Enrollment No: _____ Exam Seat No: _____

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name: Power Electronics

Subject Code: 4TE06PEL1 Branch: B.Tech (IC)

Semester: 6 Date: 17/05/2016 Time: 2:30 To 5:30 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)

1) If the gate current through the gate terminal of SCR increases, forward break voltage of SCR_____

(A) Decreases (B)Increases(C) Remains constant (D)None of the above

2) Which one of the device in the thyristor family is a bidirectional device?

(A) GTO(B) LASCR(C) SCR(D) TRIAC

3) If I_H is the holding current and I_L is the latching current for thyristor, which one of the below condition is true?

(A) $I_H = I_L$(B)$I_L > I_H$(C) $I_H > I_L$(D) None of the above

4) Reverse voltage blocking capability of power diode is more compare to the signal diode.

(A) True (B) False

5) How many power switches are used in single phase half bridge inverter?

(A) 1 (B) 4 (C) 6 (D) 2

6) Which one of this power electronics converter is used to convert fixed frequency into variable frequency?

(A)Chopper (B) Cyclo-converter (C) Inverter (D) Rectifier

7) Which one of this chopper circuit operates in four quadrant?

(A) Class A (B) Class B (C) Class C (D) Class E

8) In a full wave bridge rectifier with inductive load, if a freewheeling diode is connected across the load, the supply power factor gets improved.

(A) True (B) False

9) Which one of this commutation circuit is based on resonance?

(A) Complementary Commutation (B) Load Commutation

(C) Line Commutation (D) Impulse Commutation

10) For a full wave bridge controlled rectifier with inductive load, if $V_{rms} = V_m sin\omega t$is the supply voltage and α is the firing angle of thyristor, what will be the average load voltage?

(A) $\frac{V_m}{\pi} cos\alpha$(B)$\frac{V_m}{\pi}[1 + cos\alpha]$(C) $\frac{2V_m}{\pi} cos\alpha$(D) $\frac{2V_m}{\pi}[1 + cos\alpha]$

11) If $J_1, J_2 \, and \, J_3$ are the junction of SCR from anode to cathode, and if anode potential is made positive with respect to cathode, which junction will be reverse biased?

(A) Junction J_1 (B) Junction J_2 (C) Junction J_3 (D) Junction J_1 and J_3

12) For a half wave controlled rectifier with resistive load, if $110\,V$ is the rms input voltage and α= 45° is the firing angle of SCR, what will be the average value of load voltage ?

(A)29.90 V (B) 49.54 V (C) 42.28 V (D) 35.03 V

13) A single phase full bridge inverter is operated from a 48 V battery and is supplying power to a pure resistive load of 10 Ω. What will be the value of fundamental output voltage?

(A)43.23 V (B) 24 V (C) 4 V (D) 480 V

14) For a series inverter circuit, if inductor L and capacitor C are commutating elements, which one of the below is true condition to produce required oscillations in inverter circuit?

(A)$R^2 < \frac{4L}{C}$ (B) $R^2 < \frac{L}{C}$ (C) $R^2 > \frac{4L}{C}$ (D) $R^2 > \frac{L}{C}$

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

Q-2 **Attempt all questions** **(14)**

	(a)	Draw the basic structure of power diode and explain its operation with the help of its V-I characteristics. Compare its V-I characteristics with signal diode and ideal diode.	**07**
	(b)	Explain any three turn on methods of thyristor.	**07**
Q-3		**Attempt all questions**	**(14)**
	(a)	Draw the structure of IGBT and explain its operating principle with help of inversion layer and conductivity modulation.	**07**
	(b)	Explain how snubber circuit in useful in over voltage protection for thyristor.	**07**
Q-4		**Attempt all questions**	**(14)**
	(a)	Draw the circuit diagram and waveforms of single phase full wave bridge controlled rectifier with resistive load and explain its operation.	**07**
	(b)	Draw the circuit diagram and waveforms of three phase half wave controlled rectifier with resistive load and explain its operation.	**07**
Q-5		**Attempt all questions**	**(14)**
	(a)	Draw the circuit diagram and waveforms of single phase full bridge inverter with resistive load and explain its operation.	**07**
	(b)	Draw the block diagram of online UPS and explain its operation.	**07**
Q-6		**Attempt all questions**	**(14)**
	(a)	Derive the equation for average load voltage$E_o = T_{on} f E_{dc}$, for step down chopper. Where, E_{dc}= supply voltage, T_{on}= turn on time of the switch and f = switching frequency.	**07**
	(b)	Draw the circuit diagram and waveforms of single phase to single phase cyclo-converter for resistive load and explain its operation.	**07**
Q-7		**Attempt all questions**	**(14)**
	(a)	A step down dc chopper has a resistive load of $R = 15\ \Omega$ and input voltage$E_{dc} = 200\ V$. When the chopper switch remains ON its voltage drop is $0\ V$. The chopper frequency is $1\ kHz$. If the duty cycle is 50 %, Determine, i) Average output voltage	**07**

ii) RMS output voltage

iii) DC output power

(b) Draw the circuit diagram of three-phase to single-phase cyclo-converter and explain its operation. **07**

Q-8 **Attempt all questions** **(14)**

(a) Draw the circuit and waveforms of basic series inverter and explain its operation. **07**

(b) Explain temperature controller using power electronics. **07**