Total No. of printed pages = 6

CAI-301/PoE&EE/3rd Sem/2018/M

PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING

Full Marks – 70

Time – Three hours

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

PART– A

1. Write the correct answer : 2×10=20

(a) When a voltage of $v = V_m \sin \omega t$ is applied to a circuit, then current flowing through the circuit is $i = I_m \sin \omega t$. What is the value of power factor ?

(i) zero (ii) unity

(iii) 0.5 leading (iv) 0.5 lagging

(b) Kirchhoff's voltage law is concerned with

(i) IR drops (ii) Battery emf

(iii) Junction voltages (iv) Both (i) and (ii)

[Turn over

(c) A lagging power factor implies that

(i) Voltage is lagging the current

(ii) Current is lagging the voltage

(iii) Voltage and current are in same phase

(iv) None of the above

(d) The active power consumed by a resistance of 20Ω with a flow of 10 A current is

(i) 20 watt

(ii) 200 watt

(iii) 2000 watt

(iv) 20000 watt

(e) What is the relation between energy and power ?

(i) Energy = Power − Time

(ii) Energy = Power × Time

(iii) Energy = Power + Time

(iv) Energy = Power ÷ Time

(f) An ideal voltage source is the voltage source having

(i) Very high internal resistance

(ii) Zero internal resistance

(iii) 5Ω internal resistance

(iv) None of the above

(g) Write the unit of power

(i) Watt (ii) Joule

(iii) Calorie (iv) Second

(h) Write the polar form of $-5 - 5j$

(i) $7.071\angle 0^\circ$ (ii) $7.071\angle 135^\circ$

(iii) $7.071\angle 45^\circ$ (iv) $7.071\angle -135^\circ$

(i) Winding resistance of an ideal transformer is

(i) Very high

(ii) Zero

(iii) 5Ω

(iv) None of the above

(j) Active materials of a lead acid cell are :

(i) Lead peroxide

(ii) Sponge lead

(iii) Dilute sulphuric acid

(iv) All of the above

2. Fill in the blanks : $1 \times 5 = 5$

(i) Form factor is ratio of ____ and _____.

(ii) After doping semiconductor material is known as _____ material.

(iii) The unit of electrical energy is _____.

(iv) Transformer action requires _____ magnetic flux.

(v) The standard frequency for AC voltage in India is _____.

PART–B

Answer any *five* questions from the following.

3. (a) When a voltage of $v = V_m \sin \omega t$ is applied to a circuit, then current flowing through the circuit is $i = I_m \sin (\omega t - 30^o)$. Write the phasors of voltage and current. 4

(b) An alternating sinusoidal current of frequency 50Hz has a maximum value of 200 A. Reckoning the time from the instant the current is zero and becoming positive, find the current at 0.015 second. 5

4. Do the following operation : $3\times3=9$

(i) $(5 \angle 100^{o}) \div 4j$

(ii) $(5 \angle 10^{o}) + (-3-4j)$

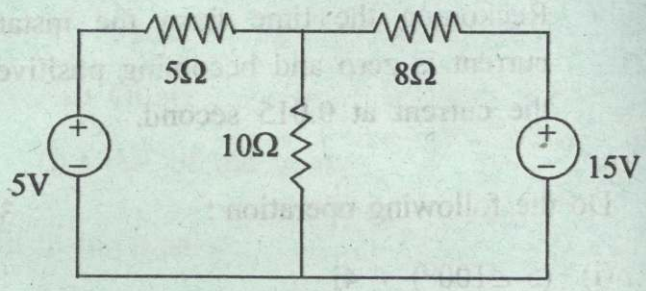
(iii) $(-5-5j) - (5 \angle -30^{o})$

5. (a) Write the assumptions for a transformer to be an ideal one. 4

(b) A 6300/210 V, 50 Hz, single phase transformer has per turn emf of about 9 volts. Find the number of high voltage and low voltage turns. 5

6. (a) Two coils connected in parallel across 100V supply mains take 10 A current from the line. The power dissipated in one coil is 600W. What is the resistance of the other coil ? 4

(b) Calculate the current flowing through the 10Ω resistance of the following figure : 5



7. (a) Write the indications of a fully charged lead acid cell. 4

(b) Write the chemical changes during discharging and charging of a lead acid cell ? 5

8. (a) Draw the circuit diagram of a half wave rectifier, together with its input and output waveforms. 4

(b) Calculate the values of collector current I_C and emitter current I_E for a BJT with emitter-to collector current gain $\alpha_{dc} = 0.98$ and base current $I_B = 100\mu A$. Determine base to collector gain β_{dc} for the device. 5