Enrollment No: _____   Exam Seat No: _____

C.U.SHAH UNIVERSITY
Summer Examination-2019

Subject Name: Power Electronics-I
Subject Code: 4TE05PEL1   **Branch: B.Tech (Electrical)**
Semester: 5   **Date: 14/03/2019**   **Time: 10:30 To 01:30**   **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) Give any two characterisitics of an ideal switch.

   2) Draw the symbol of TRIAC and its V-I characterisitcs.

   3) MOSFET is a_____ controlled device

   4) Which power electronic converter is also known as frequency changer?

   5) Draw the symbol of DIAC and its V-I characterisitcs.

   6) How many junctions exist in an SCR?

   7) What is the function of free wheeling diode in a phase controlled rectifier circuit?

   8) Define: Latching current

   9) An AC voltage controller converts fixed ac frequency into variable frequency. Determine whether the given statement is true or false.

   10) Which power electronics device has lowest turn on and turn off time?

   11) Ripple component in a six pulse converter is less compare to three pulse converter. Determine whether the given statement is true or false.

   12) Give any two difference between $180°$ conduction mode and $120°$ conduction mode for 3-phase inverter.

   13) Which power electronics converter converts a fixed DC voltage into a variable DC voltage?

   14) Which device in the thyristor family turns off by applying a negative gate pulse?

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

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

(a)	Draw the V-I Characterisics of SCR. Explain the forward blocking and forward conduction operation of SCR	**07**
(b)	Draw the structure of power diode, compare its structure and static V-I characteristics with signal diode. What are the advantages of power diode over signal diode?	**07**

Q-3   **Attempt all questions**   **(14)**

(a)	Draw the circuit diagram and explain the operation of single phase half wave controlled rectifierwith resistive load. Draw the waveforms of supply voltage, load voltage and load current	**07**
(b)	Draw the circuit diagram of single phase full wave bridge controlled rectifier with resistive load and explain its operation. Draw the waveforms of supply voltage, load current and load voltage	**07**

Q-4   **Attempt all questions**   **(14)**

(a)	Draw the circuit diagram of a step down chopper and explain its operation. Derive the equation of output voltage for a step down chopper.	**07**
(b)	A 230 V (rms), 50 Hz single phase full wave bridge controlled rectifier is feeding a resistive load of 470 Ω. If the firing angle of SCR is $\alpha = 30°$, Determine i) Average load voltage ii) RMS load voltage	**07**

Q-5   **Attempt all questions**   **(14)**

(a)	Draw the circuit diagram of single phase AC voltage controller with resistive load and explain its operation. Draw the waveforms of supply voltage, load voltage and load current.	**07**
(b)	Draw the circuit diagram of UJT firing circuit and explain its operation with necessary waveforms.	**07**

Q-6   **Attempt all questions**   **(14)**

(a)	A single phase voltage controller has input voltage of 230 V, 50 Hz and a load of R= 15 Ω. If the firing angle of SCR $\alpha = 45°$, Determine	**07**

i) RMS output voltage ii) Input power factor

(b) Explain how does a freewheeling diode improves the input power factor in a controlled rectifier circuit with inductive load. **07**

Q-7 **Attempt all questions** **(14)**

(a) Draw the circuit diagram and waveforms of single half bridge inverter with R-L load and explain its operation. **07**

(b) Draw the circuit diagram and waveforms of single fullbridge inverter with resistive load and explain its operation. **07**

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

(a) Draw only the circuit diagram, waveforms of gate pulse, phase voltage for three phase inverter with $180°$ conduction mode for resistive load. **07**

(b) Draw the circuit diagram of single phase to single phase cyclo-converter with resistive load and explain its operation with necessary waveforms. **07**