Q. Code:693280

Reg. No. | | | | | | | | | | | | | |

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fifth Semester

EE18502 – POWER ELECTRONICS

(Electrical and Electronics Engineering)

(Regulation 2018/ 2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Acquire knowledge about fundamental concepts and techniques used in Power Electronics.	**4**
CO 2	Ability to identify basic requirements for Power Electronics based design applications.	**4**
CO 3	Develop skills to build and troubleshoot Power Electronics circuits.	**4**
CO 4	Ability to understand the use of Power Converters in Commercial and Industrial applications.	**4**

PART- A (10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Differentiate holding current from latching current.	**1**	**2**
2.	What is the purpose of using snubber circuit?	**1**	**2**
3.	Classify the different types of controlled rectifier.	**1**	**3**
4.	Write the relation between firing angle and extinction angle in single phase fully controlled rectifier when operating with RL load.	**1**	**3**
5.	A step down chopper has input voltage of 200 V with 10 Ω load resistor connected, voltage drop across chopper is 2 V when it is ON, For a duty cycle of 0.6 calculate the average output voltage?	**2**	**3**
6.	Name the three types of control strategies available for DC choppers.	**2**	**2**
7.	Contrast voltage source and current source inverters.	**3**	**4**
8.	A single phase half bridge inverter feeds resistive load of 5 Ω. When supply voltage of 120V, determine the fundamental component of RMS output voltage.	**3**	**4**
9.	Compare integral cycle control and phase control in AC voltage controllers.	**4**	**2**
10.	Sketch the matrix converter and mention its advantages.	**4**	**2**

PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)		Illustrate the structure and different modes of operation with the characteristics of MOSFET.	**(14)**	**1**	**3**
		(OR)			
(b)	**(i)**	Describe the various types of turn ON methods in SCR.	**(7)**	**1**	**3**

	(ii)	Draw the two-transistor model of SCR and derive an expression for anode current.	**(7)**	**1**	**3**
12. (a)		Describe the working of single phase fully controlled bridge converter in the Rectifying mode and inversion mode. And derive the expressions for average output voltage and rms output voltage.	**(14)**	**1**	**4**
		(OR)			
	(b)	Interpret the effect of Source Inductance on the performance of single-phase fully controlled converter and derive the expression for output voltage.	**(14)**	**1**	**4**
13. (a)		A DC chopper has an input voltage of 200 V and a load of 8 Ω resistance. The voltage drop across thyristor is 2 V and the chopping frequency is 800 Hz. The duty cycle of 0.5, Calculate a) Average output voltage b) RMS output voltage c) Chopper efficiency and d) Input resistance.	**(14)**	**2**	**3**
		(OR)			
	(b)	Derive the expression for voltage gain in a DC-DC boost converter and explain the different modes of operation with relevant waveforms.	**(14)**	**2**	**3**
14. (a)		With neat sketches, explore the operation of three phase voltage source inverter. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for 180° and the resistive load is star connected.	**(14)**	**3**	**4**
		(OR)			
	(b)	Categorize techniques used to reduce the harmonics content in the inverter and with relevant diagram, explain about any two of them.	**(14)**	**3**	**4**
15. (a)	**(i)**	Illustrate the working of single phase half wave A.C voltage regulator with R load using voltage and current waveform and derive its average output voltage and power factor.	**(7)**	**4**	**3**
	(ii)	A single phase voltage controller has input voltage of 230 V, 50 Hz and a load of 15 Ω resistance for 6 cycles ON and 4 cycles OFF. Calculate (a) RMS output voltage, (b) input power factor (c) Average and RMS thyristor currents.	**(7)**	**4**	**3**
		(OR)			
	(b)	With neat sketch and relevant waveforms, explain the working of single phase to single phase step-up cycloconverter with resistive load.	**(14)**	**4**	**3**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

			Marks	CO	RBT LEVEL
16.		Construct the circuit to obtain DC output voltage from a single phase AC input supply using two thyristors and two diodes should be connected in symmetrical configuration and derive the expression for RMS and average output voltage.	**(10)**	**2**	**5**