

Code: DE-22

Subject: INDUSTRIAL ELECTRONICS

<b>JUNE 2007</b>
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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 has
- |                     |                    |
|---------------------|--------------------|
| (A) One terminal.   | (B) Two terminal.  |
| (C) Three terminal. | (D) Four terminal. |
- b. A free wheeling diode is used in a controlled rectifier in case of
- |                      |                        |
|----------------------|------------------------|
| (A) Resistive load.  | (B) Inductive load.    |
| (C) Capacitive load. | (D) All types of load. |
- c. An inverter converts
- |  |                    |
|--|--------------------|
| (A) A.C. into D.C.                         | (B) D.C. into A.C. |
| (C) A.C. into A.C. of different frequency. | (D) None of these. |
- d. The frequency of a chopper is given as  $f =$
- |                        |                            |
|------------------------|----------------------------|
| (A) $T_{ON} + T_{OFF}$ | (B) $T_{ON} / T_{OFF}$     |
| (C) $T_{OFF} / T_{ON}$ | (D) $1 / T_{ON} + T_{OFF}$ |
- e. The main application of a cycloconverter is found in
- |                                   |  |
|-----------------------------------|--|
| (A) Traction.                     | (B) Speed control of synchronous motors. |
| (C) Speed control of D.C. motors. | (D) Lifts & hoists.                      |
- f. In the forward blocking state, the SCR is

- (A) In the ON state. (B) At the point of breakdown.  
 (C) Reverse biased. (D) In the OFF state.
- g. In dielectric heating process the supply voltage should not exceed  
 (A) 15kV. (B) 33kV.  
 (C) 6kV. (D) 1kV.
- h. In auxiliary commutated chopper, the charging and discharging time of capacitor  
 (A) Are constant.  
 (B) Depends on the load current.  
 (C) May be constant or may depend on load current.  
 (D) Neither of above.
- i. Induction heating is used for  
 (A) Melting. (B) Annealing.  
 (C) Forging. (D) All the above.
- j. \_\_\_\_\_ method of heating is based on the transformer principle.  
 (A) Eddy-current. (B) Dielectric.  
 (C) Induction. (D) Resistance.

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

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- Q.2** Explain the different ways of triggering a thyristor. **(16)**
- Q.3** a. Explain the circuit of a single – phase bridge inverter. Also draw the waveforms. **(8)**  
 b. A series inverter is fed by 2000 volts. The value of circuit components are  $C = 10\mu\text{F}$ ,  $L = 20\text{mH}$ ,  $R = 80\Omega$ . If turn OFF time of thyristor is 6ms, what is the frequency of output voltage? **(8)**
- Q.4** a. Explain the principle of operation and application of a single-phase cyclo converter. **(8)**  
 b. Explain with a suitable diagram how speed control of a D.C. motor using controlled rectifier can be achieved. **(8)**
- Q.5** a. Explain  
 (i) UJT triggering  
 (ii) Trigger circuit using 555 timer. **(4+4)**

- b. For a full wave controlled bridge rectifier if the input voltage is given by  $v = 30 \sin 100 t$ . Calculate for R-L load the average load voltage for firing angle  $\alpha = 30^\circ$ , extinction angle  $\beta = 30^\circ$ . What is the time period of input wave?  
(8)

**Q.6** a. What is meant by thermal loss in dielectric heating? Give the applications of dielectric heating. (4+4)

b. Explain, the basic circuits of resistance welding & give a few applications of resistance welding. (5+3)

**Q.7** a. Explain the circuit of a single – phase full wave converter with R – load and without free wheeling diode. Also draw the waveforms. (4+4)

b. Explain, with circuit diagrams Jone’s chopper and Morgan’s chopper. (4+4)

**Q.8** a. Explain the principle of induction heating giving a few applications. (6+2)

b. Is induction heating more advantageous? Explain. Also explain the process of dielectric heating with a simple diagram. (4+4)

**Q.9** Write notes on:-

(i) Classification of inverters. (4)

(ii) Application of series and parallel inverters. (4)

(iii) Principle of operation and application of a single-phase cyclo converter. (4+4)