

GUJARAT TECHNOLOGICAL UNIVERSITYBE- Vth SEMESTER-EXAMINATION – MAY/JUNE - 2012**Subject code: 151903****Date: 04/06/2012****Subject Name: Fluid Power Engineering****Time: 02:30 pm – 05:00 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) Prove that head loss due to friction is equal to one third of total head inlet for maximum power transmission through nozzle. **07**
- (b) Explain the following terms : (1) Major losses (2) Minor losses and (3) Equivalent pipe **07**

- Q.2** (a) A jet delivers water at the rate of 60 liters per second with velocity 30 m/s. The jet strikes tangentially on the vane moving in the direction of the jet with the velocity of 15 m/s. The vane is so shaped that if stationary it would deflect the jet through an angle 50°. Calculate: (1) angle made by absolute velocity at outlet and (2) work done per sec. **07**
- (b) Show that in case of jet striking the flat plates mounted on wheel, the efficiency will be maximum when the tangential velocity of wheel is half of the jet. **07**

OR

- (b) A jet of water of 30 mm diameter, strikes on the hinged rectangular plate weight 100 N at the center of the plate. The velocity of the jet is 8 m/s. Calculate: (1) angle through which the plate will swing, and (2) force must be applied at the lower edge of the plate in order to keep the plate vertical. **07**
- Q.3** (a) Explain the following terms with reference to water turbines. Give expression of each efficiencies. **07**
- (1) Hydraulic efficiency (2) Mechanical efficiency and (3) Overall efficiency
- (b) The following data is related to Pelton wheel turbine **07**
- (1) Head at the base of the nozzle=80 m
(2) Diameter of the jet = 100 mm
(3) Discharge of the nozzle=0.30m³/s
(4) Power at the shaft=206 kw and
(5) Power absorbed in mechanical resistance= 4.5 kw
Determine: (1) power lost in nozzle and (2) power lost due to hydraulic resistance in the runner.

OR

- Q.3** (a) Why governing of water turbine is required? Explain governing of any one hydraulic turbine with neat sketch. **07**
- (b) Francis turbine designed to develop 160 kw working under a head 10 m and running at 200 rpm. The hydraulic losses in turbine are 15% of available energy. The overall efficiency of turbine is 80%. Assume flow ratio=0.94 and speed ratio=0.25. Calculate: (1) guide blade angle and runner vane angle at inlet and (2) diameter and width at inlet. **07**

- Q.4** (a) Enlist the various types of impeller used in centrifugal pump and explain any one from it with a neat sketch . **07**
(b) Find the power required to drive a centrifugal pump which delivers $0.04 \text{ m}^3/\text{sec}$ of water to a height of 20m through a 15 cm diameter pipe and 100 m long. The overall efficiency of the pump is 70% and coefficient of friction $f=0.015$ used in Darcy's equation. **07**

OR

- Q.4** (a) Give classification of Reciprocating pump. Draw neat sketch of single acting reciprocating pump **07**
(b) Write a short note on Submersible pump. **07**

- Q.5** (a) Derive an expression for the optimum value of the intercooler pressure in a two stage reciprocating air compressor for perfect inter cooling condition. **07**
(b) A centrifugal air compressor has a pressure ratio of 4:1 with an isentropic efficiency 88% when running at 14000 rpm and including air at 25° C . Curved vanes at inlet give the air a pre-whirl of 18° to axial direction at all radii and the mean diameter of eye is 245 mm. The absolute air velocity at inlet is 120 m/s. Impeller tip diameter is 580 mm. Calculate slip factor. **07**

OR

- Q.5** (a) With a suitable sketch explain the working principle of an axial flow compressor. Draw the stage velocity triangles. **07**
(b) Explain working of Differential hydraulic accumulator with neat sketch. **07**

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