

# CBCS SCHEME

USN

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

15MT63

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019

## Power Electronics

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- Give the definition of power electronics. Explain the relationship of power electronics to power, electronics and control. Mention any two applications of power electronics. (08 Marks)
  - Explain control characteristics of GTO, MCT, SITH and IGBT with the help of waveforms and circuit diagrams. (08 Marks)

OR

- Mention and explain the different types of power electronic converter systems. Draw their input and output characteristics. (08 Marks)
  - With necessary sketches explain, briefly the switching characteristics of IGBT. (08 Marks)

### Module-2

- Using two transistor models, explain how a small gate current can turn on a SCR. (08 Marks)
  - With a circuit diagram and waveforms explain RC-Half wave triggering circuit. (04 Marks)
  - A thyristor is supplied from 230 V, 50 Hz mains. If the conduction angle  $\beta = 120^\circ$ , determine the voltage at which the thyristor is triggered. (04 Marks)

OR

- With relevant circuit diagram and waveforms, explain the UJT relaxation oscillator. (06 Marks)
  - Explain natural commutation and forced commutation with circuit and waveforms. (06 Marks)
  - The input voltage to circuit shown below is  $V_s = 200$  V with a load resistance of  $R = 10 \Omega$  and load inductance of  $L = 50 \mu\text{H}$ . If damping ratio is  $\xi = 0.7$  and  $i = 5$  A.

Determine (i) The value of  $R_s$  and  $C_s$ .

(ii) Maximum  $dv/dt$

(04 Marks)

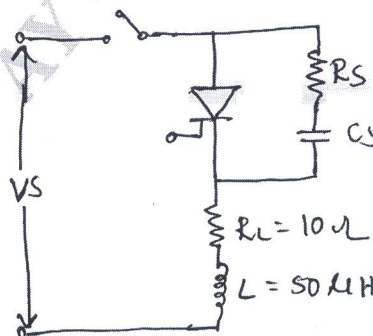


Fig. Q4 (c)

**Module-3**

- 5 a. What is an ac voltage controller? With the help of circuit diagram and waveforms. Explain the principle of phase control. (08 Marks)
- b. An AC voltage controller has a resistive load of  $10\ \Omega$  and rms input voltage  $120\ \text{V}$ ,  $60\ \text{Hz}$ . 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. (08 Marks)

OR

- 6 a. Explain single-phase semiconverter with circuit, waveform and relevant expressions. (08 Marks)
- b. Explain Three-phase full-wave converter with circuit, waveforms and expression for rms output voltage. (08 Marks)

**Module-4**

- 7 a. What is chopper? Explain the principle of step-up chopper with relevant equations. (08 Marks)
- b. A chopper is feeding an RL load as shown in Fig. Q7 (b). The chopper frequency is  $1\ \text{kHz}$  and duty cycle  $K = 0.5$ . Calculate
- The minimum instantaneous load current  $I_1$ .
  - The peak instantaneous load current  $I_2$
  - The average value of load current  $I_B$ .
  - The rms load current  $I_0$ . (08 Marks)

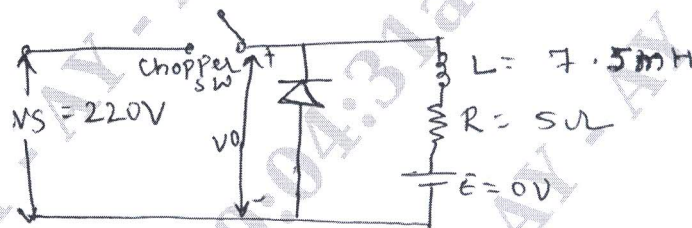


Fig. Q7 (b)

OR

- 8 a. Give the classification of chopper. Explain briefly each one of them. (08 Marks)
- b. Explain the working principle of IMPULSE commuted thyristor chopper with necessary circuit diagram and waveforms. (08 Marks)

**Module-5**

- 9 a. What is an inverter? Explain the principle of operation of single-phase half-bridge inverter. (08 Marks)
- b. Explain three-phase inverters with relevant circuit diagram and waveforms. (08 Marks)

OR

- 10 a. Explain single pulse-width modulation for voltage control of single-phase inverter. (08 Marks)
- b. Explain sinusoidal pulse width modulation with waveforms. (08 Marks)

\*\*\*\*\*