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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION. DECEMBER 2015

ELECTRICAL & ELECTRONICS ENGINEERING

Stream: CONTROL SYSTEMS & ELECTRICAL MACHINES

01EE6303 - Power Electronic Circuits

Time: 3 hours Max marks: 60

Answer any two full questions from each part.

PART–A (Module I and II)

1 a. Explain the turn-on and turn-off process in a GTO with the help of appropriate voltage and current waveforms. (5)

b. A single phase ac voltage controller is connected to a load of R = 10Ω. Input voltage is 230V, 50Hz. Firing angle delay is 30º. Determine the rms value of 3rd harmonic output voltage (4)

2 a. Discuss the power loss in a diode during the reverse recovery transients. (4)

b. Explain with relevant diagrams and waveforms the working of a 2 – stage sequence control of 1- phase voltage controller with RL load. (5)

3 a. Draw the power circuit diagram of a three phase fully controlled bridge rectifier with RLE load and explain the inverter operation with voltage waveform. (5)

b. Explain the conduction and switching losses in a IGBT. (4)

PART–B (Module III and IV)

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

b. With circuit diagram and relevant waveforms explain the operation of flyback converter. Derive the expression for average output voltage. (4)

5 a. The data for a CUK converter are as follows; (5)

V_1 = 160 V and frequency 25 kHz. For a duty cycle of 25%,

(a) Determine Vc_1 and V_0;

(b) The peak forward voltage the switch has to block;

(c) (c) Sketch the waveforms of VL_1 and VL_2.

b. Explain the working of a push-pull type switched mode power supply. (4)

6 a. Explain the working of a Half bridge DC – DC switched mode converter with circuit diagram and waveforms. (5)

b. With circuit diagram and necessary waveforms, explain the operation of a buck-boost (4)

PART–C (Module V and VI)

7 a. With circuit diagram and relevant waveforms, explain the operation of single phase capacitor commutated current source inverter with inductive load. (6)

b. Describe how the voltage is controlled in single phase inverter using sine triangle PWM. (6)

8 a. Explain current control scheme in inverter using hysteresis current controller. (6)

b. Explain harmonic reduction by stepped wave inverters. (6)

9 a. Explain the different voltage control methods in single phase inverters. (6)

b. Explain current control scheme in inverter using PWM current controller (6)
