

**ANURAG Engineering College**

(An Autonomous Institution)

II B.Tech II Semester Supplementary Examinations, June/July-2024

**POWER ELECTRONICS**

(ELECTRICAL AND ELECTRONIC ENGINEERING)

Time: 3 Hours

Max. Marks: 75

**Section – A (Short Answer type questions)****(25 Marks)****Answer All Questions**

	Course Outcome	B.T Level	Marks
1. Draw the firing circuit for SCR using UJT and write the necessary design equations	CO1	L1	2M
2. Draw static V-I characteristics of IGBT and mark the region in which the device is operated as a switch.	CO1	L2	3M
3. What is the effect of connecting freewheeling diode across R-L load in controlled rectifiers?	CO2	L1	2M
4. What is active power input of single phase full converter at $\alpha = 60^\circ$ ?	CO2	L2	3M
5. Which converter will act as three pulse as well as six pulse converter?	CO3	L1	2M
6. What is the conduction periods of diodes in three phase semi converter for 60 Hz frequency with $\alpha = 30^\circ$ ?	CO3	L2	3M
7. List the applications of AC voltage controllers	CO4	L1	2M
8. In an AC voltage controller, six cycles of input voltage are made on and four cycles are made off simultaneously across the load. Find the circuit power factor.	CO4	L2	3M
9. Find the effective resistance and average thyristor current in a basic DC-DC chopper in terms of duty cycle	CO5	L1	2M
10. Draw the circuit diagram for parallel inverter.	CO5	L2	3M

**Section B (Essay Questions)****Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

11. A) i) Simplify the different turns – ON methods of a thyristor? Explain each method ii) Two thyristors having a difference of 4mA in latching current are connected in series in the circuit. Voltages across the devices are 450V and 300V. Calculate the required equalizing resistance and capacitance, if the permissible difference in blocking voltage is 10V and the difference in the recovery charge is $5\mu\text{C}$ .	CO1	L3	10M
<b>OR</b>			
B) i) Discover the V-I characteristics of a thyristor and explain different operating regions? ii) Analyze the working of MOSFET	CO1	L3	10M
12. A) i) Utilize with neat circuit diagram and associated waveforms, operation of a 1- $\Phi$ half controlled converter with RL load. ii) A 1- phase full bridge converter using four SCRs feeds power to RLE load with $R=10\ \Omega$ , $L = 100\text{mH}$ , and $E = 100\text{V}$ . The ac source voltage is 230V at 50Hz. Assuming continuous conduction; solve the average value of load current for firing delay angle $45^\circ$	CO2	L3	10M
<b>OR</b>			
B) Analyze the operation of single phase fully controlled converter with RL load. Derive the output voltage and current expressions for firing angle of 45 degrees.	CO2	L3	10M

13. A) i) Derive the expression for the RMS load voltage of six pulse converter with R load  
 ii) Analyze the circulating current mode of operation of Dual converter with RL Load. CO3 L3 10M
- OR**
- B) i) Draw the output voltage waveform of 3-phase fully controlled rectifier for a firing angle of 60 degrees. Indicate firing sequence. Also discover expression for output voltage. CO3 L3 10M  
 ii) A 3 phase fully controlled bridge rectifier is operating from a 400V, 50 Hz supply. The load is highly inductive and current constant and continuous. solve the load voltage at firing angle of 45 deg
14. A) Build the circuit of single phase voltage controller with antiparallel connection of two thyristors and an R-L load. Explain its working. Sketch load voltage and load current waveforms. Derive an expression for output voltage. CO4 L3 10M
- OR**
- B) i) Distinguish between an ac voltage controller and a cyclo-conveter with respect to operation and control aspects. CO4 L3 10M  
 ii) Analyze the operation of a single phase midpoint type step down cyclo converter with the help of circuit diagram and waveforms
15. A) i) Draw a schematic diagram of a single phase ac chopper and discuss in brief with output voltage and current waveforms. CO5 L3 10M  
 ii) Analyze in brief how average voltage across the load is made more than dc supply voltage using chopper. Derive the expression for the average voltage.
- OR**
- B) A 3-phase bridge inverter is operated in  $180^\circ$  conduction mode. Solve output line voltage and phase voltage expression. CO5 L3 10M