

Name :

Roll No. :

Invigilator's Signature :

**CS/M.TECH (EE)/SEM-2/MTP-205B/2013
2013**

GENERATION OF NON-CONVENTIONAL ENERGY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer any *five* of the following : $5 \times 14 = 70$

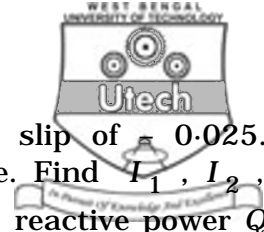
1. a) Draw and explain equivalent circuit of an induction generator. Define capacity credit in respect of wind generator connected to the utility grid.

b) A three-phase, *T*-connected, 220 V (line to line), 10 hp, 60 hz, six pole induction machine has the following constants in ohms per phase.

$$R_1 = 0.30 \Omega / \text{phase}, R_2 = 0.14 \Omega / \text{phase},$$

$$R_m = 120 \Omega / \text{phase}, X_1 = X_2 = 0.35 \Omega / \text{phase},$$

$$X_m = 13.2 \Omega / \text{phase}.$$

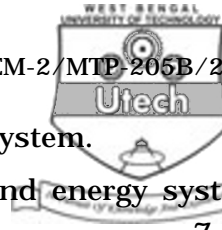


It is operated as a generator at a slip of $s = 0.025$. Terminal voltage is 220 V line to line. Find I_1 , I_2 , input power P_m , output power P_e , reactive power Q and efficiency η_g .

If the rated I_1 is 25A when operated as a motor, comment on the amount of overload, if any. 3 + 3 + 8

2. a) Draw the block diagram of an asynchronous electrical system when wind turbines, transmission and generator grid are being disconnected from the centre grid.
- b) An induction machine can be made to operate as an isolated self-excited induction generator. Justify.
- c) State and explain how a three-phase induction generator will supply power to a single phase unbalanced load. 5 + 4 + 5
3. a) Draw the configuration of a hybrid system in which power conditioners are used for generating solar power.
- b) State and explain by a single line control loop for integration of wind and solar system.
- c) What is wind turbine simulator and how it can be integrated with solar energy conversion system for feeding power into the 1 \emptyset and 3 \emptyset grid ?
- d) Draw and explain an island grid configuration containing rotating phase shifter, synchronous generator along with two diesel generators.

3 + 3 + 4 + 4



4. a) Explain grid connected wind energy system.
 b) Draw and explain how the hybrid wind energy system operates. 7 + 7
5. a) What is Horizontal axis wind turbine ?
 b) What are the advantages of V.A.W.T. in comparison of H.A.W.T. ?
 c) Define the different terms with respect to H.A.W.T.
 i) Angle of attack
 ii) Trailing edge
 iii) Pitch control
 iv) Tethering
 v) Yaw control. 2 + 2 + (5 × 2)
6. a) Give the classification of different type of solar collectors.
 b) Define any *three* of the following :
 i) Evacuated tube collector
 ii) Compound parabolic concentrator
 iii) Circular Fresnel lens concentrator
 iv) Hemispherical bowl mirror concentrator. 2 + (3 × 4)
7. Draw and explain different solar thermo-mechanical systems (any two) : 2 × 7
 a) Solar thermal water pump
 b) Solar vapour compression refrigeration
 c) Central tower receiver power plant.

