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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2024

HYDRAULIC MACHINES

[Maximum Marks: **100**] [Time: **3** Hours]

PART-A

[Maximum Marks: **10**]

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

1. Define fluid jet.
2. What is the use of breaking jet in Pelton wheel?
3. Differentiate turbine and pump.
4. Define slip of a reciprocating pump.
5. Write the equation for specific speed of a turbine. (5 x 2 = 10)

PART-B

[Maximum Marks: **30**]

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

1. Explain the propulsion of ships by water jet.
2. A 50 mm diameter jet exerts a force of 1.4715 kN in the direction of flow against an inclined plate at 30° with the axis of the jet. Find the rate of flow?
3. Explain about design of pelton wheel turbine.
4. Compare impulse turbine and reaction turbine.
5. Define unit power, unit speed and unit discharge.
6. Explain the function of air vessels in reciprocating pump.
7. Explain the cavitation in centrifugal pumps. (5 x 6 = 30)

PART-C

[Maximum Marks: **60**]

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

UNIT – I

III. a. A jet of water of 2 cm diameter moving with a velocity of 20 m/s, strikes a hinged square plate of weight 250 N at the centre of the plate. Find the angle through which the plate will swing. (7)

b. Derive the expression for force exerted by the jet on a stationary symmetrical curved plate, when the jet is striking at its centre. (8)

OR

IV. a. Derive the expression for the force exerted by the jet on a flat inclined plate moving in the direction of the jet. (8)

b. A jet of water 5cm in diameter and moving with a velocity of 15 m/s impinges on a series of vanes moving with a velocity of 5 m/s. Determine (i) force on the plate (ii) work done and (iii) efficiency of jet. (7)

UNIT – II

V. (a) Explain the governing of an impulse turbine with sketches. (8)

(b) A Pelton wheel develops 3.75MW power at an effective head of 200m. If the discharge through the nozzle is 2000 lps, calculate the overall efficiency of the turbine. (7)

OR

VI. a. Explain the working of a Pelton wheel turbine with neat sketch. (8)

b. A Pelton wheel is supplied water under a head of 200 m through a 100 mm diameter pipe. If the quantity of water supplied is l.25m^3/s. Find the number of jets. Assume coefficient of velocity is 0.97. (7)

UNIT- III

VII. a. Explain the working of Kaplan turbine with neat sketch. (8)

b. A Kaplan turbine develops 7357.5 kW power at a head of 5.50 metres. Assuming a speed ratio of 2.09, flow ratio of 0.68, diameter of the boss equal to 1/3 times the diameter of the runner and an overall efficiency of 60%, calculate diameter and speed of the turbine. (7)

OR

VIII. a. Explain different types of draft tubes. (7)

b. Explain the working of Francis turbine with neat sketch. (8)

UNIT - IV

IX. a. Explain the multistage centrifugal pumps with sketches. (8)

b. A single acting reciprocating pump having a piston of 200 mm diameter and a stroke of 400 mm runs at 50 rpm. It delivers water at a rate of 10 litres per second. Find the theoretical discharge, coefficient of discharge, slip of the pump. (7)

OR

X. a. Define manometric head, manometric efficiency, mechanical efficiency and overall efficiency of a centrifugal pump. (8)

b. Explain the working of air lift pump with a sketch. (7)

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