

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-IV • EXAMINATION – WINTER • 2014

Subject Code: X41902**Date: 29-12-2014****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) Show that the force exerted by a jet of water on an inclined fixed blade in the direction of jet is given by $F_x = \rho a v^2 \sin^2 \theta$ with usual notation. **07**
- (b) A jet of water of diameter 100 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 165° , 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) Write a brief note on: Water Hammer **07**
- (b) Explain the following terms : **07**
1. Pipes in series
 2. Pipes in parallel
 3. Equivalent pipe

OR

- (b) Prove that total head loss due to friction is equal to $1/3^{\text{rd}}$ of the total head at inlet for maximum power transmission through pipes or nozzles. **07**

- Q.3** (a) Explain the following terms related to hydraulic turbine : **07**
1. Gross head
 2. Net head
 3. Hydraulic efficiency
 4. Overall efficiency
- (b) A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at a rate of $1.5 \text{ m}^3/\text{sec}$ under a head of 60 meters. The bucket deflect the jet through an angle of 165° . Assuming that coefficient of velocity as 0.94 Calculate: **07**
1. Velocity of jet
 2. Work done per second on the runner
 3. Hydraulic efficiency of turbine

OR

- Q.3** (a) Explain the function of draft tube. Enlist the type of draft tube and draw a neat sketch of any one. **07**
- (b) Draw and explain Characteristic curves of hydraulic turbine **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 $0.05 \text{ m}^3/\text{sec}$ of water to a height of 25m through a 20 cm diameter pipe and 75 m long. The overall efficiency of the pump is 75% 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**
- Q.4 (b)** Write a short note on Submersible pump. **07**
- Q.5 (a)** A centrifugal air compressor draws air at a temperature of 27°C running at 12000 rpm has the following data: **07**
1. Outer diameter of blade tip= 550 mm
 2. Slip factor=0.92
 3. Isentropic total head efficiency= 90%
- 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. **07**
Draw the stage velocity triangles.
- 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**
