1. (a) Define unit speed, unit power and unit discharge and derive their relevant relations.

(b) Write down the advantages and disadvantages of hydro power projects.

(c) The run off data of a river at a particular site is as follows

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Month | Mean discharge  ( millions of meter3) | Month | Mean discharge  ( millions of meter3) | Month | Mean discharge  ( millions of meter3) |
| January | 32 | May | 12 | September | 118 |
| February | 25 | June | 55 | October | 65 |
| March | 20 | July | 85 | November | 42 |
| April | 0 | August | 110 | December | 30 |

Draw the hydrograph and flow duration curve.

What will be the power developed, if the available head is 90m and the overall efficiency of generation is 64%?

***6+3+6=15***

\*\*\*\*\*\*\*\*

**TU/CODL**

**TEZPUR UNIVERSITY**

**SEMESTER END EXAM (AUTUMN), 2017**

**DRE 104: WIND AND HYDRO ENERGY**

*Full Marks:* ***70***  *Time:* ***3 hours***

*The figures in the right-hand margin indicate marks*

*for the individual questions*

*-----------------------------------------------------------------------------------------*

1. Choose the right answer **1×10=10**
2. Which type of turbine would you recommend for 1000 m head
3. Kaplan (b) Propeller

(c) Franics (d) Pelton

1. The share of hydro in India’s electricity installed capacity is
2. 19% (b) 26%

(c) 33% (d) 45%

1. The installed capacity of Three Gorges dam of china is

(a) 22.5 GW (b) 18 GW

(c) 32.5 GW (d) 12.5 GW

1. The instrument used for measuring the wind speed is

(a) Tacho meter (b) Anemometer

(c) Roto meter (d) Multi meter

1. Why HAWT are more popular over VAWT?

(a) Easy to manufacture (b) Efficiency is high

(c) Number of blade is less (d) Cost of generation is low

**P. T. O.**

1. The tip speed ratio for WEG compared to Windmill is
2. Higher (b) Lower

(c) No relation (d) equal

1. The tip speed ratio range for low torque application is
2. 1 to 2 (b) 2 to 3

(c) below 1 (d) above 4

1. Which of the following country has the highest wind power installation

(a) China (b) USA

(c) India (d) Denmark

1. The value of maximum power coefficient (CPmax) is

1. 0.593 (b) 0.798

(c )0.321 (d) 0.213

(x) Pitch regulation is related to

(a)Yaw mechanism (b) blade setting angle

(c) Wind direction (d) Power output

2**.** (a)What is the available wind power?

(b) What are the different forms of presenting the wind data? Explain the characteristics of a good wind site.

(c) Define Betz limit and derive the value for CP (max).

**P.T.O**

(d) The wind regime at a site is described by Weibull scale parameter of 6m/s and shape parameter of 2. What is the total annual duration in hours for which a wind speed of 10m/s will be available at that site?

***2+3+5+5=15***

1. (a) Define: *airfoil; angle of attack, blade setting angle; tip speed ratio, pitch angle, drag force* and *lift force*.
2. Write down the assumptions used in axial momentum theory and blade element theory.
3. A wind generator with a 10m diameter blade span has a cut-in wind speed (minimum speed for power generation) of 5 m/s, at which velocity the turbine generates 3 kW electric power. Determine the efficiency of wind-turbine generator set.

***6+4+5=15***

4. (a) How the electric power generated from hydropower?

What are the various factors considered in designing a hydroelectric power plant?

1. Draw a schematic diagram of a hydropower plant. Explain in brief the various components of this power plant.

(c ) A hydroelectric scheme has a catchment area of 204 km2 and the available runoff is 60% with annual rainfall of 180 mm. On an average a head of 305 m is available. Find the power that can be developed from the scheme if the overall efficiency of the plant is 85%.

***4+5+6=15***

**P.T.O**