BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING)
THIRD YEAR SECOND SEMESTER EXAM 2024

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 do you mean by run-off? Make a list of different factors affecting the run-off. 7

   b) What is catchment area? Explain its characteristic features. 7

   c) What do you mean by hydrograph and flow duration curves? 6

2. a) What are the advantages and disadvantages of small hydro projects? 6

   b) Draw a schematic of small hydro plant with its major components. 6

   c) A Pelton wheel is having a mean bucket diameter of 100cm and is running at 1000rpm. The net head on the Pelton wheel is 720m. If jet deflects at an angle of 165 ° and discharge through nozzle is $0.1 m^3/s$, determine power available at the nozzle inlet and hydraulic efficiency. 8

3. a) What are the site selection criteria of a hydro project? 5

   b) Discuss the social and environmental impacts of hydropower plant. 6

   c) An inward flow reaction turbine operates under a head of 22 m with external and internal diameters are 1.2m and 0.6m respectively. Velocity of flow through the runner is constant and equal to 2.4m/s. The guide blade angle is given as 10 ° and the runner vanes are radial at inlet. If the discharge at outlet is radial, determine the speed of the turbine and hydraulic efficiency. 9

4. a) How wind turbines are classified? 4

   b) Draw a schematic of wind turbine plant with its major components. 6

   c) Find the condition to have the maximum power developed by a wind turbine. What is the corresponding efficiency? 10

5. a) What do you mean by wave power? Explain its merits and demerits. 8

   b) Discuss any three wave energy conversion techniques with neat sketch. 12

6. a) What is tidal power? Discuss its advantages and limitations. 8

   b) Explain the operation of single basin tidal power considering single effect and double effect schemes separately with neat schematic diagram. 12

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

   a) Hydrologic Cycle

   b) Pumped Storage Power Plant

   c) Water Hammer

   d) Surge Tank

   e) PV characteristics of wind power plant