

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**PDDC - SEMESTER-IV • EXAMINATION – SUMMER • 2014**

**Subject Code: X41902****Date: 19-06-2014****Subject Name: Fluid Power Engineering****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)** 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**
- (b)** A jet of water of diameter 80 mm strikes a curved plate at its centre with a velocity of 20 m/s, the plate is moving with a velocity of 10 m/s in the direction of the jet. The jet is deflected through an angle of  $160^\circ$ , assuming the plate is smooth. Calculate : **07**
1. Force exerted in the direction of jet
  2. Work done by jet on the plate per sec
  3. Efficiency of the jet.
- Q.2 (a)** Explain the following terms : **07**
1. Major losses
  2. Minor losses
  3. Equivalent pipe
- (b)** Prove that head loss due to friction is equal to one third of total head inlet for maximum power transmission through nozzle. **07**
- OR**
- (b)** An oil of specific gravity 0.78 is flowing through a pipe of diameter 300 mm at the rate of  $0.6 \text{ m}^3/\text{sec}$ . Find the head loss due to friction and power required to maintain the flow for a length of 500 meter. Take kinematic viscosity of an oil as 0.29 stokes. **07**
- Q.3 (a)** Discuss any Characteristic curves of hydraulic turbine **07**
- (b)** Why governing of water turbine is required? Explain governing of any one hydraulic turbine with neat sketch. **07**
- OR**
- Q.3 (a)** The external and internal diameters of an inward flow reaction turbines are 1.20 meter and 0.6 meter respectively. The head on the runner is 20 meter and velocity of flow through the runner is constant and equal to 3.0 m/sec. The guide blade angle is given as  $12^\circ$  and the runner vanes are radial at inlet and discharge at outlet is radial, determine : **07**
1. The speed of the turbine
  2. The vane angle at outlet of the turbine
  3. Hydraulic efficiency
- (b)** Write a short note on Radial flow reaction turbine and give design parameters for it. **07**
- 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**
- OR**
- Q.4 (a)** Explain the working of a single stage centrifugal pump with neat sketch **07**

- Q.4 (b)** The outer diameter of an impeller of a centrifugal pump is 500 mm and outlet width 50 mm. The pump is running at 700 r.p.m and working against a head of 20 meter. The vanes angle at outlet is  $40^\circ$  and manometric efficiency is 78%. Determine : **07**
1. Velocity of flow at outlet
  2. Velocity of water leaving the vane
  3. Angle made by absolute velocity at outlet with the direction of motion at outlet, and
  4. Discharge

- Q.5 (a)** A centrifugal air compressor draws air at a temperature of  $25^\circ\text{C}$  running at 15000 rpm has the following data: **07**
1. Outer diameter of blade tip= 500 mm
  2. Slip factor=0.85
  3. Isentropic total head efficiency= 0.82
- Assuming that the absolute velocities of air at inlet and outlet are same. Calculate :
1. Temperature rise of air passing through compressor
  2. Static pressure ratio
- (b)** With a suitable sketch explain the working principle of an axial flow compressor. Draw the stage velocity triangles. **07**

**OR**

- Q.5 (a)** Give detail classification of rotary compressor and explain any one with line sketch **07**
- (b)** Derive an expression for the optimum value of the intercooler pressure in a two stage reciprocating air compressor for perfect inter cooling condition. **07**

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