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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY  
FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2018

*Electrical and Electronics Engineering*

*Stream(s): Control Systems & Electrical Machines*

*01EE6303 Power Electronics 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 dynamic characteristics of MOSFET with the help of Voltage and current waveforms (3)  
b. What are the characteristic features of an ideal switch (3)  
c. Describe different configurations of switches using semiconductor devices (3)
2. a. Explain the analysis of a single phase ac voltage controller with RL load (5)  
b. Explain the conduction and switching losses in MOSFET (4)
3. a. Explain the static and dynamic characteristics of an IGBT (6)  
b. The off state voltage is  $V$  and on state current is  $I$ , the switching frequency is  $f$ , Obtain the expression for the average switching power loss, Instantaneous peak power loss in the switch. Assume the switch is ideal (3)

**PART B**

4. a. Explain the boost converter and obtain the condition for continuous inductor current and capacitor voltage (6)  
b. A boost converter has an input voltage of 5V, the average output voltage is 15V and the average load current is 0.5A. The switching frequency is 25kHz. If  $L=150\mu\text{H}$  and  $C=220\mu\text{F}$ , Determine the duty cycle, critical values of  $L$  and  $C$  (3)
5. a. Describe the working of a fly back converter with neat circuit diagram and wave forms. (5)  
b. Distinguish between isolated DC-DC converters. (4)
6. a. In a Cuk converter operating at 50kHz,  $L_1=L_2=1\text{mH}$  and  $C_1=5\mu\text{F}$ . The output capacitor is sufficiently large to yield an essentially constant output voltage. Input voltage is 10V and output  $V_0$  is regulated to be constant at 5V. It is supplying 5W to a load. Assume ideal components and constant voltage across  $C_1$ , Calculate the percentage error in voltage. (3)

- b. Explain the operation of Boost converter in Discontinuous current mode (3)
- c. Describe the working of a forward converter with neat circuit diagram and wave forms (3)

**PART C**

- 7. a. Explain the operation of three phase inverter in 180° conduction mode. Draw the output voltage wave forms and obtain the RMS value of the fundamental component of line Voltage (9)
- b. Explain different PWM technologies (3)
- 8. a. Explain the working of single phase capacitor commutated current source inverter. Draw relevant wave forms (9)
- b. Describe about Bang-Bang control (3)
- 9. a. Explain harmonics reduction by stepped wave inverter (3)
- b. With neat circuit diagram and relevant wave forms explain the working principle of current controlled voltage source inverter. (9)

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