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11920

3 Hours / 100 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) 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:

12

- (i) Define Kinematic viscosity.
- (ii) Draw a neat sketch of differential manometers.
- (iii) State Bernoulli's theorem.
- (iv) List out different types of draft tube.
- (v) Define turbulent flow.
- (vi) Draw a neat sketch of centrifugal pump.
- (vii) State the concept of cavitation in turbine.
- (viii) State the use of Air vessel.

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

- (i) Explain construction and working of Bourden pressure gauge with neat sketch.
- (ii) Describe the concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure.
- (iii) Write Darcy's formula for head loss due to friction. State meaning of each term.

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

- a) Explain what is total pressure and centre of pressure acting on immersed body.
- b) Explain with neat sketch, principle of working of pitot-tube.
- c) Derive an equation to find force of impact of jet which strikes on a flat plate at right angle which is fixed.
- d) Explain with neat diagram hydraulic gradient line and total energy line with its application.
- e) State laws of fluid friction for laminar flow.
- f) Define :
 - (i) Fluid pressure
 - (ii) Pressure head
 - (iii) Pressure intensity.

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

- a) Draw a layout of hydroelectric power plant and explain in brief.
- b) Give classification of hydraulic turbine and their application.
- c) Explain construction and working of pelton turbine with a neat sketch.
- d) 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° . Assuming plate smooth find
 - (i) Force exerted on plate
 - (ii) Power of jet in KW

- e) Define
- (i) Surface tension
 - (ii) Compressibility
- f) A simple manometer containing mercury is used to measure pressure of water flowing in a pipeline. The mercury level in the open tube is 60mm higher than that as the left limb tube. If height of water in the tube is 150mm, determine the pressure in the pipe in terms of head of water.

4. Attempt any TWO of the following: 16

- a) Differentiate between Francis and Kaplan turbine (any eight point)
- b) Explain construction and working of multistage pump with neat sketch and its applications.
- c) Two jets strike the buckets of pelton turbine which is having shaft power as 15500KW. The diameter of each jet is 200 mm. If net available head on turbine is 400m. Find overall efficiency of turbine assuming $C_v = 1.00$.

5. Attempt any FOUR of the following: 16

- a) State any one cause of trouble given below.
 - (i) Pump starts and suddenly stops
 - (ii) Pump consumes so much power
 - (iii) Pump does not start
 - (iv) Discharge of pump is too low.
- b) With the help of neat indicator diagram, explain separation and cavitation in the reciprocating pump. What are its effects?
- c) A centrifugal pump is to discharge 110 lit/sec. at speed of 1440 rpm, against a head of 25m. The impeller diameter is 250mm and its width 50mm at outlet. Find the vane angle at outlet assuming a manometric efficiency of 80%.
- d) What are minor losses in pipes? list them.
- e) Derive an expression for discharge through venturimeter.
- f) Explain hydraulic power transmission through pipe.

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

- a) (i) Derive an expression for the force exerted by a jet of water on a moving inclined plate.
(ii) Draw and explain velocity triangle for jet striking tangentially on an unsymmetrical curved plate.
 - b) Explain construction and working of double acting reciprocating pump and its application.
 - c) A Francis turbine operating under a head of 60m runs at 420 rpm. If the outer diameter is 0.90 and inner diameter is 0.45m. If discharge is radial, determine the vane angles at inlet and outlet, if velocity of flow is constant and 12 m/sec hydraulic efficiency is 80%.
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