

**MODEL QUESTION**  
**EIGHTH SEMESTER B.TECH DEGREE EXAMINATION**  
**(2013 Scheme)**

**13.805.3 POWER ELECTRONIC APPLICATIONS IN POWER SYSTEMS (E)**

**Time : 3 Hrs**

**Max Marks: 100**

**PART - A**

**Answer All Questions**

- 1) Sketch the load current waveform in a single phase square wave inverter supplying a series RL load and indicate the time intervals when each switch component is conducting.
- 2) Why Asynchronous PWM is not preferred at low values of frequency modulation ratio
- 3) Compare the frequency spectrum of unipolar and bipolar sine PWM
- 4) Compare current controlled and voltage controlled inverter control schemes
- 5) What is islanding operation in grid connected PV systems?
- 6) How PV plants can provide reactive power support to utility grid?
- 7) Why soft starters are used in an induction generator based wind energy systems?
- 8) What are the limitations of a PMSG based wind energy system?
- 9) Compare passive and active filters
- 10) What is the criteria used to select the type of active filter  
(10×2=20)

**PART - B**

**Answer one full question from each module**

**Module I**

- 11) a) Derive the Fourier series expansion for output phase voltage in 3-phase VSI operating in 180° conduction mode. Also find the THD in output phase voltage.  
(10)  
b) With neat diagrams explain the working of a diode clamped type multilevel inverter  
(10)
- OR**
- 12) a) Explain the principle of space vector modulation in detail  
(10)  
b) With neat diagrams explain the working of a flying capacitor type multilevel inverter.  
(10)

## Module II

- 13) a) Explain the working of a grid connected PV inverter using a high frequency transformer (10)
- b) Explain the working of a line commutated inverter used for grid connected PV applications. What are its limitations? (10)

**OR**

- 14) a) Explain the method of power flow control employed in a grid connected voltage controlled VSI (12)
- b) Explain the working of a self commutated inverter used for grid connected PV systems (8)

## Module III

- 15) a) Compare the performance of Synchronous generator and Induction generator based Wind energy systems. (10)
- b) Explain slip power recovery scheme used in grid connected wind energy systems. (10)

**OR**

- 16) a) Explain the working of rotor resistance chopper control used in wind energy systems (10)
- b) Explain the working of a static scherbius system used in DFIG based wind energy systems (10)

## Module IV

- 17) a) Explain the working of a shunt active filter implemented with two PWM VSIs connected in cascade (10)
- b) Explain reference current generation scheme used in a shunt active power filter using instantaneous reactive power theory. (10)

**OR**

- 18) Explain the circuit structure and principle of operation of a series active power filter in detail (20)

(20×4=80)