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Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **ET255U - Power Electronics**

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Maximum Marks : **60**   Duration : **3 Hrs**

Edit   Print   View Answer Key   Close   **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. All questions are compulsory. Do not write anything on the question paper.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Additional supplements will not be provided.
4. Assume suitable additional data; if required.
5. Use of a logarithmic table, drawing instruments and non programmable calculators is allowed.
6. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
7. Figures to the right indicate full marks

1)   Solve any two sub-questions

a. A SCR is used to control the power in resistive load. The supply is 400 V DC and SCR is in series with di/dt inductor. The maximum allowable di/dt and dv/dt to the SCR are 50A/μsec and 200V/ μsec respectively. Compute the values of the di/dt inductor and snubber circuit components R_s and C_s.   [6]

b. A 1-ø half wave controlled rectifier circuit feeds power to a RL load. Discuss the operating principle and draw the waveforms for source voltage, load voltage, load current and voltage across the SCR for a given firing angle 30˚. Hence obtain the expression for average load voltage.   [6]

c. Giving the constructional details, sketch the schematic diagram and circuit symbol of an SCR. Draw static V-I characteristics along with operating modes. Also define holding and latching current.   [6]

2)   Solve any two sub-questions

a. Sketch the V-I characteristics of TRIAC and explain the switching action. What are the modes of triggering TRIAC? Which one is generally preferred?   [6]

b. A 1-ø semi-converter connected to 230V, 50Hz source is feeding a load resistance of 10Ω in series with a large inductance that makes the load current ripple free. For a firing angle of 45˚. Calculate the input and output performance parameter of this converter.   [6]

c. Describe the working of 3-ø half controlled rectifier with resitive load with delay angle of π/6 radians and sketch the waveforms associated with it. Hence drive the expression for average output voltage.   [6]

3)   Solve any two sub-questions

a. A buck converter is connected to a dc source of 230V, load resistance of 10 Ω. Take a voltage drop of 2V across the chopper when it is ON. for a duty cycle of 0.4. Calculate i) average and rms values of output voltage and ii) chopper efficiency.   [6]

b. What is the operating principle of 1-ø full bridge voltage fed inverter with RL loads? Sketch the voltage and current waveforms.   [6]

c. With the help of a circuit diagram, discuss the working of a step up/down chopper? Also derive its output equation.   [6]

4)   Solve all sub-questions

a. For a 1-ø full ac voltage regulator feeding a resistive load, draw the waveforms of source voltage, gating signals, output voltage, voltage across SCR. Brief it's working with reference to the waveforms drawn.   [6]

b. What is cyclo-converter? What is the operating principle of 1-ø step-up mid-point cyclo-converter? Enumerate some of its industrial applications.   [6]

5)   Solve all sub-questions

a. What is a PWM modulated inverter? How will you operate a 1-ø half bridge inverter using sinusoidal PWM technique?   [6]

b. Brief the principle operation of UPS and configurations of the same.   [6]

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