ROLL NO. _____

Code: DE71/DE110 **Subject: POWER ELECTRONICS**

DiplETE – ET (Current & New Scheme)

Time: 3 Hours **June 2019** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: **(2×10)**

a. Power diode is generally constructed from
(A) Silicon **(B)** Germanium
(C) Both **(D)** None of these

b. Power MOSFET IS
(A) Bipolar **(B)** Voltage controlled
(C) Unipolar **(D)** Both **(B)** & **(C)**

c. The minimum value of current required to maintain conduction in a thyristor is called the
(A) Latching current **(B)** Holding current
(C) Gate current **(D)** Breaking voltage

d. A 3-phase to 3-phase cycloconverter is not popular because
(A) It requires 18 thyristors **(B)** Complicated firing circuit
(C) Both **(A)** & **(B)** **(D)** None of these

e. A step - up chopper is connected to 100 V dc supply. For a duty cycle of 0.5 the output voltage in volts will be
(A) 100/1.5 **(B)** 100/0.5
(C) 100 **(D)** 200

f. Feedback diodes are required in inverters which are
(A) CSI **(B)** VSI
(C) Both **(D)** None of these

g. Six SCRs in a 3-phase full rectifier are fired at an interval of____.
(A) 180^o **(B)** 120^o
(C) 60^o **(D)** 90^o

h. SCR's di/dt protection is achieved by connecting SCR in _____with ____.
(A) Parallel, RC **(B)** Parallel, L
(C) Series, L **(D)** Series, RC

i. An AC voltage of 70.7 volts is applied to a single-phase bridge controlled rectifier. The PIV rating of each thyristor should be
(A) 70.7 V **(B)** 100 V
(C) 141.4 V **(D)** 35.35 V

j. In case of a inverter, PWM is used to control
(A) Harmonic **(B)** Voltage
(C) Current **(D)** Both **(A)** & **(B)**

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a.What are the various types of power electronics circuits? Explain briefly with their area of applications. **8**

b. Explain conduction loss w.r.t. a transistor. **4**

c. Explain the V-I characteristics of a Power Diode. **4**

Q.3 a. Draw symbol & V-I characteristics of (i) IGBT and (ii) N-Channel POWER MOSFET. **8**

b. How a thyristor can be triggered using a UJT? **8**

Q.4 a. In context of an SCR, explain the following:
(i) Commutation
(ii) Line commutation
(iii) Commutation by resonance
(iv) Turn-off time. **8**

b. Explain in brief (i) GTO and (ii) MCT **8**

Q.5 a. Draw the circuit of a half wave controlled rectifier with an inductive load and a FWD. Also, explain its working in detail. **8**

b. Explain with the help of waveforms the operation of a full-wave center tap rectifier with RL load firing angle of 135˚. **8**

Q.6 a. A three-phase half wave controlled rectifier is connected to a 220 V source. If the delay angle is 45˚ and the load resistance R = 10 Ω, determine:
(i) the average output voltage
(ii) average SCR current
(iii) average power dissipation in the SCR
(iv) maximum reverse voltage rating. **8**

b. Explain with the help of circuit diagram, the working principle of three phase full wave half controlled bridge rectifier. **8**

Q.7 a.What is step-up chopper? Draw its circuit diagram and explain its operation for the on state and off state. **10**

b. How the average output voltage of a DC chopper can be varied? **6**

Q.8 a.What is an inverter? Why PWM is used in an inverter circuit? List out its various industrial applications. **6**

b. Draw the circuit of single-phase Current Source Bridge Inverter and explain its working with the help of load current waveform. **10**

Q.9 a. For the application of heating loads, choose Integral Cycle Control or Phase Control and Justify the same. **4**

b. What is cycloconverter? State its applications. **4**

c. Explain briefly: (i) Solid State Relay and (ii) Static AC switch using TRIAC. **8**