

CBCS SCHEME

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18MT62

Sixth Semester B.E. Degree Examination, Jan./Feb. 2023

Power Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- Explain the control characteristics of SCR and BJT. (10 Marks)
 - Draw and explain switching characteristics of MOSFET. (10 Marks)

OR

- State the merits, limitations and area of applications of the following power switching devices IGBT. (10 Marks)
 - Explain the switching characteristics of Diode. (10 Marks)

Module-2

- Define :
 - Holding current
 - Latching current
 - Breakover voltage and indicate their values on V - I diagram. (10 Marks)
 - For the impulse commutation circuit shown, $V_S = 220V$, $C = 20\mu F$ and $R = 10\Omega$. Determine the turn off time t_{off} . Derive the formula used. Take initial voltage on capacitor, $V_C(t) = -V_S$.

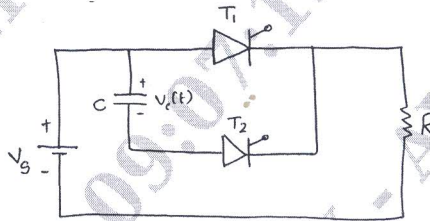


Fig.Q3(b)

(10 Marks)

OR

- With neat connection diagram and relevant waveforms, explain that UJT can be used as a relaxation oscillator. (10 Marks)
 - A complementary commutation circuit operates from a DC supply of 120V and uses $R_1 = R_2 = 10\Omega$ commutating capacitor $C = 10\mu F$ calculate :
 - The circuit turn - off time t_c
 - Peak thyristor current. (05 Marks)
 - Distinguish between natural commutation and forced commutation. (05 Marks)

Module-3

- An AC voltage controller has a resistive load of $R = 10\Omega$ and rms input voltage is $V_S = 120V$, 60Hz. The thyristor switch is on for $n = 25$ cycles and off for $m = 75$ cycles. Determine :
 - The rms output voltage
 - Input power factor
 - Average and rms current of thyristors. (10 Marks)
 - Draw the circuit of a single phase fully controlled bridge rectifiers feeding highly inductive load. Derive an equation for average load voltage. (10 Marks)

OR

- 6 a. Bring out the clear difference between half controlled and fully controlled rectifier. (10 Marks)
- b. Draw different circuit configurations of a single phase AC regulator. Explain their operation with waveforms. (10 Marks)

Module-4

- 7 a. Explain the basic principle of a step down chopper and write down the expression for :
i) Average output voltage
ii) Output power
iii) Effective input resistance in terms of the chopper cycle. (10 Marks)
- b. An SCR chopper is supplying an inductive load $R = 10\Omega$ and $L = 2H$. The DC supply to the chopper is 200V. If the chopper is operating at a frequency of 200Hz and ON/OFF time ratio of chopper is 2 : 3, calculate :
i) Max and min values of load current in one cycle of chopper operation under steady state conditions
ii) Average load current. (10 Marks)

OR

- 8 a. What is two quadrant chopper? Briefly explain and state its use. With necessary diagram explain the working of it. (10 Marks)
- b. Explain the modes of operation for an impulse commutated thyristor chopper. (10 Marks)

Module-5

- 9 a. Write short notes on :
i) Modified sinusoidal PWM
ii) Harmonic distortion in inverter. (10 Marks)
- b. With the help of circuit diagram and waveforms, explain the working of 1ϕ bridge inverter. (10 Marks)

OR

- 10 a. Explain 120° mode of 3-phase inverters with the help of waveforms. (10 Marks)
- b. State the various techniques of voltage control in inverter. Explain the sinusoidal PWM technique. (10 Marks)
