

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

Semester: 1
Subject Code: 203207130
Subject Name: Renewable Energy System

Date: 18/12/2019
Time: 10:30am to 1:00pm
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** A) Explain with diagram working of geothermal power generation system. (05)
 B) Define distributed generation. How it is classified? (05)
 C) Explain in brief about generators with power electronics interfaces in distribution system. (05)

Q.2 Answer the following questions. (Attempt any three) (Each five mark) (15)

- A) What are the advantages and disadvantages of renewable energy generation sources?
- B) What are the general requirements of generator protection in distribution system? Explain in brief.
- C) Derive equation of maximum torque produces on windmill.
- D) A solar cell (0.9 cm^2) receives solar radiation with photons of 1.8 eV energy having an intensity of 0.9 mW/cm^2 . Measurements show open circuit voltage of 0.6 V/cm^2 , short circuit current of 10 mA/cm^2 and the maximum current is 50% of the short circuit current. The efficiency of cell is 25%. Calculate the maximum voltage that the cell can give and find the 'Fill Factor'.

Q.3 A) What are upstream and downstream fault? How that affects overcurrent protection in distribution system when distributed generation sources are present? Explain in detail. (07)

- B) A propeller type, horizontal shaft wind turbine having following wind characteristics: (1) Speed of 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: (08)
- 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) What are the types of Anti-Islanding protection used in distribution system having distributed generation sources? Explain each in brief. (08)

Q.4 A) Design a solar PV system having two CFLs (18 Watt each) and two fans (60 Watt each) operating for 6 Hours per day with following assumptions: (07)

- 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

OR

- A) How voltage dips occurred in system in presence of distributed generation sources? Explain in detail considering synchronous generator as distributed generation sources. (07)
- B) Which are the security issues occurred while implementing / installing Distributed Generation sources in distribution system? Explain in detail. (08)