



**B.E DEGREE EXAMINATIONS: MAY 2015**

(Regulation 2009)

Sixth Semester

**ELECTRONICS AND INSTRUMENTATION ENGINEERING**

EIE118: Power Electronics

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Snubber circuit is used to limit the rate of
  - a) decrease in current
  - b) conduction period
  - c) rise of voltage across SCR
  - d) turn off time
2. IGBT is a ..... controlled device
  - a) Voltage
  - b) Current
  - c) Power
  - d) Energy
3. In BJT,
  - a)  $\beta = \alpha/\alpha+1$
  - b)  $\beta = \alpha/\alpha-1$
  - c)  $\alpha = \beta/\beta +1$
  - d)  $\alpha = \beta +1/\beta$
4. In a single phase full wave controlled bridge rectifier, minimum output voltage is obtained at conduction angle \_\_\_\_\_ and maximum at conduction angle\_\_\_\_\_.
  - a)  $0^\circ, 180^\circ$
  - b)  $180^\circ, 0^\circ$
  - c)  $0^\circ, 0^\circ$
  - d)  $180^\circ, 180^\circ$
5. In dc choppers if  $T_{on}$  is the ON period and  $f$  is the chopping frequency, then output voltage in terms of input voltage  $V_s$  is given by
  - a)  $V_s \cdot T_{on}/f$
  - b)  $V_s \cdot f/T_{on}$
  - c)  $V_s/f \cdot T_{on}$
  - d)  $V_s \cdot f \cdot T_{on}$
6. Which of the following regulator can provide output voltage more than or less than the input voltage?
  - a) Buck regulator
  - b) Boost regulator
  - c) Buck-Boost regulator
  - d) AC voltage controller

7. What type of device is used for single phase CSI
  - a) MOSFET
  - b) GTO
  - c) SCR
  - d) Thyristor
8. The shunt compensators are usually employed for
  - a) Voltage Compensation
  - b) Power Compensation
  - c) Impedance Compensation
  - d) Current Compensation
9. A cycloconverter is a
  - a) frequency converter
  - b) current converter
  - c) Voltage converter
  - d) Voltage to frequency converter
10. The semiconductor switch used for HVDC transmission system is
  - a) MOSFET
  - b) BJT
  - c) SCR
  - d) TRIAC

**PART B (10 x 2 = 20 Marks)**

11. What is holding current of SCR?
12. What are the types of power diodes?
13. What are the effects of source inductance on the performance of AC-DC converters?
14. What is Phase control in controlled rectifier?
15. Write any two salient features of buck converter?
16. Define the term duty cycle in DC - DC converter.
17. What is two quadrant DC chopper?
18. What are the methods for controlling harmonics?
19. Name the types of AC voltage controller.
20. Mention the advantage and disadvantage of three phase to three phase bridge cycloconverter.

**PART C (5 x 14 = 70 Marks)**

21. a) (i) Explain the switching characteristics of IGBT. (8)
  - (ii) How does the concept of saturation differ in MOSFET with BJT? (6)
- (OR)**
- b) (i) Describe the construction of TRIAC with aid of diagram and explain its characteristics. (7)
  - (ii) Explain the different modes of operation of a thyristor with the help of its static IV characteristics. (7)

22. a) With necessary circuit and waveforms, explain the principle of operation of three phase fully controlled bridge rectifier feeding R-L load and derive the expression for the average output voltage.

**(OR)**

- b) A single-phase full converter is supplied from 210 V, 50 Hz, The load consists of  $R = 12 \text{ ohm}$  and a large inductance so render the load current constant for a firing angle delay  $60^\circ$ , determine
- Average output voltage
  - Average output current
  - Average and RMS values of thyristor currents
  - Power factor

23. a) (i) Explain the control strategies of DC chopper (7)
- (ii) In a type A chopper, the input supply voltage is 230V, the load resistance is 10 ohm and there is a voltage drop of 2V across the chopping thyristor when it is on. For a duty ratio of 0.5. Calculate (i) the average and rms values of the output voltage (ii) the average and rms thyristor current. (7)

**(OR)**

- b) Explain the operation of the four quadrant chopper (class-E) with suitable sketch.

24. a) With neat sketch explain the 3 phase voltage source inverter at  $180^\circ$  mode operation.

**(OR)**

- b) Explain the principle of operation of three-phase inverter operating in  $120^\circ$  conduction modes with necessary waveforms. Also obtain the expression for rms value of output voltage

25. a) What is an UPS? Describe short - break static and no - break static UPS configurations.

**(OR)**

- b) (i) Write short notes on UPFC (7)
- (ii) Static VAR compensation. (7)

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