MASTEROFTECHNOLOGYIN ENERGY SCIENCE&

TECHNOLOGY EXAMINATION, 2024

(2nd Semester)

WIND ENERGY TECHNOLOGY

Time: Three hours Full Marks: 100

Use a separate Answer- Script for each part

PART-I (60 marks)

Answer ***any three*** from the following questions. [20X3 = 60]

Q1. a) Define cut-in-speed, rated speed, cut-out speed.
b) What are the factors that affect the nature of wind for a given site?
c) What parameters need to be taken into account while choosing the wind turbines?
d) Discuss about the different types of electrical generators used? (4x5=20)

Q2. a) Discuss about the different types of rotors used in wind machines?

b) What is Betz' theory? Derive the mathematical expression governing the maximum wind power production from this theory. (8+12=20)

Q3. A 40 m diameter(D) ,three bladed wind turbine produces 6 KW at a wind speed of 14 m/s. Air density is the standard 1.225 kg/m3 .Under these conditions ,

a) At what rpm does the rotor turn operates with a TSR of 4.0?
b) What is the tip speed of the rotor?
c) If the generator needs to turn at 1800 rpm,what gear ratio is needed to match the rotor speed to the generator speed
d) What is the efficiency of the complete wind turbine (Blades, gear box, generator) (20)

Q4. Write short notes on below (***answer any four***) : -

a) Tip Speed Ratio(TSR)
b) Power coefficient(Cp)
c) Wind Shear
d) Drag and lift blade design
e) Hybrid wind energy conversion system (4x5=20)

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M.TECH ENERGY SCIENCE AND TECHNOLOGY

FIRST YEAR SECOND SEMESTER EXAM 2024

WIND ENERGY TECHNOLOGY

Time : Three hours (Part I + Part II) **Full Marks : 100**

Use a separate Answer – Script for each part

Part – II (40 marks)

Answer ***any two*** from the following questions. **[20 x 2= 40]**

Q5. a) Why energy storage is necessary for wind?
b) Discuss in brief about the different energy storage methods.
c) How are the aerogenerators that are mounted on high towers protected from lightning? (2+12+6=20)

Q6. Compare the energy at 15 degree C,1 Atm pressure contained in 1 square meter area of the following wind regimes :

a) 100 hours of 6m/s winds (13.4mph)
b) 50 hrs at 3 m/s plus 50 hrs at 9 m/s

c) Why we should not use Average wind velocity in the above calculations?
d) If the wind speed is 20 m/s and the blade length is 50m .Calculate the power in the wind.

(4 x 5=20)

Q5.a) Name the instrument to measure wind velocity?
b) Discuss about Rotational anemometer, Pressure anemometer and Hot wire anemometer.
c) What is the purpose of Wind Rose diagram and Wind vane? (2+12+6=20)