

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024

Subject Code:2151903

Date:05-12-2024

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.

- Q.1** (a) State the functions of following components of hydro power plant: Trash rack, surge tank and power house. **03**
- (b) How will you obtain an expression for the minimum speed for starting of a centrifugal pump? Give classification of Centrifugal pump. **04**
- (c) Enlist the various types of impeller used in centrifugal pump and explain any One from it with a neat sketch. **07**
- Q.2** (a) State major applications of hydro power plant **03**
- (b) What is Cavitation? What are the effects & precaution of cavitation in hydraulic turbine? **04**
- (c) Why governing of water turbine is required? Explain governing of any one hydraulic turbine with neat sketch. **07**
- OR**
- (c) A jet of water of diameter 4 cm having velocity 18 m/s and strikes on a series of vanes (plates).The vanes are so arranged that each vane appears successively before that jet in the same position and always moves with a velocity of 6 m/s .Calculate (1) Force on the vane (2) Work done (3)The efficiency of system **07**
- Q.3** (a) Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50 %. **03**
- (b) Define indicator diagram. Draw ideal indicator diagram and prove that work done by the reciprocating pump is proportional to the area of indicator diagram. **04**
- (c) Explain the phenomenon of surging and choking in centrifugal compressor. **07**
- OR**
- Q.3** (a) Compare centrifugal and reciprocating pumps. **03**
- (b) Write short note on the e Screw compressor **04**
- (c) With neat sketch explain construction and working of hydraulic ram. **07**
- Q.4** (a) Differentiate clearly between Impulse turbine and Reaction turbine. **03**
- (b) Differentiate between fluid coupling and fluid torque converter. **04**
- (c) Show that when a jet of water impinges on a series of curved vanes, maximum efficiency is obtained when the vane is semi-circular and the velocity of jet is double the velocity of vane. **07**
- OR**
- Q.4** (a) Compare Centrifugal compressor and axial flow compressor. **03**
- (b) Justify the circumstances under which separation can occur in a reciprocating pump. **04**
- (c) An inward flow reaction turbine has a degree of reaction 0.6.The periphery velocity of the blade entry is 10 m/s and velocity of flow is constant at 2.2 m/s .The rotor diameter at entry is twice that an exit. Neglecting friction losses. Find the blade angles at entry and exit. Water leaves the rotor without whirl .Sketch the shape and arrangement of the blade. **07**

- Q.5** (a) What is pre-whirl? Explain the effect of pre-whirl in centrifugal compressor **03**
 (b) Explain construction and working of simple hydraulic accumulator. **04**
 (c) A centrifugal pump having 36 cm outlet diameter and 18 cm inlet diameter is to deliver water against a net head of 25 m at 1200 rpm. The width of impeller at outlet is 6 cm and flow velocity is constant from inlet to outlet. The entry is radial and the impeller vanes are bent back at 30° to the tangent at outlet. Taking manometric efficiency 90%. determine the width of impeller at inlet, the angle of vane tip at inlet and the discharge from the pump. **07**

OR

- Q.5** (a) Explain construction and working of direct acting hydraulic lift. **03**
 (b) With a suitable sketch explain the working principle of an axial flow compressor. Draw the stage velocity triangles. **04**
 (c) Explain function, construction and working of air lift pump. State the advantages and disadvantages. **07**
