Total No. of printed pages = 8

END SEMESTER EXAMINATION – 2021

Semester : 4th (New)

Subject Code : El/Et-304

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS 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 :** 1×5=5

   (a) The unit of impedance is _____.

   (b) The _____ offer maximum resistance to the flow of current.

[Turn over

(c) One complete set of positive and negative values of an alternating quantity is known as _____.

(d) When two alternating quantities of the same frequency have different zero points, they are said to have _____.

(e) Transformers are rated at _____.

2. Answer in one word each : 1×5=5

(a) The ratio of maximum value to the RMS value of an alternating quantity.

(b) The relationship between frequency and speed of an alternating quantity.

(c) Power absorbed in a purely inductive circuit.

(d) The back emf equation of a DC motor.

(e) The semiconductor in its extremely pure form.

3. Write true or false : 1×5=5

(a) Kirchhoff's current law is based on the principle of conservation of charge.

(b) The ratio of apparent power to true power is known as power factor.

(c) The operation performed by an AND gate is similar to logical addition.

(d) The separation between conduction band and valence band is known as band gap.

(e) The base of a transistor is heavily doped.

4. Match the following columns :

Column – A	Column – B
(a) The maximum value obtained by an alternating quantity.	(i) Alternation
(b) The number of cycles that occur in 1 second	(ii) Cycle
(c) One half cycle	(iii) Waveform
(d) One complete set of positive and negative values	(iv) Amplitude
(e) The shape of the curve obtained by plotting the instantaneous values of voltage or current as ordinate against *time as abscissa	(v) Frequency

5. Choose the correct answer : $1 \times 5 = 5$

(a) The best conductor is

(i) Copper (ii) Gold

(iii) Silver (iv) Aluminium

(b) The unit of capacitance is

(i) Henry (ii) Siemens

(iii) Ohm (iv) Farad

(c) A Generator works DC on the principle of

(i) Electromagnetic induction and Fleming's Left hand rule.

(ii) Mutual induction

(iii) Electromagnetic induction and Fleming's Right hand rule.

(iv) None of the above

(d) The relationship between angular velocity, ω and frequency, f is

(i) $\omega = 2\pi f$ (ii) $f = 2\pi\omega$

(iii) $f\ \omega = 2\pi$ (iv) $\omega\ f = 1$

(e) The impurity to be added to a semiconductor to make it n-type semiconductor is

(i) tetravalent (ii) pentavalent

(iii) trivalent (iv) hexavalent.

PART – B

Marks – 45

6. (a) State Ohm's Law. 2

(b) Mention some of the characteristics of a series circuit. 3

(c) Find the equivalent resistance between points A and B in the circuit shown in Fig.1. 4

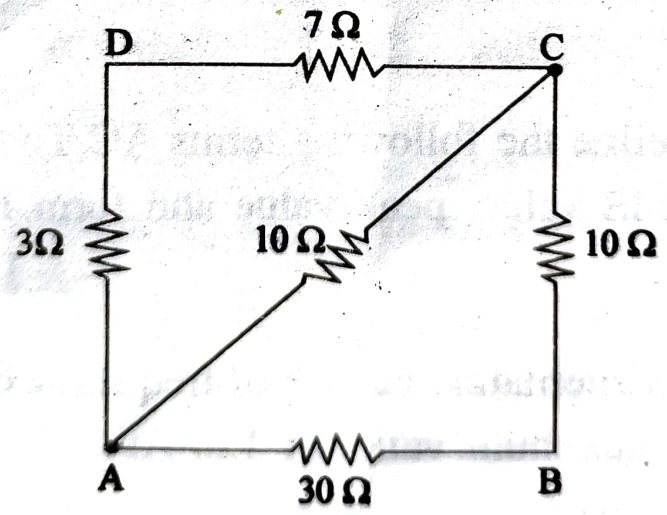

Fig.1.

7. (a) State and explain Kirchhoff's Laws. 2+2=4

(b) A Wheatstone bridge ABCD is arranged as follows :

AB = 20Ω, BC = 5Ω, CD = 4Ω and DA = 10Ω. A galvanometer of resistance 6Ω is connected between B and D. A 100-volt supply of negligible resistance is connected between A and C with A positive. Find the magnitude and direction of galvanometer current. 5

8. (a) Describe the construction of a DC motor. 5

(b) Deduce the emf equation of a DC Generator. 4

9. (a) Define the following terms AC Time period, RMS value, peak value and form factor. 1.5×4 =6

(b) An alternating current of frequency 60 Hz has a maximum value of 120 A. 3

(i) Write down the equation for the instantaneous value.

(ii) Reckoning time from the instant the current is zero and becoming positive, find the instantaneous value after 1/360 second.

(iii) Find the RMS value of current.

10. (a) Explain the RL series AC circuit with circuit diagram and phasor diagram. Find the expression of current and phase angle. 4+2=6

(b) Describe the operation of a Transformer. 3

11. (a) Explain the operation of a PNP transistor. How many types of transistor biasing are there ? Name them. 3+1.5=4.5

(b) What is a rectifier ? Describe the operation of a full wave Bridge rectifier. 1+3.5=4.5

12. (a) What is a semiconductor ? What are the different types of biasing in PN junction diode ? 1+3=4

(b) Draw the logic symbol and construct the truth table of the following gates : 5

NOT gate, XOR gate and NOR gate.

13. Write short notes on any *three* : 3×3=9

(a) Seven segment display

(b) House wiring

(c) 8085 microprocessor

(d) LED and LCD.