Total No. of printed pages = 4

CAI-301/PE&EE/3rd Sem/2013/M

PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Fill in the blanks : $1 \times 10 = 10$

   (i) The direction of induced emf can be found by —— law.

   (ii) A Zener diode operates on ——— bias.

   (iii) The maximum value of an alternating current is 50A. Its RMS value will be ———.

   (iv) Total number of electrons in the outermost shell of germanium is ———.

   (v) Conversion of AC to DC is called ———.

   (vi) In series resonance, current in the circuit is ———.

[Turn over

(vii) The unit of angular velocity is ———.

(viii) Electron-volt is the unit of ———.

(ix) A pentavalent impurity has ——— valence electrons.

(x) In pure capacitive circuits, voltage ——— the current.

2. (a) What do you mean by an ideal transformer ? 2

(b) An ideal 25 KVA transformer has 500 turns on the primary winding and 40 turns on the secondary winding. The primary is connected to 3000 Volt, 50 Hz supply.

Calculate :

(i) Primary and secondary currents on full-load

(ii) Secondary emf and

(iii) The maximum core flux. 8

(c) Derive the emf equation of a transformer. 5

3. (a) Show that in a pure inductive circuit current lags behind the voltage by 90^{o}. 5

(b) A choke coil takes a current of 2·5A when connected across 250V, 50 Hz mains and consumes 400 watts.

Find :

(i) The power factor

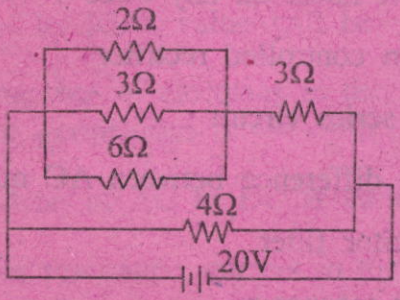
(ii) Resistance of the coil

(iii) Inductance of the coil. 5

(c) Prove that the average value of alternating current in a complete cycle is zero. 5

4. (a) A battery consisting of 10 cells in series has two of the cells reversed. EMF of each cell is 1·5V and internal resistance is 0·1Ω. The resistance of the external circuit is 4Ω. Find the reduction in current due to the two cells being reversed connected. 6

(b) For the following circuit, calculate the power loss in the 2Ω resistor. 9



5. (a) Write any three properties of semiconductors. 3

(b) What do you mean by doping ? Explain how a p-type semiconductor material can be formed from intrinsic semiconductor by the process of doping. 7

(c) With neat diagram, explain the behaviour of a PN-junction in reverse bias mode. 5

6. (a) What are the different characteristics of a transistor in CB-mode ? Explain with necessary diagrams. 7

(b) With neat circuit diagram, explain the operation of a npn-transistor in CB-mode. 4

(c) The base current in a transistor is 0·01 mA and emitter current is 1 mA. Calculate the values of α and β. 4

7. Write short notes on any *three* : 5×3=15

(a) Silicon controlled rectifier

(b) RLC series circuit

(c) Phase difference between AC quantities

(d) Capacitor filter

(e) Series resonance.