C.U. SHAH UNIVERSITY Winter Examination-2015

Subject Name: Power Electronics - I

Subject Code: 4TE05PEL1

Semester :5Date: 02/12/2015Time: 2:30To 5:30Marks: 70Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

Q-1 Attempt the following questions:

- a) The SCR is turn-off when the anode current falls below
 - (i) Forward current rating
 - (ii) Break-over voltage
 - (iii)Holding current
 - (iv)Latching current
- **b**) Optocoupler combine
 - (i) SIT and BJT
 - (ii) IGBT and MOSFET
 - (iii)Power transistor and silicone transistor
 - (iv)Infrared light emitting diode and silicon phototransistor
- c) Which semiconductor power device out of the following is not a current triggered device?
 - (i) Thyristor
 - (ii) GTO
 - (iii)Triac
 - (iv)MOSFET
- d) Which following is a two terminal three-layer device?
 - (i) Power BJT
 - (ii) Power diode
 - (iii)Power MOSFET
 - (iv)Power IGBT
- e) Power MOSFET is a
 - (i) Voltage controlled device
 - (ii) Current controlled device
 - (iii)Frequency controlled device
 - (iv)None of the above
- f) Chopper control for DC motor provide variation in
 - (i) Input voltage
 - (ii) Frequency

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(14)

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(iii)Both (1) and (2)

- (iv)None of the above
- g) Cyclo-converter converts _
 - (i) ac voltage to dc voltage
 - (ii) dc voltage to dc voltage
 - (iii) ac voltage to ac voltage at same frequency
 - (iv) Ac voltage at supply frequency to ac voltage at load frequency
- **h**) Triac can be used only in
 - (i) Inverter
 - (ii) Rectifier
 - (iii) Chopper
 - (iv) Cyclo-converter
- i) In a single phase full wave converter (M2 connection) feeding a highly inductive load, the firing angle for each thyristor is an in the respective half cycle. The period of conduction of each Thyristor is
 - (i) $\pi \alpha$
 - (ii) π
 - (iii) $\pi + \alpha$
 - (iv) π 2α
- j) In a single phase semi converter number of Thyristor is
 - (i) 16
 - (ii) 8
 - (iii) 4
 - (iv) 2
- **k**) In a 3 phase bridge inverter, the gating signal for the three phases have a phase difference of
 - (i) 120°
 - (ii) 60°
 - (iii) 240°
 - (iv) 90°
- I) A 3 phase fully controlled converter is a
 - (i) 3 pulse converter
 - (ii) 6 pulse converter
 - (iii) 8 pulse converter
 - (iv) 12 pulse converter
- m) The commutation method in an inverter is
 - (i) Line commutation
 - (ii) Forced commutation
 - (iii) Either (i) or (ii)
 - (iv) None of the above
- **n**) Inverter find application in
 - (i) HVDC transmission
 - (ii) UPS
 - (iii) Variable speed ac drive
 - (iv) All of the above

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Attempt any four questions from Q-2 to Q-8

Q-2	a)	Attempt all questions Draw the symbol and V-I characteristics of following power device, i) Power BJT	(14) 7
		ii) SCR	
		iv) TRIAC.	
	b)	Give the comparison between power MOSFET and power BJT.	7
Q-3		Attempt all questions	(14)
	a)	Explain operation of SCR using two transistor analogy	7
	b)	 A single phase full-wave controlled rectifier is operated from a 230V, 50Hz supply, if load resistance is 100Ω and firing angle is π/4. Determine, i) PIV for SCR 	7
		ii) Average value of output voltage and current	
		iii) RMS value of output voltage and current	
Q-4		Attempt all questions	(14)
	a)	Explain principle of step-down chopper with necessary waveforms.	7
	b)	Explain single phase full-bridge controlled converter for inductive load.	7
Q-5		Attempt all questions	(14)
	a)	Explain single phase ac voltage controller for resistive load with necessary waveforms.	7
	b)	Draw the waveforms of three-phase half wave converter with resistive load for firing angle 0° , 45° , 90° , 135° .	7
Q-6		Attempt all questions	(14)
	a)	Explain basic principle and operation of single phase to single cyclo-converter.	7
	b)	Explain single phase full bridge inverter with resistive load.	7
Q-7		Attempt all questions	(14)
	a)	List voltage control technique for inverter and explain any two in detail.	7
	b)	Explain dynamic (switching) characteristic of SCR.	7
Q-8		Attempt all questions	(14)
	a)	List triggering circuit and explain any one in detail.	7
	b)	Explain 180° conduction mode of three-phase inverter with necessary waveform.	7

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