

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2017

Electrical and Electronics Engineering

Specialization-Control Systems and 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. Compare the characteristics of ideal and practical switches (3)
 - b. Explain static & dynamic characteristics of Power Diodes (6)
2.
 - a. Describe about the conduction & switching losses in an MOSFET (4)
 - b. Explain the operation of single phase voltage controller with RL load and derive the expressions for the rms output voltage, rms and average thyristor current. (5)
3.
 - a. Explain how to implement two quadrant and four quadrant switches using power electronics components. (4)
 - b. An ac voltage controller with On-Off control has a resistive load of $R=10\Omega$ and the rms input voltage is $V_s = 120V$, 60 Hz. The thyristors switch is on for 20 cycles and off for 80 cycles. Determine (a) the rms output voltage, (b) the input power factor and (c) the average and rms current of thyristors (5)

PART B

4.
 - a. Explain the operation of boost converter and determine the value of inductance and capacitance for continuous conduction mode. (4)
 - b. Explain the working principle of Cuk converter and analyze the ripple in output voltage (5)

5. a. Explain the working of forward converter and draw the waveforms (6)
- b. A fly back converter has the following circuit parameters. $V_s=24V$, $N_1/N_2=3$, $L_{in}=500\text{ }\mu\text{H}$, $R=5\Omega$, $C=200\text{ }\mu\text{F}$, $f=40\text{ kHz}$, $V_0=5V$. Determine the required duty ratio. b) the minimum, maximum, average values for the line current. (3)
6. a. In a CUK converter operating at 50 Hz, $L_1=L_2=1\text{mH}$ and $C_1=5\text{ }\mu\text{F}$. The output capacitor is sufficiently large to yield an essentially constant output voltage. Here $V_s=10\text{ V}$ and the output V_0 is regulated to be constant at 5V. It is supplying 5W to a load. Assume ideal components. Calculate the percentage error in assuming a constant voltage across C_1 or in assuming constant currents i_{L1} and i_{L2} . (6)
- b. Compare the fly-back converter with forward converter. (3)

PART C

7. a. Explain the working principle of a 3-phase inverter in 180° conduction and draw the gating signals, phase and line voltages and compare with 120° degree conduction in a three phase inverter (12)
8. a. Describe the working principle of current controlled scheme in voltage source inverter. (6)
- b. Describe the working of a single phase capacitor commutated current source inverter with pure resistive load. (6)
9. a. Explain the PWM techniques for reduction of harmonic current in inverters. (6)
- b. What are the advantages and disadvantages of current source inverters? (6)