

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Winter 2019 - 20 Examination**

Semester: 5  
 Subject Code: 03106331  
 Subject Name: Distributed Generation

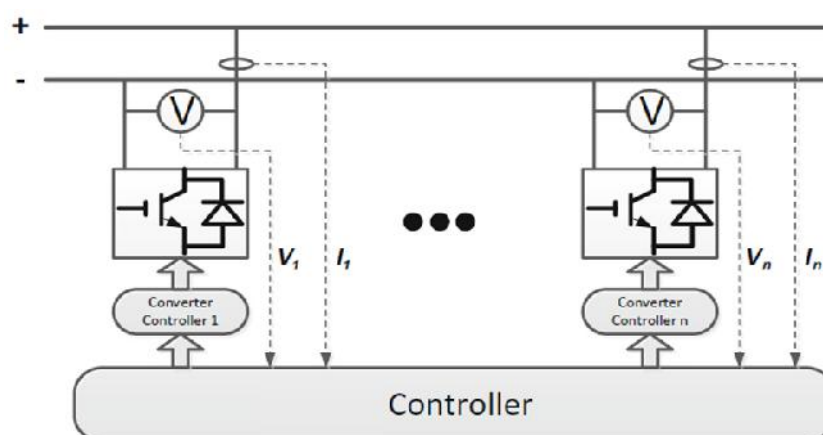
Date: 03/12/2019  
 Time: 10:30am to 01:00pm  
 Total Marks: 60

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions (All are compulsory) (Each of one mark)****(15)**

1. Which type of Generator is employed in wind power plant?
  - a) Synchronous generator
  - b) Self excited DC generator
  - c) Induction generator
  - d) Separately excited DC generator
2. In a fuel cell, electrical energy is produced by
  - a) Reaction of hydrogen with oxygen
  - b) Thermionic action
  - c) Combustion of fuel in the absence of oxygen
  - d) None of above
3. \_\_\_\_\_ type of inverter used in solar PV system match phase with a utility-supplied sine wave and are designed to shut down automatically upon loss of utility supply, for safety reasons.
  - a) Stand-alone inverter
  - b) Grid-tie inverter
  - c) Battery backup inverter
  - d) Square wave inverter
4. Energy generated through force of sea waves as they break against the coastline is known as \_\_\_\_\_ energy.
  - a) Hydro
  - b) Tidal
  - c) Micro Hydro
  - d) Both a and c
5. Theoretical maximum efficiency of wind power is about
  - a) 30%
  - b) 48%
  - c) 59%
  - d) 65%
6. Figure below shows \_\_\_\_\_ type of control used in Microgrid.



7. According to which authority, applicant and the user shall provide necessary facilities in the distributed generation resource for communication and storage of data and other parameters when distributed generation source is to be installed/connected in distribution system?
8. The point where a Local EPS is connected to an Area EPS is known as \_\_\_\_\_.
9. \_\_\_\_\_ Islanding Detection method is based on monitoring of grid variables.
10. A streamlined curved surface designed for air to flow around it in order to produce low drag and high lift forces is known as \_\_\_\_\_.

11. Group of several PV modules electrically connected in a series-parallel combination to generate the required current and voltage is called as \_\_\_\_\_.
12. \_\_\_\_\_ type of generator utilizes a Brayton cycle to transform thermal energy and kinetic energy directly into electricity.
13. \_\_\_\_\_ is a small-scale power grid that can operate independently or collaboratively with other small power grids.
14. The wind speed is measured using an instrument called as \_\_\_\_\_.
15. A power plant facility that is a localized source of power dedicated to provide to an energy user is known as \_\_\_\_\_.

**Q.2 Answer the following questions. (Attempt any three) (15)**

A) What are the advantages and disadvantages of hydro power generation system?

B) Define: (1) Swept Area

(2) Tip Speed Ratio

(3) Pitch Angle

(4) Rated Wind Speed

(5) Cut-out Speed

C) Explain working of Fuel Cell with generalized diagram.

D) List out the reasons which limit solar cell efficiency.

**Q.3 A) Explain AC Microgrid in detail along with figure and compare it with DC Microgrid. (07)**

B) A propeller type, horizontal shaft wind turbine having following wind characteristics: (1) Speed of (08)

wind 10 m/s at 1 atm and 15 °C (2) The turbine has diameter of 120 m and its operating speed is 40 rpm at maximum efficiency. Calculate:

- The total power density in the wind stream
- The maximum obtainable power density assuming  $\eta = 40\%$
- Total power produced in kW
- The torque and axial thrust

**OR**

B) Explain working of a standalone, grid connected and hybrid solar PV system with the help of neat sketch. (08)

**Q.4 A) Explain with diagram working of geothermal power generation system. (07)**

**OR**

A) Design a solar PV system having two CFLs (18 Watt each) and two fans (60 Watt each) operating (07) for 6 Hours per day with following assumptions:

- Battery efficiency = 90%
- Inverter efficiency = 90%
- Battery voltage used for operation = 12 Volts
- Battery capacity = 120 Ah
- Sunlight available per day = 8 Hours
- PV panel power rating = 40 Wp
- Operating factor = 75%
- Depth of discharge = 0.80

B) Draw simplified diagram of microgrid and explain about security issues related to it in detail. (08)