Ref. No.: Ex/ME/5/T/423A/2017 (Old)

B.E. MECHANICAL ENGINEERING (PART TIME) EXAM 2017
(OLD)
(4th Year. 2nd Semester)

HYDRO, WAVE & WIND POWER

Time: Three hours | Marks: 100

(*Answer any FIVE questions*)

Different parts of the same question should be answered together.
All symbols carry their usual meanings unless otherwise mentioned.
Assume any relevant data if necessary.

1. a) What do you mean by catchment area? Explain its importance. 6
   b) What is runoff? Explain the different factors affecting the runoff. 8
   c) Discuss about the mass curve and flow duration curve. 6

2. a) Discuss about the site selection criteria of a hydroelectric power plant. 6
   b) Draw a schematic diagram of the major components of a hydroelectric power plant. 6
   c) A Pelton wheel having tangential velocity 12 m/s operates under a net head of 200 m. Bucket deflects at 165° and discharges 150 liter per second. Determine power developed by the wheel and hydraulic efficiency of the turbine if coefficient of velocity is 0.96. Draw velocity triangles. 8

3. a) What do you mean by reaction hydro turbine? Explain briefly its governing technique. 10
   b) An inward flow reaction turbine has an external diameter and an internal diameter of 1 m and 0.5 m respectively operates under a head of 30 m. The velocity of flow at outlet is 2 m/s and the discharge at outlet is radial. If the vane angle at outlet is 15° and the width of the wheel is 200 mm at inlet and outlet, calculate the discharge through turbine and power developed. Hydraulic efficiency is 85%. 10

4. a) How wind turbines are classified? Derive the condition to have the maximum power developed by a wind turbine. 10
   b) The wind has a velocity of 16m/s at 1 standard atmospheric pressure and temperature 20° C. Calculate the total power density, maximum power, Torque at maximum efficiency for a wind turbine of diameter of 60m that runs at 70rpm. 10

[Turn over

5. a) What is wave power? How total wave power per unit surface area can be estimated 10

   b) Briefly explain about the wave power conversion technologies with neat sketch. 10

6. a) What is origin of tidal power? What are the advantages and disadvantages of tidal power? 10

   b) Explain the operation of single basin tidal power considering single effect and double effect schemes separately with neat schematic diagram. 10

7. Write short notes on: (any **FOUR**) 4 X 5 20

   a) Hydro Power Potential in India

   b) Pumped Storage Power Plant

   c) Social and Environmental impacts of Hydropower

   d) Water Hammer

   e) Draft Tube

   f) Hydrological cycle