

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]

Dec-24-0377 (CBCS)

EE-501 (Power Electronics-II)

B.Tech. 5th

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions in all, selecting One question each from section A, B, C & D. Section E is compulsory.

SECTION - A

1. (a) Discuss the working and operation of single-phase full bridge inverter configuration with RLC underdamped load. Draw the load voltage and load current waveforms under steady state operating conditions. (5)
- (b) What is Pulse-Width modulation? Discuss the various schemes involving PWM for voltage control in inverters. (5)
2. Explain the operating principle of three-phase 120 degree conduction mode voltage source inverter, with the help of topology and operating scheme. Deduce the expression of output voltage in terms of input voltage. List the merits of this operation over 180 degree mode of conduction of inverter. (10)

SECTION - B

3. Describe the working of a single-phase series inverter with an appropriate circuit and waveforms. Indicate the need of an optimum time margin. Derive an expression for output frequency in terms of circuit parameters and T_{off} . (10)

4. (a) Describe the working of a single-phase parallel inverter with relevant circuit and waveforms. (5)
- (b) A single-phase parallel inverter delivers power to the resistive load through centre-tapped transformer. Derive expression for capacitor voltage on the ideal constant current source assumptions. (5)

SECTION - C

5. Discuss the various implementation schemes of power electronics devices in wind electrical systems for effective power generation. (10)
6. (a) How can the electricity be obtained from photo-voltaic system? Discuss with circuit diagram and its operation. (5)
- (b) Discuss how a thyristor may be subjected to internal and external overvoltages. Describe the methods adopted for suppressing such overvoltages in thyristor systems. (5)

SECTION - D

7. (a) What is a Static Switch? List the merits of static switches over mechanical switches. (5)
- (b) Describe dc solid state relays with relevant circuit diagrams. (5)
8. (a) Describe the working of static ac as well as static dc circuit breakers. (5)
- (b) Discuss, why nickel-cadmium batteries are preferred over the lead-acid in UPSs? (5)

SECTION - E (Compulsory)

9. Explain the following:

- (i) What is an inverter? List a few applications of inverters.
 - (ii) List the drawback of single-phase half bridge inverter.
 - (iii) What is role of feedback diode in the inverter?
 - (iv) What is the need for controlling the voltage at the output terminals of an inverter?
 - (v) What is Sinusoidal Pulse-width modulation as used in PWM inverters?
 - (vi) Draw the circuit diagram of modified half-bridge series inverter.
 - (vii) What do you mean by Snubber circuit for protection of thyristor?
 - (viii) What do you mean by micro-turbine system and applications of power electronics?
 - (ix) Deduce the difference between single-phase ac voltage controller and single-phase ac switch.
 - (x) Draw the circuit diagram of single-pole dc switch based on a GTO.
- (10×2=20)