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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, JUNE/JULY 2018

Branch: Electrical & Electronics Engineering

Stream(s): **Control System, Electrical Machines**

01EE6303 POWER ELECTRONIC CIRCUITS

Answer *any two full* questions from *each* part

Limit answers to the required points.

Max. Marks: 60 Duration: 3 hours

PART A

1. a. Explain the turn-off process in an IGBT with the help of appropriate voltage and current waveforms. (4)

   b. Draw and explain voltage, current and power wave form of a practical switch. (5)

2. a. Assume linear variation with respect to time for both voltage and current, both during turn-on and turn-off. The OFF-state voltage is V and ON-state current is I. The switching frequency is f. Assume that the switch is ideal as regards its static performance. Obtain expression for (5)
   (i) The average switching power loss
   (ii) Instantaneous peak power loss in the switch

   b. Explain with relevant diagrams and waveforms the operation of two stage sequence control of a single phase a.c voltage controller with RL load. (4)

3. a. Explain with circuit diagram and waveforms the working of a single- phase a.c voltage controller with resistive load. (5)

   b. Realize current bidirectional and voltage bidirectional two quadrant switches and explain its operation. (4)

PART B

4. a. Explain the operation of buck converter with the help of circuit diagram and relevant waveforms. (5)

   b. A boost regulator has an input voltage Vs = 6 V.The average output voltage Va = 15V and the average load current Ia = 0.5A. The switching frequency is 20 kHz. If L = 250 μH and C=440 μF determine (i) Duty cycle K; (ii) The ripple current of inductor ΔI ; (iii) The peak current of inductor and (iv) The ripple voltage of filter capacitor ΔVc. The switching frequency is 25 kHz. (4)

5. a. Describe with relevant diagrams and waveforms the working of a forward converter. (4)

b. Explain the operation of a push- pull converter with circuit diagram and relevant waveforms. (5)

6. a. Explain the operation of a fly back converter with circuit diagram and relevant waveforms. (4)

b. Describe with relevant diagrams and waveforms the working of a buck-boost converter. (5)

PART C

7. a. Explain the operation of three phase voltage source inverter with 120° conduction mode with the help of circuit diagram and relevant waveforms. (7)

b. Describe how the voltage is controlled in 1Φ inverter using sine-triangle pulse width modulation technique. (5)

8. a. Explain the operation of single phase capacitor commutated CSI with resistive load. 6)

b. Describe the working of a single phase full bridge Voltage Source Inverter. (6)

9. a. Explain the working of a current controlled VSI with hysteresis control scheme. (8)

b. What are the advantages of Current Source Inverter? Mention its applications. (4)