ROLL NO. _____

Code: DE71 **Subject: POWER ELECTRONICS**

DipIETE – ET

Time: 3 Hours **JUNE 2013** **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. A Power Semiconductor switching device which has bidirectional current capability is _____

(A) BJT **(B)** TRIAC
(C) SCR **(D)** Diode

b. The Current ratings of a Schottky diode vary from _____

(A) 1A to 1000A **(B)** 1A to 300A
(C) Less than 1A **(D)** More than 1000A

c. A Power Insulated-Gate Bipolar Transistor is a _____ controlled device.

(A) Current **(B)** Frequency
(C) Voltage **(D)** Power factor

d. Thyristors include_____

(A) UJTs and DIACs **(B)** BJTs and FETs
(C) PUTs and UJTs **(D)** PUTs and TRIACs

e. A dual Convertor Provides_____

(A) Two-quadrant operation **(B)** Four-quadrant operation
(C) Three-quadrant operation **(D)** One-quadrant operation

f. Three-phase Controlled Rectifiers Provides_____ than single-phase Controlled Rectifiers.

(A) Higher average output voltage **(B)** Lower average output voltage
(C) Higher average output current **(D)** Lower frequency ripples

g. One of the following power converter is used to convert a fixed-voltage dc source into a variable-voltage dc source is _____

(A) Inverter **(B)** AC voltage controller
(C) DC chopper **(D)** Diode rectifier

h. An inverter whose input voltage remains constant is called_____

(A) Voltage Source Inverter **(B)** Current Source Inverter
(C) Pulse-Width Modulated Inverter **(D)** Power Source Inverter

i. In a Power electronic circuit, which is used for the Control of AC and DC Power is _____

(A) Solid State Relay **(B)** Mechanical Switch
(C) Static Switch **(D)** Electro Mechanical Switch

j. The dc output voltage of single phase half wave controlled rectifier is given by

(A) $V_{dc} = \frac{V_m}{\Pi}(1+\cos\alpha)$ **(B)** $V_{dc} = \frac{V_m}{2\Pi}(1+\cos\alpha)$

(C) $V_{dc} = \frac{V_m}{\Pi}(1+\sin\alpha)$ **(D)** $V_{dc} = \frac{V_m}{2\Pi}(1+\sin\alpha)$

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

Q.2 a. What are the different types of power electronic circuits and explain the principle of AC voltage controller with circuit diagram and input/output waveforms. **(8)**

b. Draw the circuits of parallel connection using power diodes and explain its significance in power electronics. **(8)**

Q.3 a. What is an IGBT? Discuss the cross section and equivalent circuit of IGBT and give its applications. **(8)**

b. Draw the circuit of UJT triggering circuit and explain its operation with the help of V-I characteristics and waveforms. **(8)**

Q.4 a. What is SCR? Explain the construction, operation and V-I characteristics of SCR. **(9)**

b. List out the types of thyristors and explain briefly the operation of Fast-Switching thyristor. **(7)**

Q.5 a. Draw the circuit of Single Phase Controlled Dual Convertor and explain its operation with the help of input and output waveforms. **(11)**

b. Compare the features of semi-converter, full-converter and dual converter. **(5)**

Q.6 a. Draw the circuit of Three Phase Full-Wave Controlled Bridge Rectifier and explain its working. **(11)**

b. List out the industrial applications of Three-phase controlled rectifiers. **(5)**

Q.7 With the help of circuit diagram and waveforms explain the working of following:-
(i) Step-up chopper **(8)**
(ii) Step-down chopper **(8)**

Q.8 a. Explain Single phase Pulse Width Modulated Inverter with the help of circuit diagram and waveforms. **(8)**

b. Explain a single phase bridge inverter with circuit diagram and waveforms. **(8)**

Q.9 a. What is a Cycloconverter? What are the advantages and disadvantages of Cycloconverters? What are its industrial applications? **(8)**

b. Draw the circuit of single-phase tap changer and explain its working with the help of current and voltage waveforms. **(8)**