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Question Paper Code: 55031

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fifth Semester

Electrical and Electronics Engineering

15UEE501 - POWER ELECTRONICS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A power MOSFET has three terminals called

   (a) collector, emitter, base (b) drain, source, base
   (c) drain, source, gate (d) collector, emitter, gate

2. In the buck-boost, what is the maximum value of the switch utilization factor?

   (a) 1 (b) 0.75 (c) 0.5 (d) 0.25

3. A single phase full bridge VSI has inductor L as load. For a constant source voltage, the current through the inductor is

   (a) square wave (b) triangular wave
   (c) sine wave (d) pulsed wave

4. In a single pulse modulation of PWM inverters, fifth harmonic can be eliminated if pulse width is equal to

   (a) 30^o (b) 36^o (c) 72^o (d) 108^o

5. In a diode, the cut-in voltage and forward voltage drop are respectively

   (a) 0.7 V, 0.7 V (b) 0.7 V, 1 V
   (c) 0.7 V, 0.6 V (d) 1 V, 0.7 V

6. The selection of rectifier diode depends mostly on

(a) Forward Voltage (b) Reverse Voltage
(c) Fault Current (d) Average Load Current

7. In a single phase full converter, for continuous conduction each pair of SCRs conduct for

(a) π (b) $\pi - \alpha$ (c) α (d) $\pi + \alpha$

8. A freewheeling diode is across inductive load will provide

(a) quick turn-on (b) slow turn-on
(c) reduced utilization factor (d) Improved power factor

9. TRIAC cannot be used in

(a) ac voltage regulators (b) cyclo-converters
(c) solid state type of switch (d) inverter

10. A single phase ac voltage controller feeds a pure inductive load. The conduction period of a thyristor for a firing angle α is

(a) $\pi - \alpha$ (b) $2\pi - \alpha$ (c) $\pi - 2\alpha$ (d) $2(\pi - \alpha)$

PART - B (5 x 2 = 10 Marks)

11. Write advantages of buck-boost regulator.

12. Compare VSI and CSI.

13. What are the advantages of bridge rectifier over center tapped rectifier?

14. Mention the effect of source inductance in converters.

15. What are the applications of AC voltage controllers?

PART - C (5 x 16 = 80 Marks)

16. (a) With neat waveform, explain the transfer and output characteristics of power MOSFET. (16)

Or

(b) Discuss the operation of DC-DC boost chopper and prove that its output voltage is always greater than input voltage. (16)

17. (a) (i) Draw the structure of IGBT and explain its operating principle briefly. (8)

(ii) With neat waveforms, explain the sinusoidal PWM and modified sinusoidal PWM technique. (8)

Or

(b) Explain the operation of 120 degree mode voltage source inverter with resistive load using relevant circuit. Also, draw the phase voltage waveforms. (16)

18. (a) Explain the operation of single phase full bridge rectifier with neat diagrams and also derive average, rms and ripple factor values of full bridge rectifier. (16)

Or

(b) (i) compare Half wave rectifier, center tapped rectifier and Full wave rectifier. (8)

(ii) Explain the operation of Shunt capacitor filter with rectifier circuits. (8)

19. (a) (i) Explain the operation of SCR using two transistor analogy. (8)

(ii) Derive the average DC output voltage equation for single phase semi- converter with R load. (8)

Or

(b) Explain the operation of three phase full converter with neat waveforms. (16)

20. (a) Explain the working principle of single phase ac voltage controller with necessary waveforms. (16)

Or

(b) Enlighten the operation of multistage sequence control of AC voltage controller. (16)
