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**Presidency University**

**Bengaluru**

 **SCHOOL OF ENGINEERING**

**MAKEUP EXAMINATION-JULY2024**

**Date**: 01 July 2024

**Time**: 9.30 AM to12.30 PM

**Max Marks**: 80

**Weightage**: 40 %

**Semester:** 6th (DE – II)

**Course Code**: ECE 302

**Course Name**: POWER ELECTRONICS

**Program** : B.Tech

 **Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. Scientific and Non-programmable calculators are permitted.

**Part A [Memory Recall Questions]**

**Answer any Ten Questions. Each Question carries 02 marks. (10Qx 2M= 20M)**

1. What are the various power semiconductor devices? (C.O.No.1) [Knowledge]

2. Mention various types of power converters? (C.O.No.1) [Knowledge]

3. Why do you need Snubber circuit in? (C.O.No.1) [Knowledge]

4. What is chopper? (C.O.No.4) [Knowledge]

5. What is the range of output voltage in step-down chopper? (C.O.No.3) [Knowledge]

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6. Give the classification of control rectifiers? (C.O.No.2) [Knowledge]

7. What is the advantage of single phase semiconverter over full converter?

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

8. Write the output voltage equation for 1-Ф full bridge inverter? (C.O.No.4) [Knowledge]

9. Specify the reverse blocking voltage across each device in half bridge inverter?

 (C.O.No.4) [Knowledge]

10. Mention the applications of AC voltage controller? (C.O.No.2) [Knowledge]

11. The circuit of Buck converter or step-down chopper is used to convert fixed DC voltage to variable DC voltage by controlling duty cycle (K) between 0 to 1. Can you suggest a suitable method to find effective input resistance of the chopper in terms of K, considering practical (voltage across the switch when it is ON is Vch) chopper? (C.O.No.3) [Knowledge]

12. Inverter is a type of power electronic converter that converts fixed DC power to a variable AC power. In the circuit of full bridge voltage source inverter, why GTO devices are not preferred in place of MOSFETs or IGBTs? (C.O.No.4) [Knowledge]

**Part B [Thought Provoking Questions]**

**Answer any Five Questions. Each Question carries 06 marks. (5Qx6M=30M)**

11. If two bulbs of 40 W and 100 W are connected in series across a 230V AC power supply. Specify which bulb glow brighter and why? (C.O.No.2) [Comprehension]

12. Explain how 1-Ф full bridge inverter can be used as step down chopper?

 (C.O.No.4) [Comprehension]

13. How do you generate three pulses per half cycle in single pulse width modulation?

 (C.O.No.4) [Comprehension]

14. Explain how power flow can be controlled in both direction in chopper?

 (C.O.No.3) [Knowledge]

15. In power electronics, why do you use isolator? Draw the circuit diagram?

 (C.O.No.1) [Knowledge]

16. According to theory, a class-E chopper can be operated in all four quadrants, which include the first quadrant for rotating a dc motor in forward direction, the second for rotating a dc motor in forward regenerative breaking, the third for rotating a dc motor in reverse direction, and the fourth for rotating a dc motor in reverse regenerative breaking. Could you describe how the class-E chopper can be utilised to achieve the required equivalent circuit and related waveforms for the class-C chopper (Bidirectional DC/DC converter) to operate? (C.O.No.3) [Comprehension]

17. In order to run a single phase full bridge inverter in square wave mode, 50% duty cycle switching pulses are required to activate the diagonal switches (Q1 and Q2), and complementary switching pulses are required to activate the Q3 and Q4 switches. The basic component's rms value is highest when the inverter output produces a square wave, but it still contains all of the hormones. Create a suitable plan for producing single pulse width modulated switching pulses to turn on the inverter. This will allow you to remove some harmonics and enhance the inverter's harmonic profile. Create an expression for the multiple pulse width modulation's rms output voltage. (C.O.No.4) [Comprehension]

**Part C [Problem Solving Questions]**

**Answer any Three Questions. Each Question carries 10 marks. (3Qx10M=30M)**

16. A step up chopper has an input voltage of 48V and an output voltage of 36V. if the non-conducting time of the chopper is 10$μs$. 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) [Comprehension]

17. The half wave controlled rectifier has a purely resistive load of *R* and the delay angle is $α=π/2$. Determine (i) $η$ (ii) *FF* (iii) *RF* (iv) *TUF* (v) *PIV* (C.O.No.1) [Comprehension]

18. The 1- Ф half bridge inverter has a resistive load of 5Ω and the DC input voltage is 36V. Calculate (i) RMS output voltage (ii) Fundamental component of the output voltage (iii) First five harmonics of the output voltage (iv) Fundamental power consumed by the load (v) RMS power consumed by the load. (C.O.No.4) [Comprehension]

19. The input voltage of Vs = 120V, 60 Hz powers a resistive load of 5 ohm in the single phase full wave AC voltage controller. Determining (a) the rms output voltage (b) the input power factor (c) the average current of the T1 thyristor (d) the rms current of the T1 thyristor, and if the delay angles of the thyristors T1 and T2 alpha1 = alpha 2 = alpha = (2\*pi)/3?

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