Code: DE22
Time: 3 Hou | **DECEMBER 2008** | **Subject: INDUSTRIAL ELECTRONICS**
                                                             Max. Marks: 100

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.**

- **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 best alternative in the following:** **(2x10)**

    a. Holding current
       (A) Is the same as latching current.
       (B) Is the minimum value of anode below which SCR is turned OFF
       (C) Puts the limit on Max. Current, through the SCR.
       (D) Is the Maximum value of anode current, above which SCR is turned ON.

    b. In half wave controlled rectifier
       (A) One diode and one thyristor are required.
       (B) One thyristor is required.
       (C) Either a diode or a thyristor may be used.
       (D) Two thyristors are required.

    c. In a series inverter
       (A) Commutating elements and load are in series.
       (B) Commutating elements and thyristors are in series.
       (C) Capacitor may be in parallel with L but in series with load.
       (D) Capacitor may be in parallel with load.

    d. The power factor at the input terminals of a cycloconverter is generally
       (A) Low and leading.   **(B)** Low and lagging.
                              (C) High and leading.   **(D)** High and lagging.

    e. In controlled heating circuits thyristors act as
       (A) Rectifiers.   **(B)** Inverters.
       (C) AC regulators.   **(D)** Choppers.

    f. A 1-phase fully controlled bridge converter, is fed by a voltage $V_m \sin \omega t$. The average and rms values of output voltages are
       (A) $2V_m / \pi \cos \alpha$ and $V_m / \sqrt{2}$ **(B)** $V_m / \pi \cos \alpha$ and $V_m / \sqrt{2}$
       (C) $2V_m / \pi \cos \alpha$ and V_m **(D)** $V_m / \pi \cos \alpha$ and $\sqrt{2}V_m$

g. A load commutated chopper circuit has
    (A) 1 thyristor.   **(B)** 2 thyristors
    (C) 4 thyristors   **(D)** 6 thyristors

h. _____ method of heating is based on the transformer principle.
    (A) Eddy-current.   **(B)** Dielectric.
    (C) Induction.   **(D)** Resistance.

i. For small objects the induction heating is done at a frequency of
    (A) 10kHz   **(B)** 50kHz
    (C) 10MHz   **(D)** 100kHz

j. Induction heating requires
    (A) AC input   **(B)** High frequency AC input
    (C) DC input   **(D)** No input

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

Q.2   a. Explain the principle of operation and characteristics of a thyristor.   **(8)**

    b.   Explain, resistance-triggering & RC- triggering circuit for a thyristor.
(8)

Q.3   Explain the different methods of turning on a thyristor.   **(16)**

Q.4   a. With the help of a circuit diagram and waveform, describe the operation of a single-phase fully controlled bridge circuit.   **(8)**

    b. For a full wave controlled rectifier the firing angle $\alpha = 60°$, input voltage

$v = 100 \sin 200t$. Calculate V_{rms}, V_{av} and form factor. **(8)**

Q.5   a. Explain the circuit of a single-phase half wave converter with RL load and with free wheeling diode. Draw the waveforms at the output and across the diodes.   **(8)**

    b. What are natural and forced turn off methods? Give examples.   **(8)**

Q.6   a.   Draw the circuit of a 3-phase bridge inverter. Explain the operation for 120° conduction angle with the help of a waveform.   **(8)**

       b.   Explain the operation of series inverter. Give a few applications of series inverters. **(8)**

Q.7   a.   Explain how does a step up chopper work.   **(8)**

       b.   Explain load and auxiliary commutation circuits of choppers.   **(8)**

Q.8   a.   Explain thermal loss in dielectric heating and give a few of its applications.   **(8)**

       b.   Explain why and how high frequency power source is used for Induction Heating. **(8)**

Q.9   Write short notes on
          (i) Resistance welding.   **(8)**
          (ii) Advantages of induction heating & its applications.   **(8)**