Enrollment No: _____ Exam Seat No: _____

C.U. SHAH UNIVERSITY
Winter Examination-2019

Subject Name: Power Electronics-I

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

Semester: 5 **Date: 16/11/2019** **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 differences between signal diode and power diode.

2) Draw the symbol of IGBT and DIAC.

3) Define: Latching Current.

4) For an SCR Holding current (I_H) < Latching Current (I_L.) Determine whether the given statement is TRUE or FALSE.

5) Which power electronic switch is used in high frequency applications?

6) Give any two turn on methods of SCR.

7) What is the purpose of using freewheeling diode at the output side of the rectfier?

8) Ripple factor in a three phase full bridge rectifer is smaller than single phase full wave bridge rectifier.Determine whether the given statement is TRUE or FALSE.

9) How many SCR are required in a three phase half bridge controlled rectifier?

10) Give the principle of an inverter.

11) What is the difference between single phase half bridge inverter and single phase full bridge inverter from construction point of view?

12) Give any two difference between 3 phase inverter with 180 $^\circ$ and 120 $^\circ$ conduction mode.

13) Which power electronic converter converts fixed AC voltage into variable AC voltage?

14) In a step down DC to DC converter, output voltage is greater than input voltage.

Determine whether the given staement is TRUE or FALSE.

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

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

(a) Draw and explain the switching characterisitcs of Power MOSFET. **07**

(b) Explain the following modes of operation for SCR with help of its V-I characteristics **07**

i) Reverse blocking mode

ii) Forward conduction mode

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

(a) Draw the structure and explain the operation of TRIAC in any two modes. **07**

(b) Draw the circuit diagram and waveforms of single phase full wave bridge controlledrectifier with resistive load and explain its operation. **07**

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

(a) Draw the circuit diagram and waveforms of three phase full wave bridge controlledrectifier with resistive load and explain its operation. **07**

(b) Derive the equation of average output voltage and RMS output voltage for single phase semi converter with *R-L* load. **07**

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

(a) Draw the circuit diagram and waveforms of a step down chopper and explain its operation. Derive the equation for average output voltage. **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) Draw the circuit diagram and waveforms of single phase full bridge inverter with resistive load and explain its operation. **07**

(b) Draw the circuit diagram and waveforms of three phase inverter with 120° conduction mode with resistive load and explain its operation. **07**

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

(a) Draw the circuit diagram and waveforms of single phase full wave AC voltage **07**

controller with resistive load and explain its operation.

(b) Draw the circuit diagram and waveforms of two stage sequence control AC voltage controller with resistive load and explain its operation. **07**

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

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

(b) A single phase half wave controlled rectifier feeds a load of $R = 75\ \Omega$ with an input voltage of $230\ V, 50\ Hz$ supply. Firing angle for thyristoris 45°. Calculate **07**

i) RMS value of output voltage

ii) Averagevalue of output voltage