

TED (06)–4019

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Signature

FOURTH SEMESTER DIPLOMA EXAMINATION IN MECHANICAL
ENGINEERING—OCTOBER, 2012

HYDRAULIC MACHINES

[Time : 3 hours

(Maximum marks : 75)

PART—A

(Maximum marks : 15)

Marks

I Answer the following questions in one or two sentences :

1. What is meant by efficiency of jet ?
2. What is the principle of jet propulsion ?
3. What is specific speed of turbine ?
4. Differentiate a turbine and a pump.
5. What is radial flow turbine ?
6. Define a reaction turbine.
7. What is a manometric head of a centrifugal pump ?
8. Mention the chances for negative slip in a reciprocating pump.
9. Why priming is done in centrifugal pump ?
10. What is surge tank ?

(10×1½=15)

PART—B

(Maximum marks : 60)

(Answer *one* full question from each unit)

UNIT—I

II A jet of water of diameter 50 mm strikes a flat plate normally with a velocity of 26 m/s. The plate is moving with a velocity of 10 m/s in the direction of the jet and away from the jet.

Find :

- (a) the force exerted by the jet on the plate
- (b) work done by the jet on the plate per second
- (c) power of the jet
- (d) efficiency of the jet.

12

OR

- III A 100 mm diameter jet discharging $0.45 \text{ m}^3/\text{s}$ impinges on a curved vane moving at 20 m/s. The direction of the jet and the direction of motion of the vane are the same at inlet. The vane is so shaped that if stationary it would deflect the jet by 165° . Calculate :
- (a) The force exerted in the direction of motion of the vane.
 (b) The power developed.
 (c) The hydraulic efficiency.

12

UNIT—II

- IV (a) Classify hydraulic turbines. 6
- (b) A Pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 litres per second under a head of 30 metres. The buckets deflect the jet through an angle of 160° . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.98. 6

OR

- V (a) Describe the working of an impulse turbine with a neat sketch. 6
- (b) Explain the spear regulation of a pelton wheel with the help of a neat sketch. 6

UNIT—III

- VI A Pelton wheel generates 8000 kW under a head of 130 m at a speed of 200 r.p.m. Assuming the coefficient of velocity for the nozzle 0.98, hydraulic efficiency 87%, mechanical efficiency 75%, speed ratio 0.46 and jet diameter to wheel diameter ratio $1/9$, determine :
- (a) Discharge required (c) Diameter and number of jets required
 (b) Diameter of the wheel (d) Specific speed.

12

OR

- VII (a) A turbine develops 9000 kW when running at 100 rpm. The head on the turbine is 30 m. If the head on the turbine is reduced to 18 m, determine the speed and power developed by the turbine. 6
- (b) How reaction turbines are classified and what are they ? 6

UNIT—IV

- VIII (a) Define manometric head and give the mathematical expression for manometric head. 6
- (b) Draw the arrangement of multi-stage centrifugal pump for high head. How you will get high head in this arrangement ? 6

OR

- IX (a) Explain the working of a centrifugal pump with a suitable sketch. 8
- (b) What are the efficiencies of a centrifugal pump ? 4

UNIT—V

- X Explain the working of a hydraulic intensifier with neat diagram. 12

OR

- XI Explain with sketches about a lobe pump and screw pump. 12