Total No. of printed pages = 4

END SEMESTER (REGULAR/RETEST) EXAMINATION, DECEMBER – 2023

Semester : 3rd

Branch : Common

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 :

(i) Objective questions 1, 2 and 3 are compulsory.

(ii) Answer rest of the questions as per directions.

1. Fill in the blanks : 1×5=5

(a) Specific resistance depends on the _____ of the material.

(b) An insulator has _____ temperature co-efficient of resistance.

[Turn over

(c) According to Ohm's law, incoming current _____ outgoing current.

(d) The maximum value of an alternating quantity is known as _____.

(e) Y = A+B is the boolean expression of _____ logic gate.

2. Answer in one word/sentence each : 1×5=5

(a) Define 1A current.

(b) Write one limitation of Ohm's law.

(c) Define electrical network.

(d) Define transformation ratio.

(e) What is the valence number of silicon ?

3. Match the following Columns : 1×5=5

Column – A	Column – B
(a) High band gap energy	(i) Power factor
(b) Resistive load	(ii) Universal logic gate
(c) Fuse	(iii) Safety element
(d) cosϕ	(iv) Unity power factor
(e) NOR gate	(v) Insulator

4. Define electric current. What are the factors on which the resistance of a conductor depends ? A coil consists of 2000 turns of copper wire having a cross-sectional area of 0.8 mm^2. The mean length per turn is 80 cm and the resistivity of copper is 0.02μΩm. Find the resistance of the coil and power absorbed by the coil when connected across 110 V DC supply. 2+3+6=11

5. What do you mean by active and passive network ? State and explain Kirchhoff's laws. Three resistors are connected in series across a 12 V battery. The first resistor has a value of 1 Ohm, second has a voltage drop of 4V and third has a power dissipation of 12W. Calculate the value of current. 2+4+5=11

6. What is the function commutator in DC generator ? What are the main parts of a DC generator ? Deduce the EMF equation of a DC generator. 2+4+5=11

Or

What is the significance of back EMF ? An 8-pole DC shunt generator with 778 wave connected armature conductors and running at 500 rpm supplies a load of 12.5Ω resistances at terminal voltage of 250 volt. The armature resistance is 0.24Ω and field resistance is 250Ω. Find the armature current, induced EMF and flux per pole. 2+9=11

7. Why the transformer is rated at kVA ? Define the terms Peak value, Time period, Cycle and Form factor. Derive the EMF equation of transformer. 2+4+5=11

Or

Show that in a RLC series network the resonant frequency, $fr = \frac{1}{2\pi\sqrt{(LC)}}$. A resistance of 20Ω, an inductance of 0.2H and a capacitance of 100μF are connected in series across 220V, 50Hz mains. Calculate the current and voltage across R, L and C, impedance, power and power factor consumed by the circuit. 3+8=11

8. What do you understand by forward and reverse biased diode ? Write the operation of PNP transistor. What is 7 segment display ? 3+5+3=11

Or

What are the basic logic gates ? Why NAND and NOR gates are called universal logic gates ? Write five safety precautions that are to be taken during electrical installation. 3+3+5=11