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PRESIDENCY UNIVERSITY BENGALURU

**SET-A**

SCHOOL OF ENGINEERING

**END TERM EXAMINATION – MAY/JUNE 2024**

**Semester :** Semester VI - 2021

**Course Code :** EEE3024

**Course Name :** Solar photovoltaic and Wind Energy Systems

**Program :** B. Tech.

**Date :** June 19, 2024

**Time :** 1.00PM – 4.00 PM

**Max Marks :** 100

**Weightage :** 50%

# Instructions:

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

**Part - A**

**Answer any 5 questions 5 x 4M= 20M**

1. Justify how the consumption of energy is directly proportional the progress of mankind.

(CO1) [Knowledge]

1. Renewable electricity refers to electricity generated from the renewable energy sources, which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Discuss the key elements of renewable electricity sources in detail.
2. Define the following terms
   1. Energy
   2. Sustainable energy
   3. Irradiation
   4. irradiance
3. Represent airfoil terminology with all the parameters related to it.

(CO1) [Knowledge]

(CO2) [Knowledge] (CO3) [Knowledge]

1. Wind is an intermittent and site-specific energy resource; therefore, an extensive resource assessment is essential for selecting potential sites. Explain the parameters to be considered for the site selection of wind energy systems.
2. Give the need for a grey-box model.

(CO3) [Knowledge]

(CO4) [Knowledge]

1. List the three major challenges within the energy field faced by the European community.

(CO4) [Knowledge]

**Part - B**

**Answer any 4 questions 4 x 10M = 40M**

1. Renewable electricity refers to electricity generated from the renewable energy sources. Explain the different types of renewable resources in detail.

(CO1) [Comprehension]

1. A solar cell is a PN junction diode with special construction features so that the impinging Photons from Solar energy liberate adequate Electron hole pairs for the generation of electric current from the solar cell. Explain the construction, working principle, and I-V characteristics of solar cells in detail

(CO2) [Comprehension]

1. A controlled grid converter allows for the exchange of active and reactive powers with the grid. Explain the electrical schematic diagram of a grid-connected variable speed wind power system with interfacing requirements and the conditions for the synchronizing with grid.

(CO3) [Comprehension]

1. When an induction generator is connected to the grid, the system supplies reactive power to operate the generator. Based on the operation explain the Single-Output system concerning the fixed speed with advantages and disadvantages in detail.

(CO3) [Comprehension]

1. Discuss a few important technologies in the power and heating system for integrating renewable energy systems.

(CO4) [Comprehension]

1. Compare the different infrastructures concerning different levels of intrinsic storage capacity and other needs for flexibility

(CO4) [Comprehension]

**Part - C**

**Answer any 2 questions 2 x 20M = 40M**

1. The diode current equation expresses the relationship between the current flowing through a diode and the voltage applied across it. Derive the ideal diode current equation and explain its equivalent circuit condition concerning closed and open circuits.
2. Explain the following concerning wind turbine and generator output.
   1. Constant Speed, Constant frequency
   2. Near-constant-speed, constant-frequency
   3. Variable-Speed, variable-frequency
   4. Variable-speed, Constant-frequency

(CO2) [Application]

(CO3) [Application]

1. The art of building models means to include enough details to give a realistic description of the energy system while keeping the model as simple as possible. Explain the Energy system optimization modeling in detail.

(CO4) [Application]