

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER-IV • EXAMINATION – SUMMER 2013

Subject Code: X41902

Date: 06-06-2013

Subject Name: Fluid Power Engineering

Time: 10.30 am - 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.

- Q.1** (a) Compare the Impulse and Reaction Turbine on seven aspects. **07**
(b) Classify the energy losses in the pipe. Explain the Chezy's formula. **07**

- Q.2** (a) What is the priming of Centrifugal Pump? State the four methods of priming. **07**
Explain anyone method of priming.
(b) A jet coming out of a nozzle 10 cm in diameter strikes to an inclined flat plate **07**
and exerts force of 2700 N in the direction of flow. The inclination of the plate
is 25° to the jet axis. Calculate (i) normal force acting on the plate, (ii)
velocity of jet and (iii) mass flow rate of jet.

OR

- (b) A two stage single acting reciprocating compressor sucks $15 \text{ m}^3/\text{min}$ air at **07**
pressure 100kPa and 20°C . The final pressure of air at delivery is 800 kPa. The
compression index in both the stages is 1.3 and compressor runs at 550 rpm.
Assuming perfect intercooling, intermediate pressure is ideal and no clearance.
Calculate (i) intermediate pressure (ii) total volume of each cylinder
(iii) indicated power required to drive the compressor.

- Q.3** (a) Give classification of pump. What is cavitation in pump? State the factors **07**
affects the cavitation in pump
(b) A pipe AB of diameter 300 mm and length 400 m carries water at the rate of **07**
50 liters/s. The flow takes place from A to B where point B is 30 meters above
A. Find the pressure at A if the pressure at B is 19.62 N/cm^2 . Take $f = 0.008$

OR

- Q.3** (a) Explain the construction and working of Scroll compressor with neat sketch. **07**
State four advantages of it.
(b) A centrifugal pump having outer diameter equal to two times the inner **07**
diameter and running at 1000 rpm works against a total head of 40 m. The
velocity of flow through the impeller is constant and equal to 2.5 m/s. The
vanes are set back at an angle of 40° at outlet. If the outer diameter of the
impeller is 500 mm and width at outlet is 50 mm, determine (i) Vane angle at
inlet (ii) Workdone by impeller on water per second, and (iii) Manometric
efficiency.

- Q.4** (a) Describe the stages losses in axial flow compressor in detail. **07**

- (b) Show that the force exerted by a jet of water on moving inclined plate in the direction of jet is given by **07**

$$F_x = \rho a (V-u)^2 \sin^2 \theta$$
Where a = area of jet,
 V = velocity of jet
 θ = inclination of the plate with the jet

OR

- Q.4 (a)** Explain the construction and working of Francis turbine with neat sketch. **07**
Q.4 (b) Compare the Axial flow compressor and Centrifugal compressor on seven aspects. **07**
- Q.5 (a)** Define following terms with respect to reciprocating air compressor. **07**
Mean effective pressure (ii) Indicated power (iii) Isothermal efficiency
(iv) Adiabatic efficiency (v) Effective swept volume (vi) Clearance ratio
(vii) Bore
- (b) Two jets strike the buckets of a Pelton wheel, which is having shaft power as 15450 kW. The diameter of each jet is given as 200 mm. If the net head on the turbine is 400 m, find the overall efficiency of the turbine. Take $C_v = 1.0$ **07**

OR

- Q.5 (a)** Explain the working of Vane type of compressor on P-v diagram as well as by schematic diagram. **07**
(b) A double acting reciprocating pump running at 50 rpm, delivering 40 liters per second has following specification. **07**
Piston diameter = 300 mm
Piston rod diameter = 50 mm
Stroke = 400 mm
Suction head = 4 m
Delivery head = 8 m

Calculate (i) Slip (ii) Force required to operate the pump during forward and reverse stroke of piston (iii) Power required to drive the pump
