Reg. No. : | | | | | | | | | | |

Question Paper Code: 98301

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

One credit

Electrical and Electronics Engineering

19UEE801 -WIND FARM DEVELOPMENT AND OPERATION

(Regulation 2021)

Duration: 1.30 hours Maximum: 50 Marks

Answer ALL Questions

PART A - (15 x 2 = 30 Marks)

1. The amount of energy available in the wind at any instant is proportional to ___ of the wind speed.

   (a) Square root power of two (b) Square root power of three

   (c) Square power (d) Cube power

2. The following factor(s) affects the distribution of wind energy

   (a) Mountain chains (b) The hills, trees and buildings

   (c)Frictional effect of the surface (d) All of the above

3. The wind speed is measured using an instrument called

   (a) Pyranometer (b) Manometer (c)Anemometer (d) Wind vane

4. The power output per square kilometre of a wind farm consisting of turbines with rotor diameters D in a mean wind speed um depends approximately on

   (a)D^2um^2 (b) D^3um^3 (c) um^3 (d) $D^3\ um^2$

5. The rate of change of wind speed with height is called

   (a) Wind shear (b) Wind rose (c) Wind solidity (d) None of the above

6. Turbines blades have ____ type cross section to extract energy from wind.

   (a) Aerofoil (b) Elliptical (c) Rectangular (d) All of the above

7. The fraction of power in the wind that a modern wind turbine can extract is approximately

   (a) 90% (b) 59% (c) 45% (d) 60%

8. A wind turbine designed for a tip-speed ratio $\lambda = 9$, is operating in a mean wind speed of 12 m s-1. The turbine blades are 50 m long. Estimate the number of revolutions made by the turbine in 30 years taking the capacity factor as 30%.

(a) 10^8 (a) 10^8 (a) 10^8 (a) 10^8

9. A typical spacing between turbines in a wind farm in terms of their rotor diameters D is approximately

(a) 4D×7D (a) 4D×7D (a) 4D×7D (a) 4D×7D

10. The typical capacity credit of a wind farm is

(a) 10-20% (b) 20-40% (c) 40-60% (d) 60-80%

11. The mean wind speed at site A for a wind farm is 10% higher than at site B. What would be the expected increase in electricity production at site A compared to site B

(a) 10% (b) 20% (c) 30% (d) 33%

12. The total power of a wind stream is proportional to

(a) Velocity of stream (b) (velocity of stream $)^2$

(c) (velocity of stream $)^3$ (d) 1/ (velocity of stream)

13. Currently, the fastest growing source of electricity generation using new renewable sources is

(a) Solar (b) Wind (c) Hydro (d) Coal

14. What is the kinetic energy of 1 cubic meter of air moving at the speed of 10 m/s? The density of air is 1.2 kg/m^3

(a) 12 J (b) 120 J (c) 60 J (d) 6 J

15. The percentage of energy put into a system that does useful work is

(a) Energy conservation (b) Energy efficiency

(c) Renewable energy (d) Energy conversion

PART – C (1 x 20= 20Marks)

16. (a) (i) Explain in detail about Preventive, Breakdown and Predictive maintenance of WECS system. (10)

(ii) State and Explains the factors to be considered for ideal location of wind farm (10)

Or

(b) (i) Discuss about the techniques and methods employed for central monitoring of wind energy conversion system (10)

(ii) Discuss about Techno economic feasibility Considerations of WECS (10)