No. of Pages: 2

D

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2017

Branch: Electrical & Electronics Engineering

Stream: Power Control and Drives

01EE6501: POWER CONVERTER CIRCUITS

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

Limit answers to the required points.

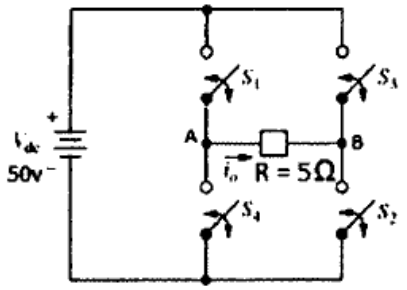
Max. Marks: 60 Duration: 3 hours

PART - A

1. a) Explain the effect of source inductance in a 3Φ full bridge diode rectifier having highly inductive load. Draw the relevant waveforms (6)

   b) Explain line current distortion. (3)

2. 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)Explain the four quadrant operation of a switch (3)

3. 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 the characteristics of an ideal switch (3)

PART –B

4. a)A 1Φ full wave controlled rectifier is connected to a highly inductive load. i) Draw the output voltage, output current and input current for a firing angle of 60°. (5)

   b) Express the input current of 1Φ full wave controlled rectifier in Fourier series and determine THD and input power factor (4)

5. Explain the operation of Buck-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= 5 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

7. a) Draw the circuit diagram and explain the operation of a flyback converter for continuous conduction mode. Give relevant waveforms. Derive the voltage transfer ratio (8)

   b) Compare linear and switched mode power supplies (4)

8. Explain the operation of 3 phase inverter with 120° conduction withneat circuit 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 Full bridge dc-dc converter (6)