Reg. No.															

Question Paper Code	14481

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Sixth Semester

Electronics and Instrumentation Engineering

20EIPC603 - POWER ELECTRONICS, DRIVES AND CONTROL

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	An IGBT is widely used in motor drives because it offers: a) High efficiency and easy gate control b) Low switching capability c) High voltage operation only d) Low voltage operation only	1	K2	CO1
2.	Compared to SCRs, Power MOSFETs generally provide: a) Slower switching speed b) Faster switching capability c) Lower frequency operation only d) Higher gate current requirement	1	K3	CO1
3.	TRIAC devices are commonly used in: a) AC power control applications b) DC motor drives only c) Rectifier circuits only d) Signal amplification	1	K1	CO1
4.	Source inductance in controlled rectifiers mainly causes: a) Increased frequency b) Elimination of harmonics c) Constant output voltage d) Commutation overlap	1	K3	CO2
5.	Fully controlled rectifiers are preferred over half-controlled rectifiers in regenerative applications because they: a) Use fewer switches b) Eliminate harmonics completely c) Allow bidirectional power flow d) Require no triggering circuit	1	K2	CO2
6.	In AC voltage controllers, phase angle control is commonly achieved using: a) MOSFET only b) Diodes only c) Transformers only d) TRIAC or SCR	1	K1	CO2
7.	A boost converter stores energy mainly in: a) Capacitor only b) Transformer only c) Inductor d) Resistor	1	K1	CO3
8.	Chopper quadrant operation is determined by: a) Switching frequency only b) Voltage and current direction c) Load resistance only d) Input AC frequency	1	K2	CO3
9.	Ripple in switching regulators is mainly influenced by: a) Transformer polarity only b) Mechanical vibration only c) Load variations d) Switching frequency and filter components	1	K3	CO3
10.	In a three-phase bridge inverter operating in 180° conduction mode: a) One switch conducts at a time b) Two switches conduct at a time c) Three switches conduct at a time d) Six switches conduct at a time	1	K1	CO4
11.	ZVS stands for: a) Zero Vector Switching b) Zoned Voltage Switching c) Zero Variable Switching d) Zero Voltage Switching	1	K2	CO4
12.	Compared to conventional inverters, multilevel inverters provide: a) Higher switching stress only b) High amplification c) Better output waveform quality d) Higher harmonic distortion	1	K3	CO4

13.	Regenerative braking occurs when a) Motor operates as a generator and returns power to supply c) Supply voltage becomes zero	b) Motor draws power continuously from supply d) Rotor is disconnected	*1*	*K1*	*CO5*
14.	Chopper-controlled DC drives are mainly preferred because they provide: a) AC frequency conversion only c) Constant rotor resistance	b) Efficient DC voltage control d) Mechanical speed control only	*1*	*K2*	*CO5*
15.	V/f control is widely used in: a) DC series motors only c) Mechanical brakes only	b) Induction motor drives d) Synchronous generators only	*1*	*K3*	*CO5*
16.	Plugging is a braking method in which: a) Frequency is increased continuously c) Rotor resistance becomes zero	b) Motor connections are reversed to produce opposite torque d) Supply is disconnected completely	*1*	*K3*	*CO5*

PART – A (ii) (Short Answer Questions)
(8 × 3 = 24 Marks)
Answer ALL Questions

17.	Compare MOSFETs and IGBTs for industrial motor drive applications based on switching performance and power handling capability.	*3*	*K4*	*CO1*
18.	Identify the role of simulation tools in analyzing power electronic circuits.	*3*	*K3*	*CO1*
19.	Illustrate the effect of source inductance on the performance of controlled rectifiers.	*3*	*K3*	*CO2*
20.	Analyze the advantages and limitations of matrix converters in variable-speed AC drive applications.	*3*	*K4*	*CO2*
21.	Identify the comparisons between step-down and step-up choppers with respect to circuit operation, output voltage control, and industrial applications.	*3*	*K3*	*CO3*
22.	Develop single-phase half-bridge voltage source inverter in a suitable power conversion application.	*3*	*K3*	*CO4*
23.	Examine the operation of a capacitor-commutated current source inverter and discuss its practical applications.	*3*	*K4*	*CO4*
24.	Apply chopper-controlled DC drives in electric vehicle applications and discuss their advantages.	*3*	*K3*	*CO5*

PART - B (Descriptive Answer Questions)
(5 × 12 = 60 Marks)
Answer ALL Questions

25.	a)	Make use of the operating principle explain the switching characteristics of an SCR with neat diagrams. Apply SCRs in controlled rectifier circuits.	*12*	*K3*	*CO1*
		OR			
	b)	Apply protection techniques such as snubber circuits, heat sinks, and overcurrent protection in power electronic systems	*12*	*K3*	*CO1*
26.	a)	Analyze the operation of dual converters in circulating and non-circulating current modes.	*12*	*K4*	*CO2*
		OR			
	b)	Analyze the operation and output waveform characteristics of cycloconverters under varying load conditions.	*12*	*K4*	*CO2*
27.	a)	Analyze the operation of Type-A, Type-B, choppers with suitable quadrant diagrams.	*12*	*K4*	*CO3*
		OR			

	b)	Analyze the operation of a buck-boost converter and explain the significance of polarity reversal in practical applications.	*12*	*K4*	*CO3*
28.	a)	Illustrate the principle of operation of 3 phase voltage source inverter with 120˚conduction mode with necessary waveforms and circuits. Also obtain the expression for line-to-line voltage.	*12*	*K3*	*CO4*
		OR			
	b)	Apply PWM techniques for harmonic reduction in inverter-fed motor drives.	*12*	*K3*	*CO4*
29.	a)	Apply the dynamic equations of electrical machines to evaluate speed and torque response in drive applications.	*12*	*K3*	*CO5*
		OR			
	b)	Make use of the principle of vector control of AC drives and apply it for independent control of torque and flux.	*12*	*K3*	*CO5*