

GUJARAT TECHNOLOGICAL UNIVERSITY

P.D.D.C. Sem - IV Examination June- 2011

Subject code: X41902

Subject Name: Fluid Power Engineering

Date: 04/06/2011

Time: 10.30 am – 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Give the classification of water turbine. **07**
(b) Draw general layout mentioning essential components of hydro power plant. Explain the function of each component. **07**

- Q.2** (a) Derive Darcy-Weisbach Formula for head loss due to friction in pipe flow. **07**
(b) A single stage reciprocating air compressor is required to compress 90 m³ air per minute from 1 bar and 27° C to 10 bar. Calculate the temperature at the end of compression, workdone, power required, heat rejected and change in internal energy during following processes. Assume no clearance. **07**
(i) Isothermal
(ii) Adiabatic

OR

- (b) The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 rpm. The vane angles of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the workdone by the impeller per unit weight of water. **07**

- Q.3** (a) Explain the following terms **07**
(i) Hydraulic gradient line
(ii) Total energy line
(iii) Equivalent pipes
(b) Classify reciprocating pump. Explain operation of double acting reciprocating pump with neat sketch. **07**

OR

- Q.3** (a) A horizontal pipe 150 mm in diameter, is joined by sudden enlargement to a 225 mm diameter pipe. Water is flowing through it at the rate of 0.05 m³/s. Find **07**
(i) Loss of head due to abrupt expansion
(ii) Pressure difference in the two pipe
(iii) Change in pressure if the change of section is gradual without any loss.
(b) Why governing of hydraulic turbine is required? Explain governing of Pelton Wheel with neat sketch. **07**

- Q.4 (a)** Derive the equation of workdone by jet when moving plate is vertical and moving along the jet **07**

$$W = \rho A u (V + u)^2$$

Where V = Velocity of water jet

A = Area of cross-section of the jet

u = Velocity of plate

- (b)** Define the following terms with respect to centrifugal pump. **07**

(i) Suction head (ii) Delivery head (iii) Static head (iv) Manometric head (v) Mechanical efficiency (vi) Manometric efficiency (vii) Volumetric efficiency

OR

- Q.4 (a)** Explain “Surging” and “Chocking” in Centrifugal compressor. **07**

- (b)** Explain construction and working of Kaplan turbine with neat sketch. **07**

- Q.5 (a)** Water is flowing through a pipe at the end of which a nozzle is fitted. **07**

The diameter of the nozzle is 100 mm and the head of water at the centre nozzle is 100 m. Find the force exerted by the jet of water on a fixed vertical plate. The co-efficient of velocity is given as 0.95

- (b)** Explain construction and working of Axial flow compressor with neat sketch. **07**

OR

- Q.5 (a)** What is jet propulsion? Derive the efficiency of jet propulsion. **07**

- (b)** Explain the operation of Screw compressor with neat sketch. **07**
