3E /sem-VII / CBGS
electrical Engg

R.E&ss

[Time: Three Hours]

Q.P. Code: 18586

| Marks:80|

7/6/2017

Please check whether you have got the right question paper.

N.B : 1. Q.1 is compulsory
2. Answer any Three out of remaining Five questions
3. Assume any suitable data wherever required but Justify the same
4. Use graph paper wherever necessary

1 (a) Compare mono-crystalline, poly-crystalline and thin film solar PV technology.   05

(b) Draw the Power Converter topology for doubly fed induction generators (DFIG) in Wind Turbines   05
and describe the working principle in brief.

(c) State the Standard Test Conditions (STC) for a solar PV module. If a solar PV module specification   05
is 250Wp at STC, what will be the expected power at 700W/m² and 400W/m² solar radiation?

(d) If a solar PV system of 1 kWp is installed in Mumbai city, how much energy yield (units in kW–
Hour) is expected in a year? Justify the answer with suitable calculation and assumptions.   05

2 (a) Assume that a solar PV rooftop system has to be designed for a 150 kW (peak) for grid (3 phase   10
415 volts) connected operation. If the solar PV panels to be use are of P_{mp}= 315Wp, V_{mp}= 36.54
V and I_{mp}= 8.62 A at STC, calculate the numbers of series and parallel combination of the solar
PV panels need to be used. Also estimate the space in square meters that will be needed for this
installation.

(b) Describe the working principle of Proton Exchange Membrane Fuel Cell (PEMFC) and explain its   10
electrical characteristics. Explain the working of a PEMFC fed power converter/inverter topology
that can be used to feed a three phase AC standalone load.

3 (a) What are the different applications of solar thermal system? What are the various means,   07
mechanisms and apparatus of collecting the solar thermal energy?

(b) Explain the concept of maximum power point tracking (MPPT) in solar PV? Explain the working   08
principle of the any one of typically used MPPT algorithms.

(c) Describe the working principle of a Tidal energy power generation system.   05

4 (a) Explain the working of a Wind Energy System (WES) with its various components. What are the   12
different power converter topologies used for WES? Explain any one of them in detail.

(b) Describe various types or forms of energy storage which are commonly used in renewable energy
system and compare their performance. What type of energy storage is suitable for hybrid   08
combination with (i) solar PV source (ii) Fuel cell source? Justify your answer.

5 (a) State the effect of the following on Solar PV system performance   08
(i) Mismatch in modules   (ii) Hot spots in the modules
(iii) Bypass diode   (iv) Blocking diode

(b) Draw I-V (current v/s voltage) characteristics of a solar PV panel with V_{mp}= 36 Volts and I_{mp}=4.15   05
Amps at 1000W/m² (at STC) and clearly mark all essential parameters on it.

(c) Describe role of renewable energy and energy storage in distributed generation, microgrid and
smart grid scenario.   07

6 (a) Explain the principles of following technologies and their importance   10
(i) Wave Energy (ii) Pumped hydro storage system

(b) Describe the working principal of a power generation using Biomass.   05

(c) Illustrate the application of energy storage in electric and hybrid vehicles.   05