

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V EXAMINATION – WINTER 2025****Subject Code:2151903****Date:25-11-2025****Subject Name:Fluid Power Engineering****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Draw the general layout of Hydroelectric power plant	03
	(b) Mention essential components of hydro power plant along with function of each component.	04
	(c) Discuss classification of hydro-electric power plant according to: i)Availability of head ii)Quality of water available and iii)Nature of load.	07
Q.2	(a) What is Impact of Jet; Write the statement of Impulse-momentum principle.	03
	(b) Explain the principle of operation of Hydro-electric power plant.	04
	(c) With neat sketch, derive the equation of force exerted by the jet striking on an inclined flat plate with moving in the direction of jet. Also derive equation of work done.	07
	OR	
	(c) Calculate the force exerted by jet on the vane in direction of motion, when the jet velocity is 17 m/s. The jet strikes a curved vane having velocity 5 m/s in same direction. The jet is deflected at an angle of 135° at outlet. The diameter of jet is 10 cm. Assume vane is smooth. Also find power exerted on the vane and efficiency of the vane.	07
Q.3	(a) Define hydraulic efficiency, mechanical efficiency and overall efficiency with respect to water turbines	03
	(b) List the main parts of Pelton wheel turbine and explain any three.	04
	(c) A hydro-electric power plant developing 67 MW brake power under the head 390 m and 400 rpm, calculate: i) Total quantity of water required. ii) Diameter of jet iii) Diameter of runner iv) No. of nozzles required v) No. of buckets in runner. Assume overall efficiency $\eta_o = 90\%$, jet ratio $D/d = 10$, co-efficient of velocity $C_v = 0.97$ and speed ratio $= 0.46$.	07
	OR	
Q.3	(a) Differentiate between Francis and Kaplan turbine	03
	(b) Discuss classification of Hydraulic Turbines	04

- (c) A Kaplan turbine runner is to be designed to develop 7500 KW shaft power. The net available head is 5.30 m. assume the speed ratio 2.09 and flow ratio 0.68. The overall efficiency is 60%. The diameter of the boss is $1/3^{\text{rd}}$ of the diameter of runner. Calculate: **07**
- i) The diameter of runner
 - ii) Speed of runner
 - iii) Specific speed.
- Q.4** (a) Define pumps. Give classifications of pumps. **03**
- (b) Draw schematic diagram of centrifugal pump. Explain its main components. **04**
- (c) Derive the equation of discharge through reciprocating pump. Also find the equation for work done and power. What do you mean by slip of reciprocating pump? **07**
- OR**
- Q.4** (a) List advantages of scroll compressor **03**
- (b) Explain construction and working of screw compressor **04**
- (c) Derive the equation for minimum work required in case of two stage reciprocating compressor with perfect inter-cooling. **07**
- Q.5** (a) List difference between positive displacement pumps and rotodynamic pumps **03**
- (b) Draw and explain main components of centrifugal compressor **04**
- (c) Discuss effect of blade shape on performance of centrifugal compressor. List advantages of radial blades. **07**
- OR**
- Q.5** (a) List the functions of draft tube. **03**
- (b) Draw and discuss differential hydraulic accumulator. **04**
- (c) Draw and discuss function, construction and working of Hydraulic Ram. **07**
