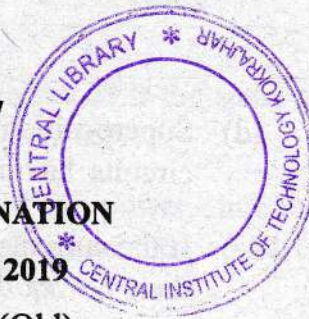


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RETEST EXAMINATION

NOVEMBER - 2019

Semester : 4th (Old)

Subject Code : EI-401

ELECTRICAL CIRCUIT AND NETWORK

Full Marks – 70

Time – Three hours

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

Instructions :

1. Questions on PART – A are compulsory.
2. Answer any *five* questions from PART – B.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10
 - (a) Insulators have _____ temperature coefficient of resistance.
 - (b) An active element in a circuit is one which _____ energy.
 - (c) kWh is the unit of _____.

[Turn over

- (d) Superposition theorem can be applied only to circuits having element like _____.
- (e) If the current in an electric bulb drops by 2%, then power decreases by _____.
- (f) If a phasor is multiplied by j , then only its _____ changes.
- (g) The form factor of a sinusoidal wave is _____.
- (h) Three-phase, four-wire system is a common feature of supply of _____.
- (i) In a 3 phase system the coils have phase difference of _____.
- (j) The power in a purely inductive circuit is _____.
2. Write true or false : $1 \times 10 = 10$
- (a) The ratio of voltage and electric current in a closed circuit remain constant.
- (b) A linear resistor is one which obeys Ampere's law.
- (c) An ideal voltage source should have zero internal resistance.

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- (d) Norton's equivalent resistance is the same as Thevenin's equivalent resistance.
- (e) For maximum transfer of power, internal resistance of the source should be equal to the resistance of the load.
- (f) Most of the AC instruments indicate average value.
- (g) Power factor is the cosine of the angle between voltage and current phasor.
- (h) A leading power factor implies that the current leads the voltage.
- (i) The operator j has a numerical value of $\sqrt{-1}$.
- (j) In a balanced 3-phase delta connected system, phase current is equal to line current.
3. Choose the correct answer : $1 \times 5 = 5$
- (a) A network having one or more than one source of emf is known as
- (i) passive network
- (ii) active network
- (iii) linear network
- (iv) non-linear network

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[Turn over

PART - B
Marks - 45

(b) If the length of a wire of resistance R is uniformly stretched to n times its original value, its new resistance is

- (i) nR (ii) R/n
(iii) n^2R (iv) R/n^2

(c) Superposition theorem is applicable for

- (i) linear circuit only
(ii) non-linear circuit only
(iii) both linear and non-linear circuit
(iv) None of the above

(d) A circuit component that opposes the change in circuit voltage is

- (i) resistance (ii) capacitance
(iii) inductance (iv) All of these

(e) Resonance in R-L-C circuit occurs when

- (i) $R = X_L - X_C$ (ii) $X_L = X_C$
(iii) $X < R$ (iv) $X_L = 2X_C$



4. (a) Define resistor and capacitor used in a circuit. 2

(b) A circuit consisting of three resistances of 12Ω , 18Ω and 36Ω respectively joined in parallel is connected in series with a fourth resistance R . The whole circuit is supplied at $60V$ and it is found that power dissipated in 12Ω resistance is $36W$. Determine the value of R and power absorbed in the parallel group. 5

(c) What are the advantages of parallel circuit? 2

5. (a) State and explain Thevenin's theorem with suitable diagrams. 5

(b) How does it differ from Norton's theorem? 2

(c) Explain Kirchhoff's First Law. 2

6. (a) Define RMS value, average value, and form factor. 3

(b) What do you mean by real, apparent and reactive power? 3

(c) Describe any one method of solving parallel AC circuit. 3

7. (a) What is the significance of j -operator ? 2
 (b) Deduce the expression of current, power angle, power and power curve when an AC circuit containing resistance, pure inductance and capacitance only. 6
 (c) What is meant by power factor ? 1
8. (a) Discuss parallel resonance. How it can be represented graphically ? 4
 (b) What are the different types of transients in an R-L circuit ? 5
9. (a) State and prove Maximum Power Transfer theorem. 4
 (b) Deduce the relationship of line and phase parameters in 3-phase star connected system. 5
10. In a series parallel circuit the parallel branches A and B are in series with C. The impedances are $Z_A = 5 + j3$, $Z_B = 9 - j7$ and $Z_C = 6 + j5$. If the voltage applied to the circuit is 180V at 50Hz. Calculate :
 (i) Currents I_A , I_B and I_C .
 (ii) The total power factor for the whole circuit. 6+3=9

11. An R-L-C series circuit containing a resistance of 75Ω , a coil of 318 mH and a capacitor of $100\mu F$ connected to 50 Hz supply. The voltage across the 75Ω resistance is 150 V. Calculate the phase angle, supply voltage, and power consumed by the circuit. 3+3+3=9

12. Write short notes on the following : 3+3+3=9
 (i) Kirchhoff's laws
 (ii) R-L-C series circuit
 (iii) Transient response on an R-L circuit.

