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 × 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.

   $R_1 = 0{\cdot}30\ \Omega$ / phase, $R_2 = 0{\cdot}14\ \Omega$ / phase,

   $R_m = 120\ \Omega$ / phase, $X_1 = X_2 = 0{\cdot}35\ \Omega$/phase,

   $X_m = 13{\cdot}2\ \Omega$ / phase.

It is operated as a generator at a slip of – 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-exited 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∅ and 3∅ 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.