

Code No: R1631025

R16**SET - 1****III B. Tech I Semester Supplementary Examinations, May - 2019****POWER ELECTRONICS**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. Answer **ALL** the question in **Part-A**3. Answer any **FOUR** Questions from **Part-B**

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**PART -A**

1. a) Why turn ON time is less than turn OFF time in SCR? [2M]
- b) What is active power input of single phase full converter at  $\alpha = 60^\circ$ ? [2M]
- c) Give the conduction periods of diodes in in three phase semi converter for 60 Hz frequency with  $\alpha = 30^\circ$ ? [2M]
- d) What is the principle operation of forward converter in CCM? [3M]
- e) What is the mechanism provided to prevent shoot through fault in VSI? [3M]
- f) Draw the waveforms of single phase half wave ac voltage controller with RL load with  $\alpha = 30^\circ$ ? [2M]

**PART -B**

2. a) Describe the switching characteristics of power MOSFET and IGBT and compare them? [7M]
- b) Draw the gate characteristics of a SCR and explain its importance in the design of gate drive circuit? [7M]
3. a) Explain the operation of single phase full-wave controlled rectifier using center tapped transformer with R-L load under discontinuous mode of operation? Draw the waveforms of output voltage, voltage across SCR and average load current for  $\alpha = 60^\circ$ ? [7M]
- b) A single phase half wave controlled rectifier without a freewheeling diode is connected to R load of  $10\ \Omega$ . The converter is supplied from 230 V, 50 Hz ac supply (i) determine average and rms load voltage (ii) if inductive load is added to the resistive load such that  $R = 10\ \Omega$  and  $L = 6\text{ mH}$ , calculate new values of average and rms load voltages? Assume  $\alpha = 30^\circ$ . [7M]
4. a) Describe the operation of three phase full converter with RL load? Draw the waveforms by choosing firing angle such that output voltage has negative part. [7M]
- b) A three phase semi converter is connected to a RL load with  $R=10\ \Omega$ . If the firing angle of SCR is  $\alpha = 60^\circ$  and it feeds 4 kW power to a resistive load determine the amplitude of maximum per phase input voltage. [7M]
5. a) Explain the operation of buck-boost converter in the CCM mode and obtain the expression for amplitude of ripple current. [7M]
- b) A buck converter has the input voltage of 220 V and it operates at 1 kHz, when the average load current is 50 A, the load resistance is  $3\ \Omega$ . Determine the value of inductance to limit the maximum peak to peak ripple current through inductor to 10% and find the value of inductance for maximum ripple current? [7M]

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6. a) How do you use PWM to inverters? Explain operation of single full bridge inverter with quasi-square wave pulse width modulation. [7M]  
b) Explain the working of auto sequential commutated current source inverter? [7M]
7. a) Explain four modes of operation of TRIAC and also state in which quadrant for which polarities of terminals it is more sensitive. [7M]  
b) A single phase ac voltage controller is connected with a load of  $R = 10 \Omega$  with input voltage of 230 V, 50 Hz supply. If the firing angle of SCR is  $90^\circ$  calculate, rms value of output voltage, power delivered to load, average value of thyristor current and input power factor? [7M]

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