

TED (15) -6022  
(Revision- 2015)

**A22-01951**

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/  
COMMERCIAL PRACTICE –APRIL -2022.

**HYDRAULIC MACHINES**

(Maximum Marks : 100)

[Time : 3 hours]

**PART–A**  
(Max. Marks:10)

Marks

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

1. Define impact of jets.
2. List the main components of Pelton wheel.
3. What do you mean by Gross head of a turbine?
4. Define unit power of a reaction turbine.
5. What are the functions of air vessels?

(5x2=10)

**PART - B**  
(Max. Marks: 30)

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

1. Explain the principle of jet propulsion
2. A jet of water of 3 cm diameter moving with a velocity of 10 m/s strikes the centre of a hinged plate having weight 98.1 N. Find the angle through which the plate swing.
3. Classify water turbines.
4. What is a draft tube? Mention its functions.
5. Compare Francis turbine and Kaplan turbine.
6. Explain slip and significance of negative slip of a reciprocating pump.
7. Explain the working of jet pump.

(5x6 =30)

**PART - C**  
(Max. Marks: 60)

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

**UNIT I**

- III** a) Derive an expression for work done by a jet of water impinging on a moving vertical plate. (8)
- b) A jet of water of diameter 80 mm moving with a velocity of 30 m/s strikes a fixed plate in such a way that the angle between the jet and the plate is  $60^\circ$ . Find the force exerted by the jet on the plate (i) in the direction normal to the plate, and (ii) in the direction of the jet. (7)

**OR**

- IV** a) A jet of water of 8 cm strikes a curved plate at its centre with a velocity of 25 m/s. the curved plate is moving with a velocity of 8 m/s in the direction of jet. The jet is deflected through an angle of  $165^\circ$ . Assuming the plate is smooth, find (i) Force exerted on the plate in the direction of jet (ii) Power of the jet (iii) Efficiency of the jet. (8)
- b) Derive the expression for the force developed, workdone and efficiency by the jet strikes on a series of vanes. (7)

**UNIT- II**

- V** a) Two jets strikes the buckets of a pelton wheel which is having shaft power as 15000 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  $C_v = 0.97$  (8)
- b) Define hydraulic efficiency, mechanical efficiency and overall efficiency of a turbine (7)

**OR**

- VI** a) Explain the governing of an impulse turbine with the help of a neat sketch (8)
- b) A Pelton wheel develops 3.85 MW power at an effective head of 220 m. If the discharge through the nozzle is 2000 lps, calculate the overall efficiency of the turbine. (7)

### UNIT- III

- VII** a) Explain the working of Kaplan turbine with the help of a neat sketch. (8)  
b) Explain the significance of specific speed of a turbine. (7)

**OR**

- VIII** a) A turbine is to operate under a head of 30 m at 300 rpm. The discharge is  $10\text{m}^3/\text{s}$ .  
If the overall efficiency is 90%, determine (i) power generated, (ii) specific speed of the turbine, and (iii) type of the turbine. (8)  
b) Explain different types of draft tubes. (7)

### UNIT – IV

- IX** a) A centrifugal pump is required to lift water to a total head of 50 m at the rate of 60 litres per second. Find the power required for the pump if the overall efficiency is 70% (8)  
b) Explain the airlift pump with the help of a neat sketch. (7)

**OR**

- X** a) A double acting reciprocating pump has a stroke of 400 mm and cylinder diameter of 200 mm. the total head is 50 m. If the pump is working at 150 rpm, find the power required to drive the pump with 85% efficiency. (8)  
b) Explain multistage centrifugal pumps with sketches. (7)

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