Total No. of printed pages = 7

END SEMESTER EXAMINATION, NOVEMBER-2018

Semester – 3rd (New Course)

Subject Code : El-304

ELEMENTS OF ELECTRICAL ENGINEERING

Full Marks – 70

Time – Three hours

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

Instructions :

1. *All* questions of PART – A are compulsory.
2. Answer any *five* questions from PART – B

PART – A

Marks – 25

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

   (a) The flow of electric current in a conductor is due to flow of ————.

   (b) One volt is equal to ————.

   (c) Electric pressure is also called ————.

[Turn over

(d) The resistance of wire varies inversely as ————.

(e) Electrical conductivity is measured in ————.

(f) With rise in temperature the insulating property of an insulator ————.

(g) The ratio of rms value to average value is called the ———— factor.

(h) The fuse wire is made of ————.

(i) The generator operates on the principle of ———— induced emf.

(j) A network having one or more than one source of emf is known as ———— network.

2. Write true or false : 1×10=10

(a) For a series as well as parallel circuit powers are additive.

(b) Resistance is an active element in a circuit.

(c) A network having one or more than one source of emf is known as passive network.

(d) Kirchhoff's current law is applicable only to junction in a network.

(e) DC voltage has one polarity.

(f) The emf induced in a DC motor opposes the applied voltage.

(g) The standard supply frequency in India is 60 Hz.

(h) The DC generator works on the principle of Flemings left hand rule.

(i) DC motor converts mechanical power into electrical power.

(j) Transformer is a rotating device.

3. Choose the correct answer : 1×5=5

(a) In which of the following substance , the resistance decreases with increase of temperature ?

(i) carbon (ii) constantan

(iii) copper (iv) silver

(b) If a phasor is multiplied by operator J, then

(i) only its magnitude changes

(ii) only its direction changes

(iii) both magnitude and direction changes

(iv) None of the above

(c) The time period of an alternating quantity is 0.02 second, its frequency will be

(i) 25 Hz (ii) 50 Hz

(iii) 100 Hz (iv) 0.02 Hz

(d) The power factor of an AC circuit is given as

(i) sine of phase angle

(ii) cosine of phase angle

(iii) tangent of phase angle

(iv) q-factor of a circuit

(e) In a parallel R-L-C circuit admittance is defined as the reciprocal of

(i) resistance (ii) reactance

(iii) impedance (iv) susceptance

PART – B

Marks – 45

4. (a) Write three properties of good conductors and good insulators. 3

(b) Define work, power and energy with units. 3

(c) Find the relation between kWh and kcal. 3

5. (a) Write the advantages of parallel circuit. 2

(b) State and explain Kirchhoff's laws. 4

(c) A resistance R is connected in series with a parallel combination of 12 ohm and 8 ohm . Calculate R if the total power dissipated in the circuit is 70 watt when the applied voltage is 20 volt. 3

6. (a) What is back emf of DC motor ? 2

(b) What are the different types of DC motor ? Explain with diagrams. 4

(c) A four pole lap wound armature has 960 conductors and a flux per pole of 20 mwb. Calculate the emf generated when running at 400 rpm. Also find the emf generated if the armature is wave wound. 3

7. (a) Define the term rms value of alternating current. 3

(b) A sinusoidal voltage of frequency 50 Hz has a maximum value of 200 $\sqrt{2}$ volts. At what time measured from a positive maximum value will the instantaneous voltage be 141.4 volts ? 4

(c) Discuss the importance of power factor. 2

8. (a) Define the following terms in an AC circuit : 6

(i) impedance

(ii) power factor

(iii) inductive reactance

(b) A circuit with 100μF is connected in series with a resistance of 25Ω across 250 volts 50Hz supply. Calculate : 3

(i) reactance

(ii) impedance

(iii) current

9. (a) Explain the working principle of a single phase transformer with the help of diagram. 6

(b) Explain the term transformation ratio. 3

10. Describe the principle of an induction motor.
A six pole 50 cycle, induction motor is running at 950 rpm.
Find the slip, slip speed and synchronous speed. 9