Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V- EXAMINATION – SUMMER 2016

Subject Code: 151903 **Date: 09/05/2016**

Subject Name: Fluid Power Engineering

Time: 02:30 PM to 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)** Derive an expression for the rise of pressure when the flowing water in a pipe is brought to rest by closing the valve gradually. **07**

(b) A pipe line AB of diameter 400mm and length 500m carries water at the rate of 60 liters/sec. the flow takes place from A to B, where point B is 35meter above A. Find the pressure at A if the pressure at B is 19.75 N/cm^2. Take f=0.008. **07**

Q.2 **(a)** Derive the condition of maximum hydraulic efficiency for Pelton wheel turbine. **07**

(b) The following data relates to a Pelton wheel turbine **07**

(i) Head of base of nozzle=80m
(ii) Dia. of the jet=100mm
(iii) Discharge of the nozzle=0.30m^3/sec
(iv) Power at the shaft=206 kw
(v) Power absorbed in mechanical resistance=4.5kw

Determine the power lost in nozzle and power lost due to hydraulic resistance in the runner.

OR

(b) Determine the runner diameter and rotational speed of Kaplan turbine having following particulars **07**

(i) Net Available Head=5.5m
(ii)Speed ratio = 2.1
(iii)Flow ratio = 0.67
(iv)Overall efficiency = 0.85
(v)Ratio of hub diameter to outside diameter = 0.35
(vi)Power available at shaft of the turbine = 8850kw

Q.3 **(a)** Derive an equation for work done per second of a jet of water striking a moving curved vane tangentially at one tip and leaving at the other. **07**

(b) What is jet propulsion? Derive the efficiency of jet propulsion. **07**

OR

Q.3 **(a)** What is degree of reaction? Prove that for Francis turbine degree of reaction is 50%. **07**

(b) Explain construction and working of reciprocating pump. **07**

Q.4 **(a)** Show that for a two stage air compressor with perfect intercooling the total work of compression becomes minimum when the pressure ratio in each stage is equal. **07**

(b) A single stage reciprocating air compressor takes in 7.5m^3/min of air at 1 bar and 27°. The air is compressed to 5.5 bar polytropically with index n=1.3. The clearance is 6% of stroke volume. Calculate **07**

(i)Temperature of air delivered
(ii)volumetric efficiency
(ii)Air power

(iv)Shaft power η_{mech}=90%
(v)Electric motor capacity if η_{motor}=96%

OR

Q.4	**(a)**	Derive an expression for minimum speed of C.F. pump for delivery to commence.	**07**
	(b)	Explain construction and working of submersible pump.	**07**
Q.5	**(a)**	What is pre-whirl? Sketch the velocity diagram with and without pre-whirl. What is its effect on pressure ratio developed by centrifugal compressor.	**07**
	(b)	Explain surging and stalling related to axial flow compressor.	**07**

OR

Q.5	**(a)**	Derive an 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)	Explain with neat sketch the construction and working if hydraulic press.	**07**

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