

Code No: R1631025

R16**SET - 1****III B. Tech I Semester Regular Examinations, October/November - 2018****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**

~~~~~

**PART -A**

1. a) Draw the turn – OFF characteristics of SCR. [2M]
- b) Explain the effect of source inductance in fully controlled bridge rectifier with continuous conduction. [2M]
- c) Draw the circuit diagram of a 3-phase full wave uncontrolled rectifier. [2M]
- d) Explain duty cycle in step up chopper operation [3M]
- e) What is the principle of operation of Inverter? [3M]
- f) Compare turn off mechanism of TRIAC and Thyristor [2M]

**PART -B**

2. a) What is power MOSFET? What are the types of power MOSFET? Write the difference between general purpose MOSFET and power MOSFET? [7M]
- b) Describe the basic behavior of thyristor using a two- transistor model. [7M]
3. What is phase angle controlled technique? Explain the operation of single – phase angle controlled rectifier. Derive the expression for average dc output voltage. Draw the relevant waveforms. [14M]
4. A three –phase full converter is connected to a load resistance of  $5\ \Omega$  and it is supplied from a 220 V, 50 Hz ac supply, If the firing angle of thyristor is  $\alpha = 30^\circ$ , Draw the relevant waveforms and determine i) average output voltage, ii) average output current, iii) rms output voltage and iv) rms output current. [14M]
5. a) Explain the operating principle of dc chopper with a suitable diagram. Draw the voltage and current waveforms of chopper. Derive expressions for average output voltage and rms output voltage. [10M]
- b) Discuss the principle of operation of Buck-Boost converter. [4M]
6. a) Describe the V-I characteristics of TRIAC and modes of operation. [7M]
- b) A single –phase half –wave ac voltage controller is connected with a load of  $R = 5\ \Omega$  with an input voltage of 230 V, 50 Hz. If the firing angle of thyristor is  $45^\circ$ , determine i) RMS output voltage, ii) Power delivered to load [7M]
7. a) What are pulse width modulated inverters? What are the different PWM techniques used in inverter? [7M]
- b) With the help of a neat circuit diagram and waveforms, explain the operation of 3-phase bridge inverter with R load. [7M]

\*\*\*\*\*

SET - 2

(Electrical and Electronics Engineering)

Max. Marks: 70

3. Answer any **FOUR** Questions from **Part-B**

\*\*\*\*\*

Code No: R1631025

**R16****SET - 3****III B. Tech I Semester Regular Examinations, October/November - 2018****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****PART -A**

1. a) Compare Power MOSFET and IGBT. [2M]
- b) What would be the input power factor in a 1-phase rectifier if extinction angle control is used for improving power factor with angle  $\beta$  is  $50^\circ$  [2M]
- c) A 3-phase controlled rectifier feeds a purely resistive load. The data are  $V_s = 220V$  (rms) and  $R_{ld} = 15$  ohms. If the firing angle  $\alpha$  is  $45^\circ$  then what would be the duration of conduction of thyristor. [2M]
- d) Discuss the time ratio control in a dc chopper [3M]
- e) Draw the waveforms for 1-phase fully controlled ac regulator with inductive load. [3M]
- f) Why a PWM inverter is superior to a square wave Inverter? [2M]

**PART -B**

2. a) Draw the switching characteristics of power MOSFETs. Define turn- ON delay time, rise time, turn – ON time, turn- OFF delay time, fall time and turn- OFF time. [7M]
- b) What are the different turning – ON methods of a thyristor? Explain each method. [7M]
3. a) Draw the circuit diagram of a single – phase full wave controlled rectifier using centre tap transformer with R load and find dc output voltage. [7M]
- b) A single phase fully controlled bridge converter with RL load is supplied from 220 V, 50 Hz ac supply. If the firing angle is  $45^\circ$ , determine i) average output voltage, ii) output current iii) input power factor. [7M]
4. a) Draw the circuit diagram of a three phase bridge converter with RL load. Discuss its working principle. Draw the voltage and current waveforms. Determine the following parameters: [14M]  
i) dc output voltage ii) average dc load current iii) rms output voltage  
iv) rms load current .
5. With the help of a neat circuit diagram and associated waveforms, discuss the operation of Buck-Boost converter. [14M]
6. a) Draw the single – phase bidirectional ac voltage controller with R load and explain its working principle with waveforms. [7M]
- b) Draw the waveforms for 3-phase a.c voltage regulator for R load for firing angle  $60^\circ$  [7M]
7. Explain the working of TRIAC as voltage controller with R load and draw the relevant waveforms. [14M]

\*\*\*\*\*

SET - 4

(Electrical and Electronics Engineering)

Max. Marks: 70

3. Answer any **FOUR** Questions from **Part-B**

2. a) What is IGBT? What are the advantages of IGBT over power BJT and power MOSFET? [7M]  
b) Draw the V-I characteristics of a thyristor and explain different operating regions. What is the effect of Gate current on the V-I characteristics of a thyristor? [7M]
3. a) What is the effect of source inductance in single –phase full – wave controlled bridge rectifier with  $RL$  load? (b) Draw the voltage and current waveforms [10 M]  
b) Explain how a free – wheeling diode improves power factor in a converter. [4M]
4. Draw the circuit diagram of 3 – phase half –wave controlled rectifier with  $RL$  load and explain its operating principle with voltage and current waveforms. Determine the following parameters for  $RL$  load with firing angle  $\alpha = 30^\circ$  : [14M]  
i) dc output voltage ii) Average dc load current iii) rms output voltage  
iv) rms load current v) Ripple factor
5. With help of neat circuit diagram and associated waveforms discuss the operation of a Buck converter in continuous conduction mode and discontinuous conduction mode. [14M]
6. Derive the expression for rms output voltage of bidirectional 1-phase ac voltage controller with  $RL$  load. And draw the relevant waveforms. [14M]
7. Explain the working of a 1-phase full bridge Inverter with  $RL$  load. Draw the relevant output waveforms. [14M]

\*\*\*\*\*