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

DECEMBER 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.**
- **The answer sheet for the Q.1 will be collected by the invigilator after half an hour 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. UJT is generally used for

   (A) Controlling the power   **(B)** Triggering a triac
   (C) Triggering an SCR   **(D)** Triggering a Diac.

b. A single-phase full wave half controlled bridge rectifier uses

   (A) 2 SCR's   **(B)** 4 SCR's
   (C) 6 SCR's   **(D)** SCR

c. According to their connections, inverters are classified as

   (A) Series inverters.   **(B)** Parallel inverters.
   (C) Bridge inverters.   **(D)** All of the above.

d. Thyristors are used to control

   (A) DC separately excited motor   **(B)** DC shunt motor
   (C) DC series motor   **(D)** All the above

e. In a single- phase full wave controlled rectifier using centre tap transformer, the voltage across each half secondary is $V_m \sin\omega t$. The peak inverse voltage is

   (A) $2 V_m$ **(B)** V_m
   (C) $0.5 V_m$ **(D)** $0.25 V_m$

f. When a dc chopper feeds an RL load, the load current, during steady state operation

   (A) Remains constant
   (B) Varies between maximum and minimum values
   (C) May remain constant or vary
   (D) Is constant if R is constant

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g. A cycloconverter can be

   (A) Step down.   **(B)** Step up.
   (C) Step down or Step up.   **(D)** Neither of above.

h. In resistance welding the heat produced is proportional to the

   (A) Current.   **(B)** Square of the current
   (C) Voltage   **(D)** Square of the voltage

i. Induction heating is used for

   (A) Melting   **(B)** Annealing
   (C) Forging   **(D)** For all the above.

j. Inflammable articles like plastic and wooden products etc can be safely heated by using _____ heating.

   (A) Eddy- current   **(B)** Dielectric
   (C) Induction.   **(D)** Resistance.

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

Q.2 a. Explain series and parallel operation of SCR's with suitable circuit diagrams. **(5+5)**

     b. Explain, UJT -triggering circuit for an SCR. **(6)**

Q.3 a. Draw the waveforms of a single - phase half wave rectifier with R-L load and with freewheeling diode. Explain its operation with a circuit diagram **(8)**

     b. A single phase rectifier for 10kW rating is required. Thyristors of current rating 50A are to be used. Find the rated voltage of thyristor using a safety factor of 2 if the rectifier is a fullwave using centre tapped transformer, full wave bridge rectifier. Assume R-L load. **(8)**

Q.4 a. With the help of a circuit diagram and waveforms, explain the operation of a single- phase half bridge inverter **(8)**

     b. In a series inverter, R = 80Ω,L= 8mH and C=12μF.Check whether the circuit will work as a series inverter. Find the maximum output frequency. **(8)**

Q. 5 a. Explain the different commutation methods for choppers. **(10)**

     b. Explain the principal of operation of chopper. Give a few applications of choppers. **(4+2)**

Q. 6 a. What are the losses in dielectric heating? Explain them of them. **(8)**

b. With the help of a circuit diagram, explain the principle of induct. heating   .

Q. 7 a. In an induction heating process following parameters were used
f = 200 Hz, B_m = 1 Wb/m^2, K= 0.83, V= 2m^3.
Calculate the value of heat produced due to eddy current losses in two hours. **(8)**

b. Give the applications of resistance welding.   Explain the basic circuits of resistance welding. **(8)**

Q. 8 a. Draw the circuit of Morgon's chopper and describe its operation. **(8)**

b. An SCR has a continuous current rating I_{av} of 25A and a dynamic resistance R of 1Ω. If the casing temperature is decreased from $40^{\circ}C$ to $30^{\circ}C$ by efficient cooling. Calculate the percent increase in the device rating. State the necessary approximation. **(8)**

Q.9 Write short notes on:

(i) Turn off circuits in inverters. **(8)**
(ii) Single-phase cycloconverter. **(8)**