Code: DE71   Subject: **POWER ELECTRONICS**

DipIETE – ET

Time: 3 Hours   **JUNE 2014**   **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. Following is an application of Power Electronics:

    (A) Electromagnetic Relay   **(B)** UPS for computer
    (C) Radio amplifier   **(D)** Function generator

b. In an ideal Diode, reverse breakdown voltage should be:

    (A) Low   **(B)** High
    (C) Zero   **(D)** Infinite

c. MOSFET is a _____ controlled device.

    (A) Voltage   **(B)** Current
    (C) Power   **(D)** Energy

d. The UJT is used in SCR based circuits for:

    (A) Rectification   **(B)** Gate protection
    (C) Commutation   **(D)** Gate pulse generation

e. The minimum value of anode current which an SCR must attain during turn on process to maintain conduction, when gate signal is removed, is known as:

    (A) Forward Leakage Current   **(B)** Reverse leakage current
    (C) Holding Current   **(D)** Latching Current

f. The Zener diode is used in parallel with gate of an SCR for:

    (A) Over Current Protection   **(B)** Over Voltage protection
    (C) Protection against spurious firing **(D)** Over heating protection

g. The number of SCRs used in a 3 pulse, 3 phase controlled rectifier are:

    (A) 2   **(B)** 3
    (C) 4   **(D)** 6

h. A step down chopper has a duty cycle of 50% and a voltage of 20V is applied across it. The average output voltage will be equal to:

    (A) 5V   **(B)** 10V
    (C) 20V   **(D)** 40V

i. A single phase full bridge inverter can operate in load commutation mode, in case load consists of:

    (A) R-L-C over damped   **(B)** R-L-C under damped
    (C) R-L-C critically damped   **(D)** R-C ckt

j. A single-phase 120V AC source controls power to a 5 ohm resistive load using integral cycle control. The maximum power produced will be

    (A) 1440 W   **(B)** 2880 W
    (C) 1000 W   **(D)** 600 W

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

Q.2   a. Differentiate between Electronics and Power Electronics. What are different devices used in both. Give some applications of Power Electronics.   **(8)**

       b. (i) How Power diode is different from signal diode.   **(4)**
          (ii) Explain Schottky Diode.   **(4)**

Q.3   a. Explain the working principle of a Power MOSFET.   **(8)**

       b. Explain the working principle of UJT with corresponding VI characteristics.

                                                                        (8)
Q.4   a. Explain protection scheme used for different kinds of protection of an SCR.**(8)**

       b. What are different commutation methods used for SCRs. Explain complimentary commutation scheme in detail.   **(8)**

Q.5   a. Explain the circuit diagram and output waveforms of Single Phase, Full Wave, fully Controlled Bridge Rectifier with Resistive load.   **(8)**

       b. What is a dual converter? Explain non circulating current type dual converter.

                                                                       (8)

Q.6   a. Explain 3φ half wave controlled rectifier with R-L load. Draw various waveforms at firing angle of 45 degrees.   **(8)**

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b. Explain the working principle of a 3ϕ, full wave, half controlled rectifier with circuit diagram and output waveforms. **(8)**

Q.7 a. Explain the working principle of Bulk-Boost Chopper with the help of circuit diagram and waveforms. **(8)**

b. A step up chopper has input voltage of 220V and output voltage of 660V. If the conducting time of thyristor chopper is 100µSec, compute the pulse width of output voltage.
In case the thyristor off period is halved for constant frequency operation, find the average value of new output voltage. **(8)**

Q.8 a. What are various methods of pulse width modulation in invertors and explain sinusoidal pulse width modulation. **(8)**

b. What are Ideal Current Source Inverters? How they are different from voltage source inverters. **(8)**

Q.9 a. What are solid state relays? How these are different from electromagnetic relays? Explain solid state relays by giving suitable circuit diagrams. **(8)**

b. Explain the working of a bridge type single phase to single phase step-up cycloconverter with wave forms. **(8)**