

Code: DE71

Subject: POWER ELECTRONICS

**DiplETE – 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

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- 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)

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- 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)