

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 197854

Roll No.

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B.TECH.

Theory' Examination (Semester-VIII) 2015-16

WATER POWER ENGINEERING

Time : 3 Hours

Max. Marks : 100

Section-A

Q.1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

- (a) List the basic principles of hydro power.
- (b) Draw flow-duration curve.
- (c) Mention the different types of run of river plants.
- (d) Write the relative merits of two unit and three unit arrangement of pumped storage plants.
- (e) Express Manning's formula to calculate economic diameter of penstock.
- (f) Recall about inlet aeration in intakes.

- (g) Differentiate between reaction turbine and impulse turbine
- (h) How cavitation affects the turbines.
- (i) Enlist the safety requirements of power house.
- (j) What are the difficulties in tidal power generation?

Section-B

Q.2. Attempt any 5 questions from this section. (10×5=50)

- (a) Outline the advantages and dis-advantages of hydro power over other power sources.
- (b) The 95% dependable discharge of a river (discharge which would be approximately available 95% of the time, i.e., Q_{95}) is 20 m³/s. If the utilizable head is 30m, Calculate
 - (i) The theoretical hp and kW of power from the flow for 95% of time ($P_{p_{95}}$).
 - (ii) The approximate actual amount of power output.
 - (iii) Total yearly developable energy.

- (iv) The actual capacity that may be installed to utilize all the average flow and the corresponding energy.
- (c) (i) Elaborate the classification of hydel plants.
- (ii) Describe about valley dam plants and diversion canal plants.
- (d) (i) Outline the three unit arrangement of pumped storage plant.
- (ii) Illustrate how to calculate the efficiency of pumped storage plants.
- (e) What is the significance of surge tanks and state its advantages ?
- (f) A turbine generates 20,000 kw power at the head of 250 m with two jets. If the overall efficiency of turbine is 75% and velocity of water in the jet is 95% of the theoretical velocity. Assume $C_d = 0.98$ speed ratio = 0.45. Determine:
- (i) The quantity of water in cumecs.
- (ii) The size of the jet.
- (g) Sketch the details of typical power house and show all components. State functions of all components.

- (h) With a neat sketch discuss single and double basin arrangements.

Section-C

Attempt any 2 questions from this section. (15×2=30)

Q.3. A common load is shared by two hydel stations: one being a base load station with 20 MW installed capacity, and the other being a standby station with 25 MW capacities. The yearly output of the standby station is 10×10^6 kWh. The peak load taken by standby station is 12 MW and this station works for 2500 hours during the year. The base load station takes a peak of 18 MW. Find out :

- (a) Annual load factors for both stations
- (b) Plant use factors for both stations
- (c) Capacity factors for both stations

Q.4. (a) Elaborate the design criteria of penstock.

- (b) Summarize the constructional features of turbines.

Q.5. (a) Discuss the losses of intakes and air entrainment at intakes.

- (b) Enlist the merits and demerits of underground power house.