Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: NOV/DEC 2022

(Regulation 2018)

Fifth Semester

MECHATRONICS ENGINEERING

U18MCI5201: Industrial Electronics and drives

COURSE OUTCOMES

CO1: Relate the basic semiconductor physics to the properties of real power semiconductor
CO2: Describe the concept of operation of AC-DC converters.
CO3: Identify the operating the single phase and three phase inverter circuits
CO4: Describe the various PWM techniques.
CO5: Identify DC equipment with changing DC voltage and choppers for simple electrical application
CO6: Describe the speed control method in DC-to-DC converter

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions: -
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Compare Power MOSFET and IGBT.	CO1	[K_2]
2.	What is holding and latching current of a thyristor?	CO1	[K_2]
3.	Give the advantages of freewheeling diodes.	CO2	[K_2]
4.	Obtain the output voltage, thyristor voltage and output current waveform of a half wave-controlled rectifier with neat sketch for a resistive load.	CO2	[K_2]
5.	Why are diodes connected in anti-parallel connection to inverter switches?	CO3	[K_2]
6.	Differentiate VSI and CSI.	CO3	[K_2]
7.	Why are thyristors not preferred for inverters?	CO4	[K_2]
8.	Give the advantages of using PWM control of inverters.	CO4	[K_2]
9.	A Chopper circuit has a frequency of 2 kHz on a 460 V supply. If the load voltage is 350 volts, apply the concept of TRC to calculate the conduction period of the thyristor in each cycle.	CO5	[K_2]
10.	What is a flyback converter?	CO5	[K_2]

Answer any FIVE Questions:-
PART B (5 x 4 = 20 Marks)
(Answer not more than 80 words)

11.	Explain the two-transistor model of a thyristor with necessary equation and circuit diagram.	CO1	[K_2]

12.		Elaborately explain the working of fully controlled bridge rectifier. Obtain the output voltage, thyristor voltage and output current waveform with neat sketch.		CO2	[K_2]
13.		Obtain the output voltage waveform of a single-phase full bridge inverter with neat sketch.		CO3	[K_2]
14.		Explain Sinusoidal PWM and modified sinusoidal PWM techniques for inverter switching.		CO4	[K_2]
15.		Identify and elaborate on the two control strategies of chopper.		CO5	[K_3]
16.		Explain the circuit and working principle of buck, boost and buck-boost converters. Apply volt-sec equation to the inductor of each type to derive the output voltage of the converter.		CO5	[K_3]

Answer any FIVE Questions:-
PART C (5 x 12 = 60 Marks)
(Answer not more than 300 words)

17.	a)	Explain the volt-ampere characteristics of thyristors with relevant curves and necessary explanation.	6	CO1	[K_2]
	b)	Explain the switching characteristics of IGBT.	6	CO1	[K_2]
18.	a)	Obtain the output voltage, thyristor voltage and output current waveform of a half wave-controlled rectifier with neat sketch for an RL load.	8	CO2	[K_2]
	b)	Find the average output voltage of a single-phase full wave-controlled rectifier if the operating voltage is 120V rms, 60 Hz and the firing angle is 60°	4	CO2	[K_2]
19.	a)	Describe the principle of operation of three phase voltage source inverter with 180° mode of conduction with necessary waveform and circuit diagram. Obtain the line-to-line voltage expression. Assume the load to be a star connected load.	12	CO3	[K_3]
20.	a)	Apply the concept of motoring and regenerative braking to explain the four-quadrant operation of a dc-dc converter.	12	CO5	[K_3]
21.	a)	Explain in detail about the speed control method of PMDC motor	12	CO6	[K_3]
22.	a)	Elaborately explain the Space Vector based Pulse Width Modulation scheme suitable for three phase inverters with necessary waveforms.	12	CO4	[K_2]

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