No. of Printed Pages : 5

OIEE-001

DECVI / DELVI / DCSVI / ACECVI / ACELVI / ACCSVI

Term-End Examination

December, 2017

00829

OIEE-001 : BASICS OF ELECTRICAL ENGINEERING

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Question no. 1 is **compulsory**. Use of scientific calculator is allowed. Missing data, if any, may be suitably assumed.*

---

1. (a) Two wires, A and B, of the same material and lengths l and $2l$ have radii r and 2r respectively. The ratio of their specific resistance will be

(i) 1 : 1

(ii) 1 : 2

(iii) 1 : 4

(iv) 1 : 8

(b) The temperature coefficient of resistance of an insulator is

(i) Positive and independent of temperature

(ii) Negative and independent of temperature

(iii) Negative and dependent of temperature

(iv) Positive and dependent of temperature

(c) A practical current source is represented by

(i) a resistance in series with an ideal current source

(ii) a resistance in parallel with an ideal current source

(iii) a resistance in parallel with an ideal voltage source

(iv) None of the above

(d) The superposition theorem is ***not*** applicable for

(i) voltage calculations

(ii) bilateral elements

(iii) power calculations

(iv) passive elements

(e) The efficiency for maximum power transfer to the load is

(i) 25%

(ii) 50%

(iii) 75%

(iv) 100%

(f) Three resistances each of value 3 Ω are connected in delta. Their value in each branch of equivalent star-connection will be

(i) 9 Ω

(ii) 6 Ω

(iii) 3 Ω

(iv) 1 Ω

(g) If E = 0 at all points on a closed surface,

1. the electric flux through the surface is zero.

2. the total charge enclosed by the surface is zero.

3. the charge resides on the surface.

(i) Only 1 and 2 are correct

(ii) Only 2 and 3 are correct

(iii) Only 1 and 3 are correct

(iv) 1, 2 and 3 are correct *7×2=14*

2\. (a) Explain the following :

(i) Series circuit

(ii) Parallel circuit

(b) Two coils connected in series have a resistance of 18 Ω and when connected in parallel have a resistance of 4 Ω. Find the resistance of each coil. *6+8*

3\. (a) Explain the construction of a nickel-iron cell. Write the chemical reaction during charging and discharging of nickel-iron cells.

(b) A battery consists of 20 cells each of emf 1·5 volts and internal resistance 0·2 Ω connected five in series per row, four rows in parallel. If this battery is connected to an external resistance of 1·25 Ω, how much current will it supply ? *6+8*

4\. (a) State the Biot-Savart law. Apply this law to derive the magnetic field due to an infinitely long straight current carrying thin conductor.

(b) Two long parallel wires A and B, 12 cm apart, carry currents of 750 A and 500 A respectively in opposite directions. Determine the flux density at the midpoint of the perpendicular line between the wires. *6+8*

5. (a) Define rms value, average value and form factor of a sinusoidally alternating voltage.

(b) Two alternating currents represented by the equations $i_1 = 7 \sin \omega t$, $i_2 = 10 \sin\left(\omega t + \frac{\pi}{3}\right)$ are fed into a common conductor. Find the equation for the resultant current and its rms vlaue. *6+8*

6. (a) State the advantages of a three-phase system over a single-phase system.

(b) A balanced star-connected load is supplied from a symmetrical 3-phase, 410 V system. The current in each phase is 30 A and lags 30° behind the phase voltage. Find the (i) phase voltage, (ii) total power, and (iii) reactive power drawn by the load. *6+8*

7. Write short notes on any ***four*** of the following: $4 \times 3\frac{1}{2} = 14$

(a) Phasor Representation of an Alternating Quantity

(b) Care and Maintenance of Lead-Acid Batteries

(c) Coulomb's Law

(d) Skin Effect

(e) Active and Reactive Powers

(f) Series Resonance