CBCS SCHEME

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17EC73

Seventh 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

1 a. Explain different types of power electronic circuits. **(10 Marks)**

b. Explain peripheral effects of power electronic components and equipment and mention how to reduce them with a neat block diagram. **(10 Marks)**

OR

2 a. List different types of power MOSFET and explain p-channel depletion type in detail. **(10 Marks)**

b. Explain the features and structure of IGBT. **(10 Marks)**

Module-2

3 a. Explain two transistor model of SCR and derive an expression for anode current in terms of transistor parameters for a thyristor. **(10 Marks)**

b. Explain static anode-cathode characteristics of SCR. **(10 Marks)**

OR

4 a. Explain gate characteristics of SCR with a neat diagram. **(10 Marks)**

b. Explain different turn-on methods of SCR. **(05 Marks)**

c. Differentiate between natural and forced commutation. **(05 Marks)**

Module-3

5 a. Explain single phase full converter with the help of circuit diagram and waveforms. **(10 Marks)**

b. The single phase dual converter is operated from a 120V, 60hz supply and the load resistance is R = 10Ω. The circulating inductance is L_r = 40mH delay angles are $\alpha_1 = 60°$ and $\alpha_2 = 120°$. Calculate the peak circulating current and the peak current of converter 1. **(10 Marks)**

OR

6 a. An on-off type ac regulator is operating with a resistive load of R = 10Ω and the rms supply v/g is 230V. The controller remains on for 40 cycles and is off for 60 cycles. Determine: i) rms load v/g ii) Input power factor. **(10 Marks)**

b. Explain the principle of phase controlled converter operation. **(10 Marks)**

Module-4

7 a. Explain buckboost regulator with neat circuit diagram and waveforms. **(10 Marks)**

b. The buck regulator has an input v/g of Vs = 12V. The required average o/p v/g is Va = 5V at R = 500Ω and the peak to peak o/p ripple v/g is 20mV. The switching frequency is 25kHz. If the peak to peak ripple current of inductor is limited to 0.8A. Determine: i) Duty cycle K ii) The filter inductance iii) The filter capacitor C and iv) Critical values of L and C. **(10 Marks)**

OR

8 a. Explain different dc converter classification. **(10 Marks)**

b. The step down dc converter has a resistive load R = 10Ω and the input voltage is Vs = 220V, when the converter switch remains on its v/g drop is u_{ch} = 2V and the chopping frequency f = 1kHz. If the duty cycle is 50%, determine: i) average output v/g va ii) rms o/p v/g vo iii) Converter efficiency. **(10 Marks)**

Module-5

9 a. Explain single phase half bridge inverter with neat circuit diagram and waveforms. **(10 Marks)**

b. The single-phase half-bridge inverter has a resistive load of R = 2.4Ω and the dc i/p v/g Vs = 48v. Determine i) the rms o/p v/g at the fundamental frequency V_{01}, ii) the output power P_0 iii) average and peak currents of each transistor iv) the peak reverse blocking voltage V_{BR} of each transistor. **(10 Marks)**

OR

10 a. Explain dc switches with neat circuit diagram. **(06 Marks)**

b. Outline various performance parameters used for inverters. **(08 Marks)**

c. Explain single phase AC switches. **(06 Marks)**

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