Reg. No. :

Question Paper Code: 58361

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

ONE CREDIT COURSE

Electrical and Electronics Engineering

15UEE861 - WIND FARM DEVELOPMENT AND OPERATION

(Regulation 2015)

Duration: One hour   Maximum: 50 Marks

Answer ALL Questions

PART A - (15 x 2 = 30 Marks)

1. The energy available in the wind at any instant is proportional to _____ of the diameter of rotor.

    (a) Cube power   (b) Square power
    (c) Square root power of three   (d) Square root power of two

2. Prior to 1950, the main use of windmills in the United States was for

    (a) draining wetlands   (b) pumping drinking water for cattle
    (c) grinding grain for bread   (d) energy generation

3. Gain in kinetic energy is equal to the

    (a) loss in P.E - work against friction   (b) loss in K.E - work against friction
    (c) loss in P.E + work against friction   (d) loss in P.E * work against friction

4. 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)

5. One of the obstacles to the rapid replacement of nonrenewable energy sources with renewable energy sources is

    (a) the improvement in the infrastructure for using renewable energy sources
    (b) the lack of government and private financial support
    (c) advancements in technological development of renewable energy
    (d) the motivation of private industry to proactively develop renewable energy

6. The change of direction of wind with respect to obstacle is called

    (a) Wind shear   (b) Wind turbulence

    (c) Wind solidity   (d) None of these

7. The BETZ limit for power in the wind that a modern wind turbine can extract is approximately

    (a) 100%   (b)59%   (c)68%   (d)72%

8. What is the NPV of a project , (life 2 year) which requires an investment of Rs.50000 & yield Rs.30000 in the 1st year and Rs.40000/- in the next year, if the interest rate is 10%.

    (a) 10331   (b) 10330   (c) 20660   (d) 30660

9. Out of the following characteristics which one provides the index of profitability

    (a) Net present value   (b)Benefit to cost ratio

    (c) Capital recovery amount   (d) Annual equivalent Amount

10. 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 (b) 3×10^7 (c) 3×10^8 (d) 3×10^9

11. The typical capacity factor of a wind farm is

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

12. In a region where the mean wind speed is 4 m s-1, the area of land required for a wind farm to produce an average output of 50 MWe is about

    (a) 33 km^2 (b)50 km^2 (c)100 km^2 (d) 150 km^2

13. Windmill towers are generally more productive if they are

    (a) higher, to minimize turbulence and maximize wind speed

    (b) lower, to minimize turbulence and maximize wind speed

    (c) higher, to minimize the number of birds that interfere with blade turning

    (d) higher, to increase heat convection from the ground

14. One disadvantage of wind energy is that

    (a) wind turbines are not cost-effective

    (b) large amounts of farmland are needed for the turbines

    (c) it must be transported from its source to where it is needed

    (d) wind turbines generate only a small amount of energy

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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

<div align="center">PART - B (1 x 20 = 20 Marks)</div>

16. (a) (i) Discuss about Techno economical feasibility Considerations of WECS.   (10)

    (ii) Explain in detail about the challenges in interconnection of WECS in to the grid.   (10)

<div align="center">Or</div>

    (b) (i) Explain in detail about Offshore wind farm development and its special considerations.   (10)

    (ii) Explain the Failure analysis, aging and rehabilitation in WECS.   (10)

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