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Total Number of Pages: 02

B.Tech
PEEE5410

8th Semester Regular / Back Examination 2016-17

ADVANCED POWER ELECTRONICS

BRANCH(S): EEE, EE

Time: 3 Hours

Max Marks: 70

Q.CODE: Z397

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: (2 x 10)**
- a) A fly-back converter is to be designed to operate in just-continuous conduction mode when the input dc is at its minimum expected voltage of 200 volts and when the load draws maximum power. The load voltage is regulated at 16 volts. What should be the primary to secondary turns ratio of the transformer if the switch duty ratio is limited to 80%. Neglect ON-state voltage drop across switch and diodes.
 - b) Enumerate two advantages of push pull converter.
 - c) What will be the maximum duty ratio in a forward converter with primary and demagnetising winding having turn ratio 1:3 ?
 - d) What is the input output relationship of a boost converter operating in discontinuous conduction mode?
 - e) What is the effect of frequency ratio on the relative harmonic content in a Sinusoidal PWM Converter?
 - f) What is the limiting value of modulation index to obtain circular trajectory in case of space vector PWM?
 - g) What is the maximum line voltage you will get at the output of 3 phase Voltage Source Inverter controlled by Sin PWM technique, if its input dc link voltage is derived from the 3 phase 400 V (line to line), 50 Hz supply through a 3 phase diode bridge rectifier and a dc link filter capacitor?
 - h) What is soft switched inverter ?
 - i) What are the merits of using high frequency transformers in SMPS?
 - j) Give the functional block diagram of active harmonic filter.
- Q2 a) What are the advantages and disadvantages of a Cuk converter? Explain with the help of circuit diagram, (4)**

- b) A push-pull converter is switched at 50 kHz with a duty cycle of 0.4. It is supplying a 48W load. The turn ratio of the centre-tapped transformer is 5. The input to the push-pull converter is 12V dc. The output inductor current ripple is 10% of the load current. (6)
- What is the output voltage?
 - What is the peak current through the primary switch?
 - What is the voltage developed across the primary switch when it is OFF?
- Q3** a) Explain the control requirement for SMPS. Discuss with block diagram the PWM controller used for Switched Mode Power Supply. (5)
- b) A forward converter is switched at 50 kHz with a duty cycle of 0.3. It is supplying a 50 W load at an output voltage of 5 V. The input to the forward converter is derived from the 230 v ac mains by using a capacitor input filter rectifier. Find out the turns ratio of the transformer. (5)
- Q4** a) Explain the principle of Selected Harmonic Elimination PWM. Discuss harmonic elimination method with multiple notches giving suitable block diagram? (5)
- b) Determine the number of notches and the notch angles of a multiple notch harmonic elimination PWM pattern such that the 5th and 7th harmonics are eliminated. (5)
- Q5** a) Explain how the gating signals are generated in three phase SPWM. What are the disadvantages of over modulation in such control scheme? (5)
- b) Explain the operation of a Resonant DC link inverter with relevant circuit diagrams and waveforms. (5)
- Q6** a) Give the sequencing of the inverter states such that the inverter switching frequency is half the space-vector carrier frequency in case of Space Vector PWM control of Voltage Source Inverter (VSI). (5)
- b) Explain the working of a forced commutated inverter with relevant circuit diagram and waveforms. (5)
- Q7** a) With block diagram, explain the control of HVDC converters showing the rectifier and inverter control characteristics in the V_d-I_d plane. (6)
- b) What are the issues of interconnection of renewable energy sources to the utility grid? (4)
- Q8** **Write short answer on any TWO:** (5 x 2)
- Load commutated inverter.
 - Three level flying capacitor type inverter
 - Sigma delta modulation
 - Matrix converter