Total No. of printed pages = 4

CAI-301/PEEE//3rd Sem/2013/N

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 any *five* questions.

1. (a) Define ampere. 1

   (b) Force between two parallel conductors carrying currents in opposite direction is 3·2 N/m when they are placed 50 mm apart in air. If current flowing in one conductor is 1000A, find the current in the other conductor. Mention whether it is a force of attraction or repulsion. 6

[Turn over

(c) An electric kettle needs 6 minutes to boil 2 kg of water from the initial temperature of 20°C. The cost of electrical energy required for this operation is 12 paire, the rate being 40 paire per kwh. Find the kw rating and the overall efficiency of the kettle. 7

2. (a) Define the following terms : 2

(i) Form factor

(ii) Average value.

(b) A tungsten filament bulb rated at 500W, 100V is to be connected to series with a capacitance across 200V, 50 Hz supply. Calculate :

(i) The value of capacitor such that the voltage and power consumed by the bulb are according to the rating of the bulb.

(ii) P.f. of the circuit.

(iii) Draw the phasor diagram. 6

(c) The following three vectors are given :

$A = 20+i20$, $B = 30\angle -120^\circ$, $C = 10+i10$.

Perform the following indicated operations

(i) $\frac{AB}{C}$ (ii) $\frac{BC}{A}$ 6

3. (a) Mention four important properties of semiconductor materials. 4

(b) With neat diagram, explain the operation of a full-wave bridge rectifier. 6

(c) Explain the operation of a clamping circuit. 4

4. (a) Establish a relation between α and β. 3

(b) Explain the operation of a NPN transistor. 6

(c) What do you mean by forward blocking mode of a thyristor? 5

5. (a) A platinum coil has a resistance of 3·146Ω at 40°C and 3·767Ω at 100°C. Find the resistance at 0°C and the temperature co-efficient of resistance at 40°C. 6

(b) A resistance R is connected in series with a parallel combination of two resistances of 12Ω and 8Ω. Calculate R if the total power dissipated in the circuit is 70W, when the applied voltage is 20V. 8

6. (a) What are the indications of a fully charged lead-acid cell? 4

(b) Write in brief any three characteristics of a lead-acid cell. 5

(c) It is desired to charge a 12V car battery at 6A from a 230V, dc source. The dc source and battery are connected in series with a group of 60W 220V bulbs in parallel. How many lamps are required for the purpose ? 5

7. Write short notes on any *two* : 7×2=14

(a) Zener diode

(b) Lagging and leading power factor

(c) Choke input filter

(d) Pure capacitive circuit with sinusoidal AC voltage source.