Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - IVth Semester–Examination – May- 2012

Subject code: X41902

Subject Name: Fluid Power Engineering

Date:09/05/2012 **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)** Explain the construction and working of Pelton wheel with neat sketch. **07**

(b) Compare Impulse and Reaction turbine on seven aspects. **07**

Q.2 **(a)** Describe water hammer phenomenon in pipes when valve is gradually closed. **07**

(b) A centrifugal compressor running at 12000 rpm delivers 1.3 m^3/s of free air. The pressure and temperature at inlet are 1 bar and 25^oC. The compression ratio is 5, blades are radial at outlet, the velocity of flow is 58 m/s and is constant throughout. Assume slip factor is 0.9 and isentropic efficiency is 84%. Determine **07**

(i) Temperature of air at outlet
(ii) Impeller diameter and blade angle at inlet
(iii) Diffuser inlet angle and
(iv) Power required

Assume inlet diameter of impeller is equal to half of outlet diameter of impeller.

OR

(b) A single acting reciprocating pump has the plunger diameter of 20 cm and stroke of 30 cm. The pump discharges 0.53 m^3 of water per minute at 60 rpm. Find the theoretical discharge, co-efficient of discharge and percentage slip of pump. Further, if suction and delivery heads are 4 m and 12 m respectively, workout power required to run the pump. **07**

Q.3 **(a)** Define the following terms with respect to centrifugal pump. **07**

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

(b) Derive the equation of Efficiency of jet when moving plate is inclined and moving along jet **07**

$$\eta=[\ 2u(V-u)^2\sin\theta]/V^3$$

Where V= velocity of water jet
u = Velocity of plate

θ = Angle between jet and plate

OR

Q.3 **(a)** State the ten uses of Air compressor. Draw the neat sketch of Reciprocating Compressor. **07**

	(b)	Draw general layout mentioning essential components of Hydro power plant. Explain the function of each component.	**07**
Q.4	**(a)**	Derive Chezy's formula for loss of head due to friction in pipes.	**07**
	(b)	Give classification of Centrifugal pump in details.	**07**
		OR	
Q.4	**(a)**	A horizontal pipe of diameter 50 cm is suddenly contracted to a diameter of 25 cm. The pressure intensities in the large and smaller pipe are given as 13.734 N/cm^2 and 11.772 N/cm^2 respectively. Find the loss of head due to contraction if Ce = 0.62. Also determine the rate of flow of water.	**07**
	(b)	Explain construction and working of Francis turbine with neat sketch.	**07**
Q.5	**(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)	Write a short note on construction and working of air Vessel with neat sketch.	**07**
		OR	
Q.5	**(a)**	Explain the working of Scroll compressor with neat sketch. State four advantages of it.	**07**
	(b)	A nozzle of 5 cm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet at 5 m/s. find the force on the plate, the workdone and the efficiency of jet.	**07**

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