

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME SEMESTER – I (NEW) EXAMINATION – SUMMER 2017**

**Subject Code: 2713305****Date: 11/05/2017****Subject Name: Hydropower Engineering****Time: 02:30 p.m. to 05:00 p.m.****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Write the classification of hydropower plant with suitable examples. **07**  
(b) Write a detailed note on different types of turbines. **07**
- Q.2** (a) It is essential to harness non-conventional sources of energy for sustainable development. Discuss this statement for its reality and limitations. **07**  
(b) Explain the function of each component of a hydropower plant with a neat sketch of its layout. **07**
- OR**
- (b) Discuss the significance of micro-hydel power plant for Indian hill region. **07**
- Q.3** (a) Explain the following: 1) Trash rack 2) peak factor 3) Firm capacity **07**  
(b) Write a short note on location, function and types of intakes. **07**
- OR**
- Q.3** (a) A hydroelectric station is to be supplied with 10 m<sup>3</sup>/s of water through a penstock which has a friction factor of 0.014. The maximum normal head on the penstock is 50 kg/cm<sup>2</sup> and a water hammer over pressure of 25 % over the normal pressure is anticipated. The safe stress in the steel used is presumed to be 3200 kg/cm<sup>2</sup>. The ready penstocks at site are likely to cost Rs. 17000 per tonne including erection charges. The life of the project is 40 years, and the rate of interest is 7%. It is proposed to sell the energy at the rate of Rs. 0.04/kWh. What should be the optimum diameter of the penstock, given that OMR costs are 5%. Assume the turbine efficiency to be 85% and the annual load factor as 0.4. **07**  
(b) Discuss the design criteria of a power canal. **07**
- Q.4** (a) Compare the rigid and elastic water column theories. **07**  
(b) Name and discuss the suitability of different types of surge tanks. **07**
- OR**
- Q.4** (a) Derive an expression for water hammer pressure in case of a rigid pipe. **07**  
(b) A power canal, bed width 14 m may be assumed to be rectangular in shape with a steady state depth of flow of 3.5 m. The canal supplies water to a power house with three turbines, each turbine rated at a discharge of 35 cumecs. If the load in the power house is suddenly thrown off so that two of the turbines have to be shut down, what would be the height of the surge in the canal? **07**

- Q.5 (a)** It is observed that a run off river power plant operates as peak load plant with a weekly load factor of 25% as firm capacity. Determine the minimum flow in river so that the power plant may act as base load plant for the following data: Rated installed capacity of generating plant =12000 KW, operating head =15 m, plant efficiency= 80%. Estimate the daily load factor of the plant if the stream flow is 15 cumecs. **07**
- (b)** Explain the function of draft tube in reaction turbine. Discuss the different types of draft tubes. **07**

**OR**

- Q.5 (a)** What are characteristic curves of turbines? Discuss their significance in performance analysis of turbines. **07**
- (b)** Describe the various types of gates and valves used in hydropower plants. **07**

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