:

(i) impeller

(ii) suction head

(iii) delivery head

(iv) suction and delivery gauge.

Also define manometric head and total head.

c) Draw an indicator diagram with effect of accelerator head and frictional head for reciprocating pump.

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

a) State the function of air vessel related to reciprocating pump. Show its position with neat sketch.

b) Write the formulae for hydraulic efficiency and mechanical efficiency of an impulse turbine. State the meaning of each term.

c) Explain construction and working of Kaplan turbine.

d) Water flows through a horizontal tapered pipe with a diameter of 300 mm at one end and 200 mm at other end. If the velocity of the water at bigger end is 2.5 m/s, find the velocity of water at smaller end.

e) Draw neat labelled sketch of vertical micro-manometer. State its significance.

f) State the advantages and limitations of hydroelectric power plant.

Marks

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

a) Water flows down an inclined tapered pipe 45 m long at a slope of 1:10. The areas at upper and lower ends of pipe are $8m^2$ and $3m^2$ respectively. If velocity at lower end is 5 m/s and pressure at upper end is 100 KPa, calculate pressure at lower end and rate of flow.

b) A jet of water 50 mm in diameter, moving with a velocity of 15 m/s, imparts on a series of vanes moving with a velocity of 6 m/s. Find:

(i) force exerted by the jet

(ii) work done by the jet

(iii) efficiency of the jet

c) (i) List four minor losses with neat sketch and give appropriate formulae.

(ii) Explain surface tension and capillarity