Registration No: | | | | | | | | | | |

Total Number of Pages: 02 **M.TECH**

P2PDCC 01

2nd Semester Regular Examination 2016-17
Advanced Power Converter
BRANCH: ELECTRICAL AND ELECTRONIC ENGG, POWER ELECTRONIC, POWER ELECTRONIC & DRIVES, POWER ELECTRO AND ELECTRICAL DRIVES, POWER ELECTRO AND POWER SYSTEMS

Time: 3 Hours

Max Marks: 100

Q.CODE: Z346

Answer Question No.1 which is compulsory and any FOUR from the rest.

The figures in the right hand margin indicate marks.

Q1 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) Why is dead time necessary in case of Voltage Source Inverter (VSI)? Give its effect on the performance of VSI.

b) 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?

c) What is the limiting value of modulation index to obtain circular trajectory in case of space vector PWM?

d) What is the maximum duty cycle in a Forward Converter with primary and demagnetizing winding having nos. of turns in the ratio 1:3?

e) How many separate dc sources will be required for getting 9 levels voltage output in case of cascaded H bridge 3 phase MLI?

f) What are the advantages of Switched Mode Power Supply (SMPS) over Linear power supply?

g) What is the advantage of Flying Capacitor type Multi Level Inverter over Diode Clamped type?

h) Find maximum voltage stress of the switch in the primary winding and diode in the tertiary winding if the converter-transformer has 10 primary turns and 15 tertiary turns and the maximum input dc voltage is 300 volts for a forward converter.

i) A fly-back converter has primary to secondary turns ratio of 15:1. The input voltage is constant at 200 V and the output voltage is maintained at 18 V. What should be the snubber capacitor voltage under steady state?

j) What is the advantages of soft switched inverter over hard switched inverter?

Q2 **a)** Explain the principle of operation of single phase capacitor commutated Current Source Inverter (CSI) with relevant block diagram and waveforms. **(10)**

b) Explain the principle of operation of three phase Switched Mode Rectifier with relevant circuit diagram and waveforms **(10)**

Q3 **a)** Explain the principle of operation of variable band Hysteresis Current control PWM Voltage Source Inverter with relevant block diagram and waveforms. **(10)**

b) Explain the principle of operation of minimum ripple current PWM giving the control strategy and relevant waveforms. **(10)**

Q4 **a)** Explain the principle of operation of Flying Capacitor type 5 Level Inverter showing the relevant circuit diagram and switching control strategy. **(10)**

b) Explain the principle of operation of Space Vector Modulated three phase Voltage Source Inverter (VSI) with relevant space vector diagram. Give the sequencing of the inverter states such that the inverter switching frequency is half the space-vector carrier frequency. **(10)**

Q5 **a)** Explain the operation of buck-boost converter with relevant circuit diagram giving the inductor current and the switch waveforms. Derive the input output relationship for this converter operating in discontinuous mode. **(10)**

b) An R-L load is connected to a 250V,400 Hz buck converter. The average load current is 80A. The load resistance is 0.5Ω. Find the minimum value of the inductance to limit the maximum ripple of the inductor current to 10% of average load current. Also find the inductance for the worst case ripple condition. **(10)**

Q6 **a)** Draw the circuit diagram of a practical flyback dc-dc converter and explain the operation of this converter illustrating the function of each component used. **(10)**

b) A flyback converter operates in the discontinuous mode with an input voltage of 300V and a turn ratio of 10:1 at a frequency of 50 kHz. The output voltage is 30 V and the maximum output current is 1A. **(10)**

Calculate (a) the peak input current
(b) The transformer stored energy
(c) the inductance.

Q7 **a)** Explain the operation of Load Resonant converter with relevant circuit diagram and waveforms **(10)**

b) Explain the working of high frequency link integral half cycle converter with suitable circuit diagram and relevant waveforms. What is the advantage of using high frequency link in this converter? **(10)**