DipIETE – ET (OLD SCHEME)

Code: DE22   **Subject: INDUSTRIAL ELECTRONICS**
Time: 3 Hours   **Max. Marks: 100**

JUNE 2010

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 the best alternative in the following:**   **(2×10)**

a. Induction heating is also known as _____ .

  (A) ac heating   **(B)** dc heating
  (C) eddy current heating   **(D)** none of these

b. Power required for dielectric heating is.

  (A) Less then 1 MHz   **(B)** 1 MHz or above
  (C) Both **(A)** & **(B)**   **(D)** none of these

c. The condition of making the series inverter circuit under-damped is

  (A) $R^2 > 4L/C$ **(B)** $R^2 = 4L/C$
  (C) $R^2 < 4L/C$ **(D)** none of these

d. The resistance welding process requires a _____ .

  (A) high value of ac current at low voltage
  (B) high value of dc current at low voltage
                          (C) low value of ac current at high voltage
  (D) low value of dc current at high voltage

e. The frequency of chopper circuit is given by

  (A) $1/(t_{on} + t_{off})$ **(B)** $t_{on} + t_{off}$
  (C) $t_{on} - t_{off}$ **(D)** t_{on}/t_{off}

f. A single phase bridge inverter delivers its output to a series connected R L C load with R=2 ohm, X_L = 8 ohm. For this inverter, load commutation is possible in case the Magnitude of Xc is

  (A) 10 ohm   **(B)** 6 ohm
  (C) 8 ohm   **(D)** zero

g. A Cycloconverter is frequency changer _____ .

(A) from higher to lower frequency with two stage conversion
(B) from higher to lower frequency with one stage conversion
(C) from lower to higher frequency with two stage conversion
(D) from lower to higher frequency with one stage conversion

h. A single- phase half - wave controlled bridge uses _____.

(A) four SCRs   **(B)** two SCRs
(C) three SCRs   **(D)** one SCR

i. The controlled rectifiers are always made of _____.

(A) germanium   **(B)** silicon
(C) Both **(A)** and **(B)**   **(D)** none of these

j. R-C triggering is preferred over resistance triggering because it _____.

(A) causes quick triggering
(B) provides accurate triggering
(C) provides a larger value of the triggering angle
(D) protects the device from getting damaged

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

Q.2 a. Explain the two transistor model of thyristor.   **(8)**

b. The dv/dt rating of the SCR as shown in Fig.1 is 100 V/μs. Determine the minimum value of the capacitance C that is required so that no erratic turn-on due to dv/dt occurs when power is switched on by closing the switch S.   **(8)**
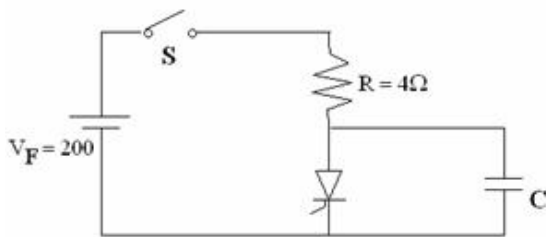

Fig.1

Q.3   a. In forwarding biasing mode, name any four techniques to turn-on the thyristor and explain any **Two**.
(8)

b. What is the need of series or parallel connection of SCR? Explain the series connected SCR.
(8)

Q.4 a. Explain the principle of single phase half wave converter with resistance load only.   **(8)**

b.   A 230 V, 50 Hz, one-pulse SCR controlled converter is triggered at a firing angle of 40° and the load current extinguishes at an angle of 210° . Find the circuit turn off time, average output voltage and the average load current for
(i) R=5 Ω and L=2 mH.
(ii) R=5 Ω, L=2 mH and E=110 V.   **(8)**

Q. 5   a. Draw the circuit of a three phase half controlled bridge rectifier and explain the same.   **(8)**

        b.   A series inverter circuit has an output frequency of 50 Hz. The time gap between turn-OFF of one SCR and turn-ON of the other SCR is 10 m-sec. Calculate:
(i) The time period of oscillations.
(ii) The resonance frequency.   **(8)**

Q. 6   a. Explain the working of parallel inverter with neat diagram.   **(8)**

        b.   Write disadvantages of series inverter.   **(8)**

Q. 7   a. Write the advantages and application of chopper circuit.   **(8)**

        b.   A dc chopper remains ON for 30 μsec and OFF for 10 μsec. Determine:
(i) The duty cycle and
(ii) The chopper frequency.   **(8)**

Q. 8   a. Write any **Five** advantages and any **Three** applications of induction heating.   **(8)**

        b.   Method of heating for non conducting materials, what is the effect of variation of voltage and frequency on the same method?   **(8)**

Q.9   a. Write the basic concept of resistance welding and explain spot welding.   **(8)**

        b.   What are the advantages of flash butt welding over butt welding?   **(8)**