Ex/ME(M2)/PE/H/T/415F/2024

B.E.MECHANICAL ENGINEERING FOURTH YEAR. 1ST SEMESTER EXAMINATION 2024

Subject : HYDRO, WIND AND WAVE POWER

Time: Three Hours **Full Marks :100**

*Answer any **five** questions*

1. a) What are the three possible methods of support of a penstock?

b) Why banded penstocks are used ?

c) How can you determine the number of Penstocks ?

d) What is economical diameter of penstock ?

e) How can you determine economical diameter of penstock graphically ?

3 + 3 +3 +3 +8

2.. a) Explain the phenomenon of water hammer.

b) Derive an expression for pressure rise due to sudden closure of valve considering the pipe material to be elastic.

c) Explain the working principle of surge tank.

d) What are the different types of surge ta? **3 + 10 +3 +4**

3. a) How would you place hydropower in the mix of different powers ?

b) Explain hydrologic cycle with a neat diagram.

c) What are the basic advantages of Hydel Power ?

d) Explain detention and depression storage . **3 + 9 +4 +4**

4, a) Describe the principle of working of an infiltrometer .

b) Discuss Horton's equation for infiltration along with infiltration curve.

c) Explain the method of ϕ-index.

d) When a run-of-river plant operates as a peak load station with a weekly load factor of 20 %, all its capacity is firm capacity. What will be the minimum flow in the river so that station may serve as the base load station? It is given that

Rated installed capacity of generator = 10,000 kW

Operating head = 15m

Plant efficiency = 80 %

Estimate the daily load factor of the plant if the stream flow is 15 cumec

6+ 4 +3 +7

5. a) Explain a recording type rain gauge with a neat sketch.

b) Calculate the average precipitation by the average method and Theissen Polygon method from the following data :

Station No.	Precipitation (mm)	Area (sq. km)
1	67	82
2	85	80
3	93	92
4	117	75
5	130	32
6	52	50

c) Explain the method of isohyetes for determining the average rainfall of a region.

d) How the rainfall of an area can be represented ? **7 + 6 +3 +4**

6. a) What is the basic principle of Tidal Power generation ?

b) What should be the criteria for the location of tidal power plant ?

c) Discuss the difficulties in tidal power generation.

d) Explain single Ebb cycle system of tidal power generation.

e) How can you estimate energy and power developed in a tidal power plant.

4 + 5 +3 +5 + 3

7. a) What are the main components of a wind turbine ? Show the components with a neat sketch.

b) Derive the condition for maximum power available from wind **8 +12**