

# CBCS SCHEME

15MT63

USN

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020

## Power Electronics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- Define power electronics. Explain the relationship of power electronics to power, electronics and control. Give any three applications of power electronics. (08 Marks)
  - Explain control characteristics of i) GTO ii) MCT iii) SCR iv) SITH. With the help of waveforms and circuit diagrams. (08 Marks)

OR

- What is power converter? List different types of power converters and mention their functions. (08 Marks)
  - With necessary waveforms, explain the switching characteristics of IGBT. (08 Marks)

### Module-2

- Sketch the static VI characteristics of an SCR and explain :
    - Latching current
    - Break over voltage
    - Holding current. (08 Marks)
  - The input voltage to circuit shown below Fig.Q3(b) is  $V_s = 200V$  a load resistance of  $R = 10\Omega$  and a load inductance of  $L = 50\mu H$ . If the damping ratio is 0.7 and discharging current of capacitor is 5A. Determine : i) Values of  $R_s$  and  $C_s$  ii) Maximum  $dv/dt$ . (08 Marks)

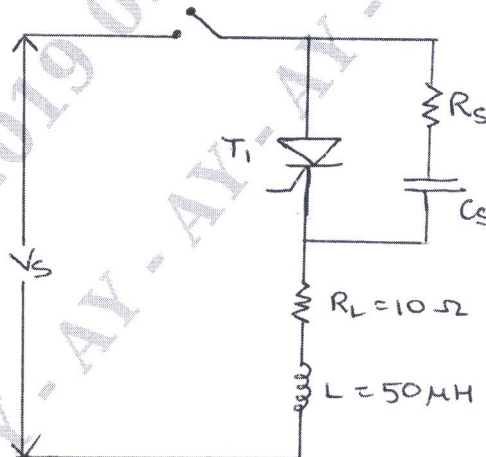


Fig.3(b)

OR

- Define commutation. Compare natural and forced commutation. (08 Marks)
  - Explain UJT relaxation with the help of circuit diagram and show :  $T = RC \log_e \left[ \frac{V}{V_{1-n}} \right]$ . (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

**Module-3**

- 5 a. An AC voltage controller has a resistive load of  $10\Omega$  and rms input voltage 120V, 60Hz. The thyristor switch is ON for  $n = 25$  cycles and OFF for  $m = 75$  cycles. Determine :
- RMS output voltage  $V_0$
  - Input power factor
  - The average and rms current of thyristors. (08 Marks)
- b. With neat circuit diagram and waveforms explain operation of single phase AC voltage controller. (08 Marks)

**OR**

- 6 a. What are the advantages of circulating current-mode dual converter? (04 Marks)
- b. Mention applications of AC voltage controller. (04 Marks)
- c. Explain the operation of single phase semi-converter with circuit and waveforms. (08 Marks)

**Module-4**

- 7 a. Explain the principle of operation of a step-up chopper. (08 Marks)
- b. A DC chopper has an input voltage of 200V and a load resistance of  $8\Omega$ . The voltage drop across the thyristor is 2V and chopper frequency is 800Hz. Duty cycle is 0.4. Find.
- Average output voltage
  - RMS output voltage
  - Chopper efficiency. (08 Marks)

**OR**

- 8 a. With neat diagram, explain four quadrant operation of a chopper. (08 Marks)
- b. For a type A chopper circuit,  $E_{dc} = 220V$ ,  $f = 500Hz$ . Duty cycle  $K = 0.3$  and load  $R = 1\Omega$ ,  $L = 3mH$  and  $E = 23$  volts. Compare the following quantities.  
Check whether the conversion is continuous or not  
Average output current  
 $I_{max}$  and  $I_{min}$ . (08 Marks)

**Module-5**

- 9 a. Explain the principle of single phase half bridge inverter with relevant circuit diagram and waveforms. (10 Marks)
- b. Write a note on performance parameters of a inverter.
- Harmonic factor of  $n^{th}$  harmonic
  - Total harmonic distortion (THD)
  - Distortion factor (DF). (06 Marks)

**OR**

- 10 a. Compare voltage source inverter and current source inverter. (06 Marks)
- b. With neat circuit diagram, explain the operation of a three phase transistorized inverter in  $180^\circ$  conduction mode with star connected R-load. (10 Marks)

\*\*\*\*\*