

Register Number:

Question Paper Code:

**KARPAGAM COLLEGE OF ENGINEERING**

(Autonomous)

Coimbatore – 32

**MODEL QUESTION PAPER  
END SEMESTER EXAMINATION APRIL-2016**

**B.E (EEE) - Semester VI**

**12E605 – POWER ELECTRONICS**

**Time: 3 hrs**

**Max. Marks: 100**

**Answer ALL questions**

**PART- A**

**(10x2 = 20 marks)**

1. State the conditions to be satisfied to turn on and turn off of an SCR.
2. List any two advantages and disadvantages of TRIAC?
3. When rectifiers will operate in inversion mode?
4. Write the expression for average output voltage waveform of three phase fully controlled converter fed RL load.
5. Define Time Ratio Control and write its types.
6. Determine the output voltage of step up chopper with 20% duty cycle fed from an 80V dc source?
7. Differentiate VSI and CSI.
8. Mention the control range of firing angle in AC voltage controller with RL load.
9. Give the two types of selenium voltage limiter.
10. State the necessity of snubber circuit.

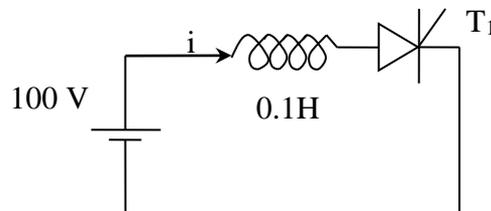
**PART - B**

**(5x16 = 80 marks)**

- 11.a
- i) Explain the structure and VI characteristics of SCR with suitable diagram. (8)
  - ii) With neat diagram brief out the switching characteristics of MOSFET. (4)
  - iii) Compare SCR and TRIAC. (4)

**(OR)**

- b
- i) If the latching current in the circuit shown in fig (i). is 4mA, obtain the minimum width of the gating pulse required to properly turn-on the SCR. (4)

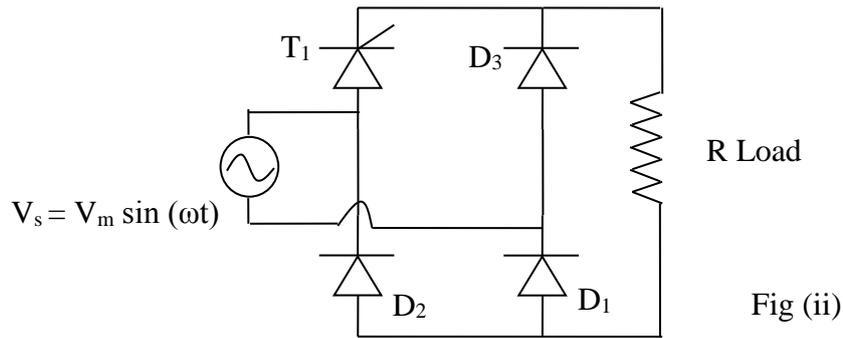


**Fig (i)**

- ii) Brief out the switching characteristics of IGBT with neat sketch (6)
  - iii) Draw and explain the Resistance firing circuit of the thyristor. (6)
- 12.a
- i) Explain with necessary waveforms the operation of single phase half controlled thyristor bridge converter with RLE load. (6)
  - ii) Explain the operation of single phase fully controlled thyristor bridge rectifier with RL Load (6)
  - iii) Derive an expression for average dc load voltage, load current, RMS voltage and RMS current of single phase full-converter with RL load (4)

**(OR)**

- b i) A single phase controlled rectifier bridge consists of one SCR and three diodes as shown in fig (ii). Sketch the output voltage waveform for a firing angle of  $\alpha$  for the SCR and hence obtain an expression for the average output voltage. (6)



- ii) Discuss the operation of three phase fully controlled converter with R load with necessary diagrams. (6)
- iii) Draw and explain the single phase dual converter with suitable diagram and waveforms. (4)
- 13.a i) Discuss the principle of operation of a step-up chopper with neat diagram and derive its output voltage. (7)
- ii) In a type A chopper, the input voltage is 230v. The load resistance is 10ohm and there is a voltage drop of 2v across the chopic thyristor when it is ON for a duty ratio of 0.4. Calculate the average and RMS value of output voltage. Also find the chopper efficiency (6)
- iii) What is Pulse Width Modulation? Why is the Frequency Modulation not suitable for choppers? (3)
- (OR)**
- b i) Draw the circuit diagram of buck converter. Derive the output voltage equation, peak to peak ripple current of inductor, peak to peak ripple voltage of capacitor. (10)
- ii) List any four advantages and applications of DC chopper. (2)
- iii) A boost regulator has an input voltage of 10V. The average output voltage is 15V and the average load current is 0.4A. The chopping frequency is 20kHz. Assume the value of inductor is 100μH. Calculate the duty ratio, ripple current of inductor (4)
- 14.a i) With neat diagram and necessary waveforms, explain the operation of three phase bridge inverter with 120° mode of conduction (10)
- ii) Derive the expression for RMS output voltage of a full wave A.C Voltage controller feeding R load. (4)
- iii) Write any four applications of a series inverter. (2)
- (OR)**
- b i) Discuss the operation of single phase to single phase step up cycloconverter (7)
- ii) Explain different PWM techniques in detail. (5)
- iii) A single phase half bridge inverter has a resistive load  $R=4\text{ohm}$  and the dc input voltage  $V_s=50\text{V}$ . Calculate
- the RMS output voltage at the fundamental frequency  $V_1$
  - the output power  $P_0$
  - the average and peak current of each thyristor
- (4)

- 15.a i) Why heat sink and cooling arrangements are employed for power switching devices? (3)
- ii) Explain clearly the overvoltage protection in forced commutated circuits. (10)
- iii) How an over current can occur in thyristor circuits? (3)

**(OR)**

- b i) Draw the thermal equivalent circuit for an SCR and discuss the various parameters involved in it. (8)
- ii) How is the effect of radio interference phenomenon minimized? (2)
- iii) Explain the various thyristor mounting techniques in detail (6)

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**Staff In-charge**

**H.O.D / EEE**