

Code: 13A03501

B.Tech III Year I Semester (R13) Supplementary Examinations June 2016

HYDRAULIC MACHINERY

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART - A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) Give the functions of a forebay in a hydroelectric scheme.
 - (b) Name hydel plants.
 - (c) A jet of water of 100 mm diameter impinges normally on a fixed plate with a velocity of 30 m/s. Find the force exerted on the plate.
 - (d) What will be the force exerted by a jet of c/s area 2000 mm^2 and of velocity 25 m/s on a fixed smooth curved vane which deflects the jet by 120° .
 - (e) Define volumetric efficiency of a turbine.
 - (f) What is jet ratio?
 - (g) A water turbine develops 130 kW at 230 rpm, under a head of 16 m. Find the scale ratio and the speed of a similar machine which will generate 660 kW when working under a head of 25 m.
 - (h) What is meant by governing of turbines?
 - (i) Define static head.
 - (j) What is indicator diagram?

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

- 2 (a) How do you assess the water potential of a hydroelectric scheme?
(b) Write notes on draft tube and penstocks.

OR

- 3 Explain various components of hydroelectric scheme.

UNIT - II

- 4 A jet of water 40 mm diameter enters a fixed curved vane with a velocity of 50 m/s at an angle 20° to the horizontal. Find the normal and tangential forces exerted by the jet if it leaves the vane at angle 15° to the horizontal.

OR

- 5 A jet of water moving at 12 m/s impinges on a concave vane shaped to deflect the jet through 120° when stationary. If the vane is moving at 5 m/s, find the angle of jet so that there is no shock at outlet. What is the absolute velocity of jet at exit and the work done per kN of water? Assume that the vane is smooth.

UNIT - III

- 6 Give the steps to be followed to design a Francis turbine runner.

OR

- 7 A Pelton wheel is required to generate 3750 kW under an effective head of 400 m. Find the total flow in lps and size of the jet. Assume generator efficiency 95%, overall efficiency 80%, coefficient of velocity 0.97, speed ratio 0.46. If the jet ratio is 10 find the mean diameter of runner.

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UNIT - IV

- 8 (a) Give the necessity of characteristic curves of a turbine. Also explain operating characteristic curves.
(b) Explain unit quantities with respect to turbines.

OR

- 9 Calculate the diameter, the speed and specific speed of a propeller turbine runner to develop 6250 kW under a head of 5 m having given that speed ratio K_u based on outer diameter = 2.10 flow ratio $\Psi = 0.65$, diameter of boss = 0.35 times external diameter of the runner, overall efficiency $\eta_0 = 85\%$.

UNIT - V

- 10 Explain working of a reciprocating pump with sketch.

OR

- 11 A centrifugal pump has to discharge 225 lps of water against a head of 25 m when the impeller rotates at a speed of 1500 rpm. Find the impeller diameter and the vane angle at the outer edge of the impeller. Assume $\eta_{mano} = 0.75$ the loss of head in pump due to fluid resistance is $0.03 V_1^2$, where V_1 m/s is the absolute velocity of water leaving the impeller the area of the impeller outlet surface is $(1.2 D_1^2) m^2$, where D_1 is the impeller diameter in m and water enters the impeller without whirl.
