

**6E3112**

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**6E3112**

**B. Tech. Vth Semester (Main/Back) Examination, June - 2010**  
**Electrical Engineering**  
**6EE4 Advanced Power Electronics**  
**(Common for 6EE4 & 6EX4)**

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

**Instructions to Candidates:**

Attempt overall **five questions** selecting **one question** from **each unit**. All questions carry **equal marks**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

**Unit - I**

1. a) Explain the principle of ON-OFF control for single phase full wave controller. (8)
- b) An ac voltage controller shown in figure (1) has a resistive load  $R=05\ \Omega$  and rms input voltage is  $V_s = 120\ \text{V}$ , 60 Hz. The thyristors switch is on for  $n=125$  cycles and is off for  $m=75$  cycles. Determine (8)
- the rms output voltage  $V_o$  and
  - the input power factor (PF)

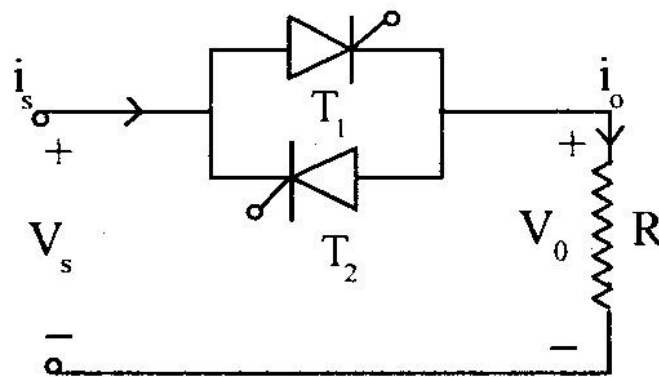


Figure - 1

2. a) For a single phase full wave controller with RL load draw the wave forms of output voltage, output current and voltage across thyristors. Determine the expression for rms output voltage. (8)

- b) The single phase full wave controller shown in figure (2) supplies an RL load. The input voltage is  $V_s = 120$  V (rms) at 60 Hz. The load is such that  $L = 5$  mH and  $R = 5 \Omega$ . The delay angles for thyristors  $T_1$  and  $T_2$  are equal, where  $\alpha = \pi/3$ . Determine (8)
- the conduction angle of thyristor  $T_1$   $\delta$  and
  - the rms output voltage  $V_o$ .

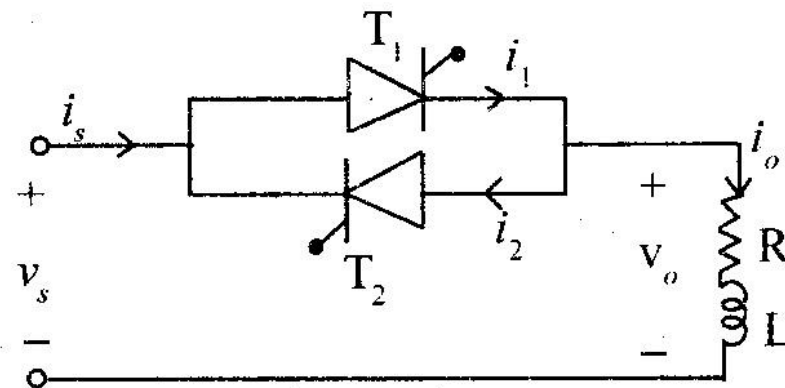


Figure - 2

### Unit - II

- Explain the operation of three phase bridge inverters for  $180^\circ$  conduction and star connected load. (8)
  - The three bridge phase inverter has a star connected load of  $R = 5 \Omega$  and  $L = 23$  mH. The inverter frequency is  $f_o = 60$  Hz and the dc input voltage is  $V_s = 220$  V. Determine (i) the rms line voltage  $V_L$  and (ii) the rms line voltage  $V_{L1}^s$  at the fundamental frequency. (8)
- Explain the sinusoidal pulse width modulation technique for voltage control of single phase inverters. (8)
  - Describe the operation of three phase current source inverter for star connected load. (8)

### Unit - III

- Describe the basic principle of working of a single phase to single phase cycloconverter for both continuous and discontinuous conduction for a bridge type configuration. Mark the conduction of various thyristors. (8)
  - Draw and explain the control circuit block diagram for a cycloconverter with non-circulating current mode. (8)
- Show that the fundamental RMS value of per phase output voltage of low frequency for an m-pulse cycloconverter is given by

$$E_{or} = E_{ph} \left( \frac{m}{\pi} \right) \text{Sin} \left( \frac{m}{\pi} \right) \quad (8)$$

- b) Describe the control scheme for a cycloconverter using voltage - sensing principle of converter group selection. Also draw and discuss the various voltage waveforms of a control scheme. (8)

**Unit - IV**

7. a) Explain the Half bridge converter operation for continuous mode. (8)  
b) Describe the configuration of half bridge and full bridge resonant DC power supplies. (8)
8. a) Explain the operation of forward converter for continuous mode. (8)  
b) Explain the bidirectional power supply operation and working. (8)

**Unit - V**

9. a) Explain the working of switched mode ac. power supply. (8)  
b) Explain the voltage mode control of forward converter. (8)
10. a) Explain current mode controlled flyback regulator. (8)  
b) Explain the operation of bidirectional ac power supply. (8)
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