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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2015

ELECTRICAL & ELECTRONICS ENGINEERING

Stream: POWER CONTROL AND DRIVES

01EE6501: POWER CONVERTER CIRCUITS

Time: 3 hours Max marks: 60

Answer any two full questions from each part.

PART–A (Module I and II)

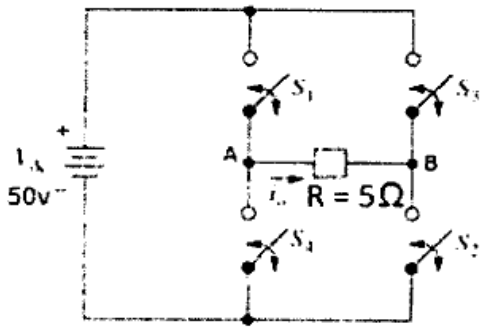
1 a. Derive an expression for average output voltage of a three phase diode rectifier with source inductance. (5)

b. Determine the performance parameters of a single phase full wave diode bridge rectifier with R load. (4)

2 a. With neat circuit diagram and waveforms explain the working of a full bridge diode rectifier with capacitive filter. Derive an expression for ripple factor. (6)

b. Explain Line Current Distortion (3)

3 a. An inverter is shown with four switches. Each switch is considered as non-ideal, with a forward characteristics given by $V_f = 1.6+0.1i_o$ V. The repetitive switching frequency is 500Hz. S1 and S4 are turned on at t=0 and turned off at t=0.6ms.S2 and S3 are turned on at t=1ms and turned off at t=1.6ms. a) Determine 1) the maximum instantaneous power loss in any one switch 2) the average power loss in it. b) Determine the maximum instantaneous power output from the converter and its average efficiency. (6)



b. What are the characteristics of an ideal switch? (3)

PART–B (Module III and IV)

4 a. With neat waveforms explain the working of 3Φ fully controlled converter for RL load with α=60° (5)

b. A three phase full converter is operated from a 3Φ, 230V, 60 Hz supply. The load is highly inductive and the average load current is I_o = 150A with negligible ripple content. If the delay angle is π/3, determine the ratings of thyristor. (4)

5 Explain the operation of Boost converter with neat circuit diagram and relevant waveforms. Derive the expressions for the average output voltage. (9)

6 a. A buck converter has an input voltage, Vs=15 V. The required average output voltage Va= 15 V and the peak to peak output ripple voltage is 10 mV. The switching frequency is 20 KHz. The peak to peak ripple current of inductor is limited to 0.5 A. Determine i) the duty cycle ii) the filter inductance iii) the filter capacitance iv) the critical values of L and C. (6)

b. Explain the inversion mode of operation of rectifier with relevant waveforms. (3)

PART–C (Module V and VI)

7 a. The average output voltage of a flyback circuit is 24 V at a resistive load of R=.8 Ω. The duty ratio is 50 % and the switching frequency is 1KHz.the on stage voltage drops of transistor and diode are 1.2 V and 0.7 V respectively. The turns ratio of transformer is a=Ns/Np=0.25, Determine (8)

i) The efficiency

ii) Average rms and peak transistor currents.

b. Explain the working of a half bridge converter with relevant waveforms (4)

8 Explain the operation of 3 phase inverter with 180° conduction with circuit neat diagram. Draw the thyristor currents, Phase voltage and Line voltage waveforms. (12)

9 a. Explain the methods of harmonic elimination in PWM inverters (6)

b. Write short notes on Push-pull dc-dc converter (6)
