Hall Ticket Number:

Code No. : 7133

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
M.E. (EEE: CBCS) I-Semester Main Examinations, Jan./Feb.-2017
(Power Systems & Power Electronics)
Power Electronic Converters

Time: 3 hours   Max. Marks: **70**

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Explain the functions of a freewheeling diode.

2. Explain the current and voltage wave forms obtained by applying DC voltage to an RL circuit in series with a diode.

3. Draw the circuit diagram of a single phase bridge rectifier and draw the load voltage and current waveforms.

4. Draw the circuit diagram of single phase half-wave controlled rectifier with R-L load and obtain the expression for average load voltage.

5. Explain the principles of step down operation in a DC-DC converter.

6. Draw and illustrate mode 1 and mode 2 operation of a boost converter of continuous conduction with suitable waveforms.

7. Explain the principle of sinusoidal pulse width modulation.

8. Explain various methods of voltage control in a single phase inverter.

9. Summarize the principle of operation of a voltage regulator with a real time application.

10. Explain the principle of AC voltage controller using PWM.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) Derive an expression for current in a circuit with series R, L components in series with a diode when the switch is closed at $t = 0$.

    b) Analyze the operation of a half bridge circuit shown in fig.1 and draw the load voltage and current waveforms for the following cases.
       i)   Resistive load   ii) inductive load
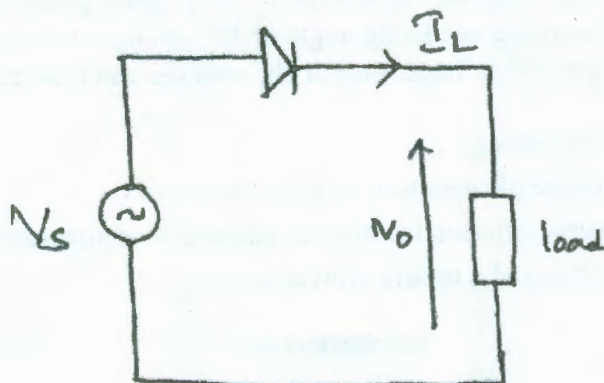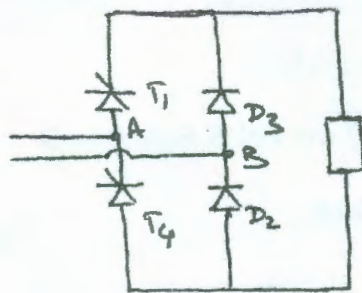   iii) RL load with freewheeling diode   iv) RLE load
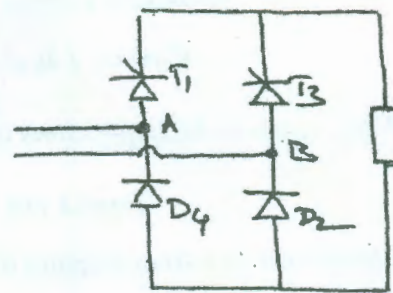

Fig. 1

12. a) Two half controlled bridge rectifier circuits are shown in case 1 & case 2, compare and analyze the principle of operation of these circuits with suitable waveforms and also illustrate the advantages and disadvantages of each rectifier.

Case - 1   Case - 2

b) For the above circuits shown in case 1 & case 2, obtain the expressions for load voltage, current and power factor of the converter.

13. a) Explain with a circuit diagram the operation of a step up converter with R load and derive an expression for current in the inductor   (i) when the switch is closed   and   (ii) when the switch is open.

b) In a step up converter input DC voltage is 10 V, switching frequency is 1 kHz, load resistor is 5 ohms, inductor is 6.5 mH, duty cycle is 50 %. Find the current in the inductor (i) when the switch is closed   and   (ii) when the switch is open.

14. a) Draw the circuit diagram of single phase bridge inverter and explain its principle and define various performance parameters.

b) A single phase half bridge inverter has a resistive load R = 2.4 ohms and the DC input voltage is 48 V. Determine the fundamental RMS output voltage, output power, average and peak currents of the mosfets, and the total harmonic distortion.

15. a) Draw the circuit diagram of a phase controlled single phase bidirectional AC voltage regulator and derive expression for output voltage.

b) Draw and analyze the principle of operation of a three phase AC voltage regulator feeding a star connected load with waveforms showing firing pulses, phase voltages and phase currents.

16. a) For a DC supply charging RL circuit through a diode, derive the expression and show the waveforms of the charging current load voltage.

b) Draw and explain the principle of operation of a three phase fully controlled bridge converter (rectifier) working at a firing angle of 30° and operating with R-L load, also draw the waveforms of input AC voltage, output DC voltage and load current.

17. Answer any *two* of the following:

a) Explain the principle of operation of a Cuk converter.

b) Describe various modulation techniques applicable to inverters.

c) Describe the function of a matrix converter.

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