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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2021

HYDRAULIC MACHINES

[Maximum Marks: **75**] [Time: **2.15** Hours]

PART-A

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

I. 1. Define impact of jets.
2. What is meant by governing of a turbine?
3. List water turbines based on the direction of flow of water through runner.
4. What is meaning of unit power?
5. Define the term slip in a pump. (3 x 2 = 6)

PART-B

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

II. 1. Derive the equation for force exerted by a jet on a stationery inclined plate.
2. A horizontal jet of water is issuing under an effective head of 25m. Calculate the diameter of the jet, if the force exerted by the jet on a vertical fixed plate is 1.12kN. $C_{v=}$ 0.9.
3. Explain impulse turbine with neat figure.
4. Compare impulse and reaction turbines.
5. Describe the working principle of Francis Turbine.
6. Explain the classification of pumps.
7. Explain the multistage centrifugal pumps with neat sketches. (4 x 6 = 24)

PART-C

(Answer ***any of the three units*** from the following. Each full question carries ***15*** marks)

UNIT – I

III. (a) Derive the expression for force developed and work done by the jet striking the centre on a moving curved plate (Symmetrical). (8)

(b) A jet of water 100mm diameters and moving with a velocity of 15m/s is impinging normally on a flat vertical plate. Determine the force exerted on the plate when (a) it is fixed, and (b) it is moving with a velocity of 5m/s in the direction of the jet. Also determine the power of jet when it is moving. (7)

OR

IV. (a) Explain the propulsion of ships by water jet with neat figures. (6)

(b) A jet of water having a velocity of 30m/s impinges on a series of vanes a velocity of 15m/s. The jet makes an angle of 30^0 to the direction of motion of the vanes when entering and leaves at angle of 120^0. Sketch the velocity triangles at entrance and exit and determine:-

a) The angle of the vane tips so that water enters and leaves without shock.

b) Work done per kilogram of water entering the vanes. (9)

UNIT – II

V. (a) What is hydraulic turbine? Explain its classification. (7)

(b) A double jet Pelton wheel operates under a 50m head and develops 90kW at an overall efficiency of 90% and co-efficient of velocity of 0.96. Find the jet diameter. (8)

OR

VI. (a) Explain the governing of an impulse turbine with sketches. (9)

(b) A Pelton turbine develops 12 MW under a net head of 300m. If the overall efficiency is 80%, determine the discharge of the turbine. (6)

UNIT- III

VII. (a) Describe the working principle of Kaplan turbine with neat figures. (7)

(b) A Kaplan turbine operating under a net head of 20 m develops 20000 kW with an overall efficiency of 86%. Speed ratio is 2.0 and flow ratio is 0.6. The hub diameter of the wheel is 0.35 times of outside diameter of wheel. Find the diameter and speed of turbine. (8)

OR

VIII. (a) Explain the selection of turbines based on specific speed and head. (7)

(b) Explain various types of draft tubes with neat figures. (8)

UNIT - IV

IX. (a) Explain the terms Cavitation and Priming in centrifugal pumps. (7)

(b) A centrifugal pump delivers $0.03m^3/s$ of water to height of 20m through a pipe of 80m long of 100m diameter. If the overall efficiency of the pump is 72%, find the power required to drive the pump. Take co-efficient of friction as 0.01. (8)

OR

X. (a) Describe air-lift pump with sketches. (7)

(b) A double acting reciprocating pump has a speed of 60rpm. It has a bore of 150mm and stroke of 300mm. If it's total static lift is 20m and discharge of 10 litres per second, Find,

(i) Theoretical discharge (ii) Slip (iii) Co-efficient of discharge of pump and

(iv) Theoretical power required to drive the pump. (8)

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