Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–IV EXAMINATION – WINTER 2015

Subject Code:X41902 **Date:21/12/2015**

Subject Name: Fluid Power Engineering

Time: 02:30pm to 05:00pm **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)**	What do you mean by minor energy losses? Derive equation for the loss of head due to sudden enlargement in pipe.	**07**
	(b)	A 33m long pipeline connects two reservoirs, both of which are open to atmosphere. The difference in their water level is 8m. The pipeline has three equal sections of 11m each. The first and last sections are 70mm in diameter and intermediate section is 50 mm in diameter. The value for co-efficient of friction for each pipes is 0.006. Calculate flow rate of liquid.	**07**
Q.2	**(a)**	Prove that in case of jet striking the flat plates mounted on wheel, the efficiency will maximum when the tangential velocity of wheel is half of the jet.	**07**
	(b)	Obtain expression for the efficiency and maximum efficiency of the ship propulsion when inlet orifices are at right angle to ship.	**07**
		OR	
	(b)	A jet of water coming out of nozzle of 8 cm diameter with a velocity of 50m/s strikes the flat plate. Calculate force on the plate , work done and power developed when (i) plate is stationary (ii) plate is moving with a velocity of 12m/s along with jet direction (iii) plate is moving with a velocity of 12m/s towards the jet.	**07**
Q.3	**(a)**	Classify the hydraulic turbines. Draw a neat sketch of main parts of Pelton wheel turbine.	**07**
	(b)	An inward flow reaction turbine produces 150kW while working under a head of 25m. The discharge through the turbine is 720lit/sec and is radial outlet. The diameter at inlet and outlet are 60cm and 45cm respectively. Take the radial velocity at outlet as 4.8m/s, width of wheel constant and speed of runner is 600rpm. Calculate (1) overall and hydraulic efficiencies and (ii) inlet angle of guide and runner blades.	**07**
		OR	
Q.3	**(a)**	What is specific speed? Obtain expression of specific speed of hydraulic turbine.	**07**
	(b)	A hydro-electric power plant developing 80MW brake power under the head 450m and at 450 rpm. Calculate (i) total quantity of water required (ii) diameter of jet and (iii) no. of nozzle required. Assuming overall efficiency= 90%, pitch diameter of wheel to jet diameter ratio= 10, Co-efficient of velocity= 0.97 and speed ratio = 0.46	**07**
Q.4	**(a)**	What is the function of draft tube? Sketch various types of draft tube. State the salient features of each of them.	**07**

	(b)	A centrifugal pump has an impeller of 100cm in diameter and it delivers $1.2m^3/s$ against a head of 100m. The impeller runs at 900rpm and width at outlet is 8.5cm. If volumetric efficiency is 97%, external mechanical loss is 9 kW and the hydraulic efficiency is 79%. Calculate (i) blade angle at outlet (ii) the power required to drive pump and (iii) the overall efficiency of pump.	**07**

OR

Q.4	**(a)**	Explain characteristics curves of centrifugal pump.	**07**
	(b)	What is main drawback of deepwell pump? How it overcome in submersible pump? Explain the working of submersible pump with neat sketch.	**07**
Q.5	**(a)**	Why multistage compression is needed? Derive an expression for minimum work input to compress the air in two stage reciprocating compressor.	**07**
	(b)	Define the degree of reaction for a centrifugal compressor stage and prove that $R = \frac{1-\phi^2 \cos ec^2 \beta_2}{2(1-\phi \cot \beta_2)}$ where $\phi = flow\ Co-efficient$	**07**

OR

Q.5	**(a)**	Derive the expression for pressure ratio per stage of an axial flow compressor in terms of isentropic efficiency, work done, blade velocity, blade angles and inlet temperature.	**07**
	(b)	Classify rotary compressors. Explain the working of vane type compressor with neat sketch.	**07**

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