

FOURTH SEMESTER DIPLOMA EXAMINATION IN MECHANICAL
ENGINEERING — OCTOBER, 2014

HYDRAULIC MACHINES

[Time : 3 hours

(Maximum marks : 100)

PART—A

(Maximum marks : 10)

Marks

I Answer all questions in one or two sentences. Each question carries 2 marks.

1. What is meant by jet of water ?
2. Write the principle parts of water turbine.
3. What is an impulse turbine ?
4. Write the discharge equation of a reaction turbine.
5. Discuss the slip in reciprocating pump.

(5×2=10)

PART—B

(Maximum marks : 30)

II Answer *any five* of the following questions. Each question carries 6 marks.

1. Find the force exerted by a jet of water of diameter 100 mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30 m/s.
2. Illustrate the classification of water turbines.
3. Explain the efficiencies of reaction turbine.
4. Explain unit speed, unit power and unit discharge.
5. Discuss the function of surge tank.
6. Explain the working of centrifugal pump with sketch.
7. What is an air vessel ? How it works ?

(5×6=30)

PART—C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT—I

- III (a) Derive an expression for the normal force and work done by a jet impinging on an inclined flat plate moving in the direction of jet. 7
- (b) A jet of water 100 mm diameter, moving with a velocity of 20 m/s, strikes on a series of Vanes moving with a velocity of 10 m/s. Calculate the force exerted by the jet and Work done by the jet. 8

OR

- IV (a) Derive an expression for the normal force by a jet impinging on a fixed curved vane at the centre. 7
- (b) A water jet 50 mm diameter, moving with a velocity of 50 m/s, strikes a curved fixed symmetrical vane at the centre. Find the force exerted by the jet of water in the direction of the jet, if the jet is deflected through an angle of 120° at the outlet of the curved vane. 8

UNIT—II

- V (a) Sketch and explain the working of Pelton wheel. 8
- (b) A Pelton wheel working under a head of 500 m, produces 13000 KW at 450 rpm. If the overall efficiency of the wheel is 90%. Find the discharge of the turbine and diameter of the nozzle, if coefficient of velocity for the nozzle is 0.98. 7

OR

- VI (a) Explain the hydraulic functions of casing in pelton turbine. 7
- (b) A pelton wheel is required to generate 4000 KW under a head of 500 m. Find the total flow in litres/second and size of the jet. Assume overall efficiency of 80% and $C_v = 0.98$. 8

UNIT—III

- VII (a) Illustrate the governing of Francis turbine with sketch. 7
- (b) A reaction turbine is working under a head of 10 m and discharge of 12000 litres/s for a speed of 250 rpm. What is its specific speed? Assume an overall efficiency of the turbine as 95%. 8

OR

- VIII (a) Explain the significance of draft tube. 7
- (b) Explain the working of Kaplan turbine with sketch. 8

UNIT—IV

- IX (a) A centrifugal pump running at 900 rpm, delivers 50 litres of water per second against a head of 10 m. Find the discharge and head of the pump, when the same pump is running at 1000 rpm. 7
- (b) Explain the working of jet pump with sketch. 8

OR

- X (a) A single acting reciprocating pump has a plunger diameter of 300 mm and stroke of 250 mm. If the speed of the pump is 50 rpm and it delivers 5 liters/second of water. Find the co-efficient of discharge and percentage of slip of the pump. 7
- (b) Explain the working of multi stage centrifugal pump with sketch. 8