Total No. of printed pages = 8

END SEMESTER EXAMINATION – 2019

Semester : 3rd

Subject Code : CAI-301

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

Answer *all* questions.

1. Pick the right answer : 10×1=10

(a) Kirchhoff's current law is applicable only

(i) Closed loops in a network

(ii) Electronic circuit

(iii) Junctions in a network

(iv) Electric circuits

[Turn over

(b) Kirchhoff's voltage law is concerned with

(i) IR drops

(ii) Battery emf

(iii) Junction voltages

(iv) Both (i) and (ii) above

(c) According to KCL, the algebraic sum of all currents meeting at a node of a network is always

(i) Zero

(ii) Positive

(iii) Negative

(iv) Determined by battery emfs

(d) The algebraic sign of an IR drop is primarily dependent upon the

(i) Amount of current flowing through it

(ii) Value of R

(iii) Direction of current flow

(iv) Battery connection

(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) Write the unit of power.

(i) Watt (ii) Joule

(iii) Calorie (iv) Second

(g) Write the unit of energy.

(i) Watt (ii) Joule

(iii) Calorie (iv) Second

(h) Write the polar form of $-5 - 6j$.

(i) $7.81 \angle 50.18^{o}$

(ii) $11 \angle 30.8^{o}$

(iii) $10.7 \angle -11.8^{o}$

(iv) $7.81 \angle -129.8^{o}$

(i) If a 240V heater is used on 120V supply, heat produced by it will be

(i) One-half (ii) Twice

(iii) One-fourth (iv) Four times

(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. Write whether following statements are true or false : 10×1=10

(a) Currents flowing through each of series resistances must be equal.

(b) Voltages across each of series resistances must be equal.

(c) Currents flowing through each of parallel resistances must be equal.

(d) Voltages across each of parallel resistances must be equal.

(e) Transformer is used in DC circuit.

(f) Transformer primary winding voltage and secondary winding voltage are equal.

(g) Potential divider is used to get variable DC voltage across load.

(h) KCL is applied in closed loop.

(i) Battery is three terminal voltage source.

(j) Polar form of complex number is expressed in magnitude and angle.

3. Fill in the blanks : 5×1=5

(i) The value of terminal voltage of an ideal voltage source is _____.

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

(iii) Two windings of a transformer are designated as primary winding and _____ winding.

(iv) Transformer action requires _____ magnetic flux.

(v) Rating of transformers is expressed in _____.

PART – B

Answer any *five* from the following.

4. (a) What do you mean by frequency and time of an alternating waveform ? Explain with suitable example. 4

   (b) An alternating current of frequency 60 Hz has a maximum value of 300A. Reckoning the time from the instant the current is zero and becoming positive, find the time taken by the current to reach a value of 141.4A for a first and second time. 5

5. Do the following operation. Write the answer in polar as well as in rectangular form. 3×3=9

   (i) $(5\angle 150^{o}) \div 4j$

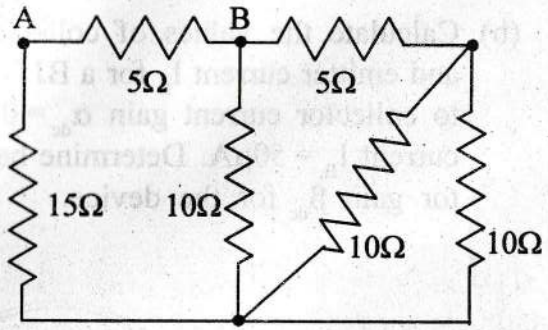
   (ii) $(5 + 2j) + (-3 + 4j)$

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

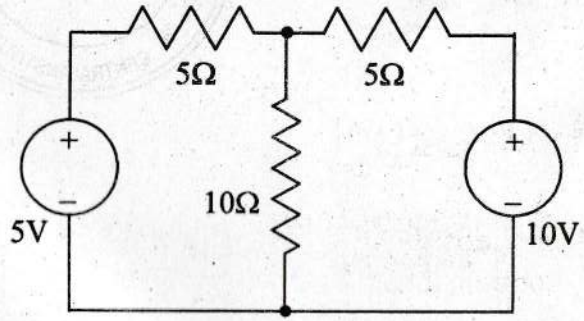
6. (a) What is an ideal transformer ? 4

   (b) The emf per turn for a single phase, 4620/440V, 50 Hz transformer is approximately 13 volts. Calculate the number of primary and secondary turns. 5

7. (a) Calculate the equivalent resistance between points A and B. 5



   (b) Calculate the current flowing through the 10Ω resistance of the following figure. 4



8. (a) Write the difference between fully charged battery and discharged battery. 4

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

9. (a) Draw the circuit diagram of a full-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 $\alpha_{dc} = 0.97$ and base current $I_B = 50\mu A$. Determine base-to collector gain β_{dc} for the device. 5