PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION – JAN 2023

Course Code: ECE 302

Course Name: POWER ELECTRONICS

Program   : B. Tech (ECE)

Date: 24-Jan-2023

Time: 01.00 PM – 04.00 PM

Max Marks: 100

Weightage: 50%

Instructions:

(i) Read the all questions carefully and answer accordingly.
(ii) Programmable calculators not allowed.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO mark.   **(5Qx 2M= 10M)**

1. The layers in SCR   (a) NPPN (b) PNPN (c) NPNP   (d) None of the above
(C.O.No.1) [Knowledge]

2. Overdrive factor is the ratio of (a) $I_{B(sat)}/I_B$ (b) $I_B/I_{B(sat)}$ (c) $I_{C(sat)}/I_B$ (d) None of the above
(C.O.No.1) [Knowledge]

3. Uni-directional ACVC consists of
(a) Two thyristors   (b) Two diodes (c) One thyristor and one diode (d) None of the above
(C.O.No.2) [Knowledge]

4. In step-down chopper
(a) Output voltage is less than input voltage (b) Output voltage is greater than input voltage
(c) Output voltage is equal to input voltage   (d) None of the above
(C.O.No.3) [Comprehension]

5. The total number of MOSFETs used in half bridge inverter (a) Four (b) Two (c) Eight (d) Six
(C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries FIFTEEN marks.   **(2Qx15M=30M)**

6. In the circuit of single phase unidirectional AC voltage controller, one SCR and one diode connected in anti-parallel configuration. Can you modify the circuit to control power flow in both positive half cycle and negative half cycle using one SCR?   (C.O.No.2) [Comprehension]

7. As you know class E chopper can be operated in all the modes that means output voltage and output current both could be positive or output voltage is positive but output current is negative or output voltage is negative but output current is positive or output voltage and output current both could be negative. Give the necessary circuit diagram and relevant waveforms to operate class E chopper as class B chopper and class D chopper?   (C.O.No.3) [Knowledge]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TWENTY marks.   **(3Qx20M=60M)**

8. A step down chopper has an input voltage of 24V and an output voltage of 10V. if the non-conducting time of the chopper is $10\mu s$. Calculate the pulse width. In case the pulse width is divided into two equal parts for constant frequency operation. Find the new output voltage.

    (C.O.No.3)

    [Application]

9. The full wave controlled rectifier has a purely resistive load of *R* and the delay angle is $\alpha = \pi/3$. Determine (i) η (ii) *FF* (iii) *RF* (iv) *TUF* (v) *PIV*   (C.O.No.1) [Application]

10. A transistor switch used to connect a 12V dc supply across a relay coil which has a dc resistance of 100 Ω, β=40 to 100, $V_{CE(sat)}$=0.3V, $V_{BE(sat)}$=0.8V. An input pulse of 0 to 5V with duty cycle 25% is applied to the base through R_B to turn on the transistor. Calculate (i) R_B to obtain an ODF of 10 (ii) $I_{C(sat)}$ (iii) Power loss in the transistor that occur during the saturation state

    (C.O.No.2) [Application]