Total number of printed pages: **Programme (D)/6th/DECE612A**

2023

POWER ELECTRONICS

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	Explain what you mean by power electronics. Also point out its applications.	(3+4=7)
	b)	Explain the block diagram of a typical power electronic system.	(6)
	c)	Explain V-I characteristics of power diodes in details.	(7)
2.	a)	What is known as reverse recovery time of a power diode? Also explain what is known as softness factor?	(3+2=5)
	b)	Describe in details by considering the output characteristics that how the power BJT acts as a switch and an amplifier.	(7)
	c)	Explain the switching performance of a power BJT by considering the resistive load circuit and the switching waveforms.	(8)
3.	a)	Differentiate between FBSOA and RBSOA as a safe operating area of the power transistor.	(5)
	b)	Differentiate in terms of structural changes between n-channel enhancement power MOSFET and n-channel DMOS power MOSFET.	(5)
	c)	Explain the working of IGBT with the help of its proper diagram.	(10)
4.	a)	Explain the switching characteristics of an IGBT.	(6)
	b)	Define reverse blocking mode of a thyristor. Differentiate between reverse blocking mode, forward blocking mode and forward conduction mode of a thyristor.	(4+5=9)
	c)	Explain the static V-I characteristics of a thyristor.	(5)
5.	a)	Explain why thyristor is needed to be protected. Also explain two types of techniques adopted for the protection of SCRs.	(2+6=8)
	b)	Explain why designing of snubber circuits is required. Also explain its working in details.	(2+5=7)
	c)	Differentiate between internal over-voltages and external over-voltages	(5)

		of a thyristor protection	
6.	a)	Differentiate between Diac and Triac by considering its V-I characteristics and figure.	(5)
	b)	Explain the RL load diode circuit with DC source. Also explain the reason why freewheeling diode is connected in the said circuit in details.	(4+3=7)
	c)	Define and mention the importance of the firing angle of a single phase half wave converter. Also define form factor of a thyristor converter.	(4+4=8)
7.	a)	Explain single phase half wave converter with RL load using freewheeling diode. Also mention the importance of such diodes in this type of circuit.	(6+2=8)
	b)	Explain the working of a single phase full bridge inverters in details.	(12)