

17988

16117

3 Hours / 100 Marks

Seat No.

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

Marks

1. Attempt any TEN of the following: 20
- a) Define dynamic viscosity and kinematic viscosity.
 - b) Define total pressure and centre of pressure.
 - c) Convert 10 N/cm^2 pressure in column of oil of specific gravity 0.82.
 - d) Describe vena-contracta related to orificement.
 - e) Define Laminar flow and steady flow.
 - f) Mercury is used in manometers. Justify?
 - g) Write down chezy's equation. State the meaning of each term.
 - h) Enlist any four minor losses in pipe.
 - i) Define the term Impact of jet.

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- j) Classify Hydraulic turbines according to
 - (i) Energy at inlet
 - (ii) Head
- k) State different types of draft tubes used in reaction turbine.
- l) Define slip and Negative slip in reciprocating pump.
- m) Describe priming of a centrifugal pump.
- n) State the functions of Air Vessel in reciprocating pump.

2. Attempt any FOUR of the following:

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- a) Explain the concept of vapour pressure.
- b) Define-Atmospheric pressure, Absolute pressure, Gauge pressure, Vacuum pressure.
- c) State any four laws of fluid friction for turbulent flow.
- d) A simple U tube manometer shows mercury level 90 mm above centre of pipe in the open limb and 60 mm below centre of pipe in the left limb connected to pipe. The pipe is horizontal and carries oil of specific gravity 0.8. Calculate the absolute pressure in the pipe.
- e) An isosceles triangular plate base 1.2 m and height 2 m is immersed vertically in such a way that the apex is in the downward direction and the side of base is parallel and 38 cm below the free surface of water. Determine total pressure and depth of centre of pressure.
- f) An open tank contains water upto height of 2 m and then oil upto height of 1 m. The specific gravity of oil is 0.75. Find the pressure at the bottom of tank.

3. Attempt any FOUR of the following:

16

- a) State Bernoulli's theorem and the assumptions made in it.
- b) Explain HGL and TEL with neat sketch.
- c) Draw inlet and outlet velocity triangles for Francis Turbine and state the name of each of the vectors used.

- d) A 30 cm \times 15 cm venturimeter is inserted in a vertical pipe carrying water flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20 cm. Find the discharge. Take $C_d = 0.98$.
- e) A pipe 850 m long connects two reservoirs whose level difference is 50 m. Find the discharge in pipe in liters/sec, if diameter of pipe is 0.5 m. Take all losses into account. Assume $f = 0.01$.
- f) Find the maximum power that can be transmitted by a power station through a hydraulic pipe 3 km long and 0.2 m diameter. The pressure at the power station is 60 bars. Take $f = 0.0075$.

4. Attempt any TWO of the following: 16

- a) Explain the working of kaplan turbine, in brief. Draw a neat labeled sketch.
- b) Compare reciprocating pump and centrifugal pump. (any eight point)
- c) A centrifugal pump is to discharge water at the rate of 110 lits/sec at the speed of 1450 rpm against head of 13 m. Impeller diameter is 250 mm and its width is 50 mm. If manometric efficiency is 75%. Determine vane angle at outer periphery.

5. Attempt any FOUR of the following: 16

- a) In case of venturimeter the length of divergent cone is more than that of convergent cone. Explain the reason.
- b) Draw a neat sketch of Impact of jet on inclined fixed plate and write formula for various forces exerted on it.
- c) A jet of water of diameter 10 cm strikes a flat plate normally with a velocity of 15 m/sec. The plate is moving with a velocity of 6 m/sec in the direction of jet. Find:
 - (i) The force exerted by the jet on the plate
 - (ii) Work done by the jet on the plate per sec.

- d) Two jets strike the buckets of pelton turbine which is having shaft power as 15500 kW. The diameter of each jet is 200 mm. If net available head on turbine is 400 m, find overall efficiency of turbine assuming. $C_v = 1.00$.
- e) A 30 cm pipe carrying water, branches into two pipes of 20 cm and 15 cm diameter. If mean velocity in 30 cm pipe is 2.5 m/s, Find the discharge in the pipe. Also find velocity in 15 cm pipe if the mean velocity in 20 cm pipe is 2 m/s.
- f) Explain ideal indicator diagram of reciprocating pump.

6. Attempt any TWO of the following:

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- a) Draw a layout of Hydro-electric power plant and explain.
 - b) Describe construction and working of centrifugal pump.
 - c) A jet of water having a velocity of 40 m/s strikes a curved vane, which is moving with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of motion of vane at inlet and leaves at angle of 90° to the direction of motion of vane at outlet. Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock.
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