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10EE662

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Advanced Power Electronics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With a neat circuit and wave form, explain the operation of 'CUK' – converter. Find the ratio of output current to input current. **(10 Marks)**

b. A Boost regulator has an input voltage of V_s = 5V. The average output voltage is V_a = 15V and the average load current I_a = 0.5A. The switching frequency is 25 KHz. If $L = 150 \times 10^{-6}$H and $C = 220 \times 10^{-6}$F, determine :
i) The duty cycle(k), ii) the ripple current of inductor iii) the peak current of inductor iv) the output ripple voltage. **(10 Marks)**

2 a. Discuss the working of Boost converter for continuous conduction mode with the help of circuit diagram and relevant waveforms. Also derive its voltage and current transformation ratio. **(10 Marks)**

b. The buck DC-DC converter has the following parameters $V_S = 50$V, D = 0.4, $L = 400 \times 10^{-6}$H, $C = 100 \times 10^{-6}$F, f = 20 KHz, R = 20Ω. Assuming ideal components, calculate : i) the output voltage ii) the maximum inductor current iii) the minimum inductor current and iv) the output voltage ripple. **(10 Marks)**

3 a. Describe the working of buck-boost converter for continuous conduction mode with the help of relevant circuit and waveforms. Also derive voltage and current transformation ratio in terms of duty cycle. **(10 Marks)**

b. The Buck – Boost regulator has an input voltage of V_S = 12V the duty cycle K = 0.25 and the switching frequency is 25 KHz the inductance $L = 150 \times 10^{-6}$H and the filter capacitance $C = 220 \times 10^{-6}$F. The average load current I_a = 1.25A. Determine :
i) The average output voltage (V_0)
ii) Peak – to – peak output voltage ripple (ΔV_0)
iii) Peak – to – peak ripple inductor current (ΔI_L)
iv) Peak current of transistor (I_P). **(10 Marks)**

4 a. With a neat circuits, explain the operations of single phase half bridge and full bridge inverters. **(10 Marks)**

b. Explain the operation of three phase inverter consisting of three legs. **(05 Marks)**

c. In a single phase full-bridge PWM inverter, V_d varies in a range of 295 – 325V. The output voltage is required to be constant at 200V(rms) and the maximum load current is 10A(rms). Calculate the combined switch utilization ratio. **(05 Marks)**

PART – B

5 a. With a neat snubber circuit and switching loci, explain the operation of zero voltage and zero current switchings. **(10 Marks)**

b. Explain different modes of operation of zero voltage switching (ZVS) resonant switch converter with relevant circuits and waveforms. **(10 Marks)**

6 a. Explain the step by single pass algorithm for the design of high frequency inductor. **(10 Marks)**

b. Give the steps involved in single pass algorithm for the design of high frequency transformer used with SMPS. **(10 Marks)**

7 a. Explain the operation of push-pull converter with relevant circuit and waveform. Also derive its voltage transformation ratio in terms of duty cycle. **(10 Marks)**

b. Explain the operation of full bridge DC – DC converter with neat circuit and waveform. **(10 Marks)**

8 a. Derive the voltage and current transformation ratio for a flyback converter with the help of neat circuit and waveforms. **(10 Marks)**

b. What are the types of AC power supplies? With a block diagram clearly. Explain 'UPS' configuration with load normally connected to AC main supply. **(10 Marks)**

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