ROLL NO. _____

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

DipIETE – ET (Current & New Scheme)

Time: 3 Hours **JUNE 2016** **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. The number of p-n junctions in a thyristor is
(A) 1 **(B)** 2
(C) 3 **(D)** 4

b. In a thyristor holding current is
(A) more than latching current **(B)** less than latching current
(C) equal to latching current **(D)** very small

c. A UJT exhibit's negative resistance region
(A) before the peak point **(B)** between peak and valley point
(C) after the valley point **(D)** both **(A)** and **(B)**

d. In a 3-phase full-converter, the six SCRs are fired at an interval of
(A) 30° **(B)** 60°
(C) 90° **(D)** 120°

e. Secondary break down occurs in
(A) MOSFET but not in BJT **(B)** both MOSFET and BJT
(C) BJT but not in MOSFET **(D)** none of these

f. In controlled rectifier, the nature of load current (load current is continuous or discontinuous)
(A) does not depend on the type of load and firing angle
(B) depends both on the type of load and firing angle
(C) depends only on the type of load
(D) depends only on the type of firing angle

g. A single-phase full bridge VSI has inductor L as the load. For a constant source voltage, current through the inductor is
(A) Square **(B)** Triangular
(C) Sine wave **(D)** Pulsed

h. In DC choppers, the wave forms for input and output voltages are respectively
(A) discontinuous, continuous **(B)** both continuous
(C) both discontinuous **(D)** continuous, discontinuous,

i. Which triggering is the most reliable?
(A) Forward voltage triggering. **(B)** Gate triggering.
(C) dV / dt triggering. **(D)** Thermal triggering.

j. A modern power semiconductor device that combines the characteristic of BJT and MOSFET is

(A) IGBT **(B)** FCT

(C) MCT **(D)** GTO

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

Q.2 a. What is power electronics? List any ten applications of power electronics. **(7)**

b. Explain the series operation of power diodes with neat Circuit diagram and V-I characteristics. **(9)**

Q.3 a. Give classification of power transistors. Explain the three operating regions of a BJT and draw its output characteristics. **(10)**

b. Compare MOSFET with BJT. **(6)**

Q.4 a. Explain V-I characteristics of SCR. **(8)**

b. Explain di/dt and dv/dt protection of SCRs. **(8)**

Q.5 a. Explain with a neat circuit diagram the working principle of a dual converter. **(10)**

b. A single phase full-wave controlled rectifier with an inductive load is connected to a 120 V source. The resistive portion of the load is equal to 10 Ω. If the delay angle (α) is 60^o. Find : **(6)**

(i) average load voltage (ii) average load current

(iii) form factor (iv) rectifier efficiency.

Q.6 a. Draw the circuit diagram of a three-phase half-wave rectifier circuit and explain its working with waveforms. **(9)**

b. A three-phase full-wave converter is operated from a three-phase Y-connected 208V,60 Hz supply and the load resistance is R=10Ω. If it is required to obtain an average voltage of 50% of maximum possible output voltage, calculate: **(7)**

(i) The delay angle α (ii) maximum output voltage

(iii) The average output current (iv) average current of SCR

Q.7 a. With a neat circuit diagram and waveform, explain the operation of BUCK-BOOST chopper. **(10)**

b. The step-down DC chopper has resistive load R=10Ω and the input voltage is Vs =220V. Assume a lossless chopper and chopping frequency f=1 kHz. If the duty cycle is 50%, determine (a) The average output voltage V_A (b) the RMS output voltage V_0 (c) output power. **(6)**

Q.8 a. With a neat circuit diagram and wave forms explain the operation of Single-phase full bridge inverter. **(8)**

b. The single phase half-bridge inverter has resistive load of R=2.4Ω, and the dc source voltage Vs=48V. Determine (i) The RMS voltage at the fundamental frequency V1. (ii) The output power P0. (iii) Peak thyristor current (iv) Peak reverse blocking voltage VBR of each thyristor. **(6)**

c. List any four applications of inverters. **(2)**

Q.9 a. What is Static Var Compensator? **(2)**

b. What is static switch? List any four advantages of static switch over mechanical switch. **(6)**

c. With a neat circuit diagram and waveforms explain the working of single phase cycloconverter. **(8)**