

JUNE 2008

Code: DE22

Subject: INDUSTRIAL ELECTRONICS

Time: 3 Hours

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.
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Q.1 Choose the correct or best alternative in the following: (2x10)

- a. An SCR is a
- (A) Two layer two-junction device.
 (B) Three layer two-junction device.
 (C) Four layer three-junction device.
 (D) Four layer four-junction device
- b. Natural commutation can be used in
- (A) DC circuits only. (B) AC circuits only.
 (C) Both AC & DC circuits only. (D) None of the above.
- c. A single-phase full converter can operate in
- (A) 4 quadrants. (B) 3 quadrants.
 (C) 2 quadrants. (D) 1 quadrant.
- d. The output frequency of an inverter depends upon
- (A) Voltage ratio of the step up transformer.
 (B) Level of the DC voltage supplied.
 (C) Type of current used.
 (D) Values and combination of the resonant element.
- e. In resistance welding the heat produced is proportional to the
- (A) Square of the current. (B) Current.
 (C) Voltage. (D) Square of the voltage.
- f. The duty cycle of a chopper is expressed
- (A) $T_{ON} + T_{OFF} / T_{ON}$ (B) T_{ON} / T_{OFF}

(C) $T_{ON} / T_{ON} + T_{OFF}$ (D) T_{OFF} / T_{ON}

g. A centre tapped transformer configuration of a single phase cycloconverter uses

(A) 2 thyristors.

(B) 4 thyristors

(C) 6 thyristors

(D) 8 thyristors

h. A relaxation oscillator consists of

(A) Tunnel diode.

(B) UJT.

(C) Tunnel diode and UJT.

(D) PIN diode

i. Articles like wood, plastics are heated using

(A) Dielectric heating

(B) Induction heating.

(C) Resistance heating

(D) Eddy current heating.

j. In R-C firing circuit the firing angle ranges from

(A) 0 to 180°.

(B) 0 to 90°

(C) 0 to 360°.

(D) 0 to 270°

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

Q.2 a. Explain the different ratings of an SCR. (8)

b. Explain, light and temperature triggering of an SCR. (8)

Q.3 a. Draw the waveforms of a three phase fully controlled rectifier. Explain its operation with a circuit diagram. (8)

b. A 3-phase full converter is fed by 400V, 3-phase 50Hz supply. The average load current is 150A and the load is highly inductive. The firing angle is 60°. Find (i) output power (ii) average rms and peak current through thyristor, (iii) peak inverse voltage.

(8)

Q.4 a. Explain the principle of operation of choppers. How are choppers classified? (8)

b. Explain how, using a rectifier the speed of a DC motor can be controlled. (8)

Q.5 a. Explain the operation of a single-phase cycloconverter. Draw the waveforms for $\frac{1}{2}$ and $\frac{1}{4}$ of the input frequency. (8)

- b. In a dielectric heating process a voltage of 230 V is applied at 30 kHz, if the capacitance of the dielectric used is 0.47 pF and phase angle of the dielectric is 30° , calculate the dielectric power loss. **(8)**

Q.6 a. With the help of neat diagram explain the working of single phase full bridge inverter. **(8)**

b. Explain the circuit of a parallel inverter. **(8)**

Q.7 a. Name and explain the different types of resistance welding with suitable examples. **(8)**

b. Give the salient features of Induction heating. Explain how induction heating is used in surface hardening of steel. **(8)**

Q.8 a. Explain the process of dielectric heating. Give a few of its applications. **(8)**

b. With the help of a circuit diagram, explain the principle of induction heating. **(8)**

Q.9 Write short notes on

(i) Jone's chopper and Morgan's chopper.

(8)

(ii) Two transistor model of an SCR.

(8)