B.E. MECHANICAL ENGINEERING (PART TIME) THIRD YEAR SECOND SEMESTER EXAM 2018

HYDRO, WIND AND WAVE 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 is hydrologic cycle? Discuss it with a neat sketch. 8
   b) What do you mean by runoff? Explain the different factors affecting the runoff. 6
   c) How rainfall is measured? 6

2. a) Draw a schematic diagram of a hydroelectric power plant indicating all major components. 6
   b) Discuss the social and environmental impacts of hydropower. 6
   c) A Pelton wheel has a mean bucket speed of 12 meters per second with a jet of water flowing at the rate of 850 litres/s under a head of 50 meters. The buckets deflect the jet with an angle of 165 °. Calculate power given to the runner and hydraulic efficiency of the turbine. 8

3. a) Distinguish between impulse and reaction hydro turbine? Explain briefly about the governing technique of an impulse turbine. 10
   b) A Francis turbine runs at 600 rpm under a head of 80 m. Its diameter at inlet is 100 cm and flow area is $0.4m^2$. The angle made by absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. Determine the discharge, power developed and hydraulic efficiency of the turbine. 10

4. a) What are the advantages and disadvantages of wind power? 8
   b) What is the condition to have maximum power developed by a wind turbine? 6
   c) Distinguish between the cut-in and cut-out velocity of a wind turbine. 6

5. a) What is wave power? Derive the expression for total wave power per unit surface area. 10
   b) Discuss about any two wave energy conversion techniques with neat sketch. 10

6. a) What is tidal power? Explain the advantages and limitations 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) Classification of wind turbine
   b) Pumped Storage Power Plant
   c) Water Hammer
   d) Surge Tank
   e) Draft Tube