Enrollment No:	Exam Seat No:
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C.U.SHAH UNIVERSITY

Summer Examination-2017

Subject Name:Power Electronics-I

Subject Code: 4TE05PEL1 Branch: B.Tech (Electrical, EEE)

Semester: 5 Date: 22/03/2017 Time: 02:30 To 05:30 Marks: 70

Instructions:

(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:

(14)

- a) Name any two commutation techniques used for SCR
- **b)** Draw the symbol of UJT and its V-I characteristics.
- c) Secondary breakdown takes place in MOSFET. Determine whether the given statement is true or false
- **d)** IGBT is a controlled device
- e) Which power electronics converter converts a fixed AC voltage into a variable AC voltage while maintain the frequency constant?
- **f**) Give any two advantages of three phase controlled rectifier over single phase controlled rectifier.
- **g)** How many junction exist in a structure of a thyristor?
- **h)** How many diodes are used in a single phase semi-converter?
- i) Which power electronics converter is also known as frequency changer?
- j) Give any four types of firing circuits for SCR.
- **k**) Define: Holding Current
- 1) How many switches are used in a single phase full bridge inverter?
- m) Give any two differences between voltage source inverter and current source inverter
- **n**) In an integral cycle control for AC voltage controller, if **n** is the number of ON cycles and **m** is the number of OFF cycles, what is the duty cycle of AC voltage



Attempt any four questions from Q-2 to Q-8 Q-2 **Attempt all questions (14)** Give various turn on methods of SCR. Explain any three methods **07** (a) Draw the structure of power diode, compare its structure and static V-I 07 **(b)** characteristics with signal diode. What are the advantages of power diode over signal diode? Q-3 Attempt all questions **(14)** (a) Draw the circuit diagram and explain the operation of single phase full wave **07** controlled rectifier (B-2 converter) with resistive load. Draw the waveforms of supply voltage, load voltage and load current **07 (b)** Draw the circuit diagram of single phase semi-converter with resistive load and explain its operation. Draw the waveforms of supply voltage, load current and load voltage **Attempt all questions** Q-4 **(14)** Draw the circuit diagram of a step up chopper and explain its operation. Derive **07** (a) the equation of output voltage for a step up chopper. A single phase half wave controlled rectifier consists 100 Ω load resistance is **07 (b)** operated from a 230 V supply mains. What is the average value of load voltage if

Q-5 Attempt all questions

(14)

(a) Draw the circuit diagram of two stage sequence control of single phase AC voltage controller with resistive load and explain its operation. Draw the waveforms of supply voltage, load voltage and load current.

the SCR's are triggered at firing angles of 45° and 90°

(b) Draw the circuit diagram of resistance firing circuit and explain its operation with necessary waveforms.



Page 2 || 3

Q-o		Attempt all questions	(14)
	(a)	A single phase voltage controller has input voltage of 230 V, 50 Hz and a load of	07
		R= 15 Ω . For 6 cycles ON and 4 cycles OFF	
		A) RMS output voltage	
		B) Input power factor	
	(b)	Explain how a freewheeling diode improves the input power factor in a controlled	07
		rectifier circuit with inductive load?	
Q-7		Attempt all questions	(14)
	(a)	Draw the circuit diagram of single phase to single phase cyclo-converter with	07
		resistive load and explain its operation with necessary waveforms.	
	(b)	Explain the of single pulse width modulation voltage control technique for single	07
		phase inverter.	
Q-8		Attempt all questions	(14)
	(a)	Draw only the circuit diagram, waveforms of gate pulse, phase voltage for three	07
		phase inverter with 120° conduction mode for resistive load.	
	(b)	Draw the circuit diagram and waveforms of single half bridge inverter with	07
		inductive load and explain its operation.	

