

Code No: 125AF

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B. Tech III Year I Semester Examinations, February - 2022****POWER ELECTRONICS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75****Answer any Five Questions  
All Questions Carry Equal Marks**

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- 1.a) 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?
- b) What are the different triggering circuits of a SCR? Draw a resistance triggering circuit and explain its operation. What is the limitation of a resistance triggering circuit? [7+8]
- 2.a) Draw the self-commutation circuit and discuss in detail. What are the advantages and disadvantages of self-commutation with respect to other commutations?
- b) Thyristors with a rating of 1250 V and 200 A are used in a string to handle 10 kV and 1 kA. Determine the number of series and parallel connected thyristors in case de-rating factor is 0.2. [7+8]
3. Draw the circuit diagram of a single-phase half-wave-controlled rectifier with R load. Explain its working principle. Draw the relevant voltage and current waveforms and determine the following parameters: (a) dc output voltage (b) Average dc load current (c) rms output voltage (d) rms load current (e) Ripple factor (f) Regulation (g) Efficiency. [15]
- 4.a) List the advantages of three-phase controlled rectifier over single-phase controlled rectifier?
- b) A three-phase converter is fed to a RLE load and draw the output voltage and current waveforms with necessary explanation and corresponding circuit diagram. [7+8]
5. Explain the following:
  - a) Class A Chopper or First Quadrant Chopper
  - b) Class C Chopper or Two Quadrant Type A Chopper. [7+8]
- 6.a) Explain the continuous and discontinuous modes operation of a type A chopper. What is the limit of continuous conduction?
- b) Prove that in a class A chopper with a RLE load, the maximum value of ripple current is  $\Delta I_{\max} = V / (4 f L)$ . [7+8]
- 7.a) Explain the working of Single - phase half – wave ac voltage controller with R load with a neat diagram and corresponding voltage and current waveforms
- b) A single-phase half-wave ac voltage controller is connected with a load of  $R = 10 \Omega$  with an input voltage of 220 V, 50 Hz. When the firing angle of thyristor is  $30^\circ$ , find the RMS output voltage, power output at load, input power factor and average value of output voltage. [7+8]
- 8.a) What is a three-phase inverter? What are the applications of three-phase inverter? What are the switching devices used in three-phase inverter circuit?
- b) Explain how harmonic reduction can be done using PWM technique. [8+7]