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3 Hours / 100 Marks Seat No. | | | | | | | | |

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. (A) Attempt any SIX of the following : **6 × 2 = 12**

(a) Define vapour pressure.

(b) Define specific weight.

(c) State various types of fluid flow.

(d) State various losses of energy of fluid flowing in a pipe.

(e) State the formula for force exerted by a jet on the curved plate, when jet Strikes the plate at the centre.

(f) State the principle of reaction turbine.

(g) State concept of priming in centrifugal pumps.

(h) State the advantages of using air vessel in reciprocating pumps.

(B) Attempt any TWO of the following : **2 × 4 = 8**

(a) Define :

(i) absolute

(ii) gauge

(iii) vacuum and

(iv) atmospheric pressure

(b) Explain the concept of piezometer for pressure measurement.

(c) Explain the various energies possessed by a flowing fluid.

2. Attempt any FOUR of the following : **4 × 4 = 16**

(a) Explain the construction and working of Bourdon's pressure gauge for pressure measurement.

(b) Explain pressure measurement using differential 'U'-tube manometer.

(c) Explain the construction and working of pitot tube.

(d) Calculate the velocity at the end of the pipes of diameter 150 mm and 220 mm connected in series having discharge of 60 *l*pm.

(e) Explain Darcy's equation for loss of head due to friction.

(f) A pipe is used for energy transmission. Length and diameter of pipe are 80 m and 45 cm respectively. Flow rate is 105 lit/s. Calculate friction loss. Neglect minor losses. Take f = 0.03.

3. Attempt any FOUR of the following : **4 × 4 = 16**

(a) A rectangular plate 3 m × 2 m is immersed horizontal inside a liquid of specific gravity 1.2. Calculate the total pressure on the plate, if it is immersed at a distance of 2 m from fluid surface level.

(b) Define total pressure and centre of pressure.

(c) Explain construction and working of orifice meter.

(d) State and explain Bernoulli's theorem. Obtain Bernoulli's equation.

(e) Define hydraulic gradient line and total energy line.

(f) Explain the concept of power transmission through pipes.

4. Attempt any TWO of the following : **2 × 8 = 16**

(a) Obtain the expression for force exerted by the jet of water on fixed vertical plate.

(b) Differentiate between Impulse and Reaction turbine.

(c) Explain the construction and working of centrifugal pump.

5. Attempt any FOUR of the following : **4 × 4 = 16**

(a) An equilateral triangular plate of 3 m side is immersed vertically in such a way that the apex is in the downward direction and the side is of base is parallel and 25 cm below free fluid surface level. The plate is immersed in tank of oil having specific gravity 1.1. Calculate total pressure and depth of centre of pressure.

(b) Classify hydraulic turbines with example.

(c) State the various types of draft tube and explain any one in detail.

(d) Draw layout of hydroelectric power plant and state the function of each component.

(e) State the phenomenon of cavitation in centrifugal pump. How it is prevented ?

(f) Explain the construction and working of single acting reciprocating pump with suitable diagram.

6. Attempt any TWO of the following : **2 × 8 = 16**

(a) (i) Obtain an expression for impact of jet of a liquid on a fixed curved plate when the jet strikes at the centre of the curved plate.

(ii) Explain various efficiencies associated with turbine.

(b) (i) Define slip in reciprocating pump. Explain positive slip and negative slip.

(ii) State various types of casings in centrifugal pump. Explain any one in brief.

(c) Draw and explain indicator diagram showing combined effect of friction and acceleration head for single acting reciprocating pump.

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