U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 16EC7DCPEL **Max Marks: 100**
Course: Power Electronics **Date: 04.03.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) What is power electronics? Mention some of its industrial applications. **04**

b) List different types of power converters and mention the nature of input and output power in each case. **08**

c) Write the symbol and v-i characteristics of the following devices (i) SCR (ii) IGBT (iii) TRIAC. **06**

d) Compare TRIAC and DIAC **02**

UNIT - II

2 a) With a neat sketch explain two transistor model of SCR and derive an expression for the anode current in terms of transistor parameters. **08**

b) Explain the various types of triggering methods of SCR. Which is most commonly used. **08**

c) The latching current of a Thyristor shown in Fig Q2(c) is 50 mA. The duration of the firing pulse is50 μsec. Will the Thyrisor get fired? **04**

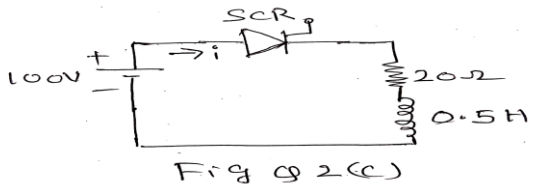

Fig Q 2(c)

OR

3 a) With a neat circuit and waveforms explain the Resistance – Capacitance (RC) full wave trigger circuit. **06**

b) Design UJT relaxation oscillator for triggering SCR with Vs = 30 V. The parameters of UJT are $\eta = 0.51$ $I_P = 10\ \mu A$ $V_V = 3.5\ V$ $I_V = 10\ mA$ & The frequency of oscillation is 60 Hz. The width of triggering pulse is 50 μsec. Assume V_D =Diode voltage drop =0.5 V **08**

c) What is the necessity for protecting SCR's against di/dt and dv/dt ? Explain how SCR's are protected against these two. **06**

UNIT - III

4 a) With a neat circuit diagram, associated waveforms explain the operation of a single phase full converter & show that the converter can operate in two quadrants by deriving the relevant expression. Assume R-L load with ripple free continuous load current. **08**

b) A single phase semi converter feeds power to a resistive load of R = 10 Ω from 230 V, 50 Hz supply. If the average output voltage is 75% of the maximum possible average output voltage determine i) firing angle ii) average & rms output currents. **05**

c) With a neat circuit diagram & associated waveforms explain the working of a single phase dual converter with circulating current mode. **07**

UNIT - IV

5 a) Explain the working of step down chopper with resistive load with a neat circuit and waveforms .Also derive the expressions for i) rms output voltage ii) Input power. **08**

b) A step down DC chopper has a resistive load of 15 Ω and the input voltage Vs= 200 V. When the chopper switch is on its voltage drop is 2.5 V. The chopper frequency is 1 kHz. if the duty cycle is 50% find (i) average output voltage (ii) rms output voltage (iii) chopper efficiency **05**

c) Explain the principle of operation of a step up chopper with circuit diagram and waveforms. Derive an expression for average output voltage. **07**

OR

6 a) What is Buck regulator? Explain its working with circuit and waveforms. Also derive the expression for average output voltage. **10**

b) A Boost regulator shown in Fig Q 6(b) has an input voltage of Vs=5 V. The average output voltage Va=15 V and the average load current Ia=0.5 A. The switching frequency is 25 kHz. If L= 150 μH and C=220 μF. determine (i) duty cycle (ii) the ripple current of inductor (iii) peak current of inductor (iv) ripple voltage of filter capacitor (v) the critical values of L and C **10**

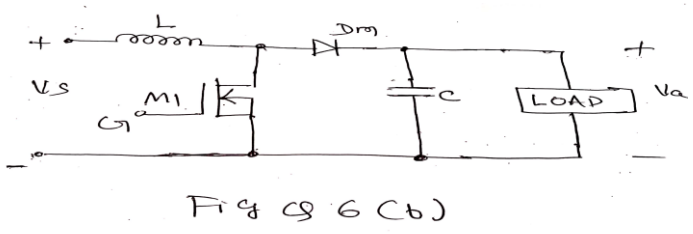

Fig Q 6 (b)

UNIT - V

7 a) Explain single phase full bridge inverter with a neat circuit and waveforms. Derive the expression for rms output voltage. **08**

b) Discuss the performance parameters of inverters. **06**

c) With a neat circuit explain the variable DC link inverter. **06**

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