Total No. of printed pages = 6

El-401/ECN/4th Sem/2018/M

ELECTRICAL CIRCUIT AND NETWORK

Full Marks – 70

Time – Three hours

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

PART – A

Marks – 25

Time – One hour

Answer *all* the questions.

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

   (a) Norton's theorem can be applied only in ____ circuit.

   (b) A network having one or more than one source of e.m.f is known as _____ network.

   (c) In a parallel RLC circuit, with $X_L > X_C$ the circuit behaves as _____.

[Turn over

(d) Admittance is equal to the reciprocals of _____.

(e) Number of cycles per second is called _____.

(f) The equation of true power is _____.

(g) The ratio of true power by apparent power is called _____.

(h) Negative phase angle means _____.

(i) In delta connected three phase system, the line voltage = _____.

(j) In the two parallel branches of a parallel circuit, more current will flow through that branch which has _____ impedance.

2. State true or false : $1 \times 10 = 10$

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

(b) The total resistance in a series circuit is always less than the least resistor.

(c) The voltages across all components in a parallel circuit are equal.

(d) Thevenin's resistance is found by removing voltage sources along with their internal resistance.

(e) An ideal voltage source should have zero source resistance.

(f) The superposition theorem requires as many circuits to be solved as there are sources.

(g) The time period of a wave is same as frequency.

(h) Form factor is the ratio of r.m.s value and average value.

(i) At series resonance, applied voltage V = voltage across R.

(j) The power factor of pure capacitive circuit is 1.

3. Multiple choice questions : $1 \times 5 = 5$

(a) In a star-connected system, the current flowing through the line is :

(i) Greater than the phase current

(ii) Equal to the phase current

(iii) Lesser than the phase current

(iv) None of these.

(b) Ohmic value of capacitive coil is called :

(i) Impedance

(ii) Resistance

(iii) Capacitive reactance

(iv) Inductive reactance

(c) In a three phase AC circuit, the sum of all three generated voltage is :

(i) Infinite

(ii) One

(iii) Zero

(iv) None of the above.

(d) In case of inductive circuit, frequency is ____ proportional to the inductive reactance.

(i) directly

(ii) inversely

(iii) No effect

(e) Unit of admittance is :

(i) Ohm

(ii) Siemens

(iii) Henry

(iv) Farad.

PART – B

Marks – 45

Time – Two hours

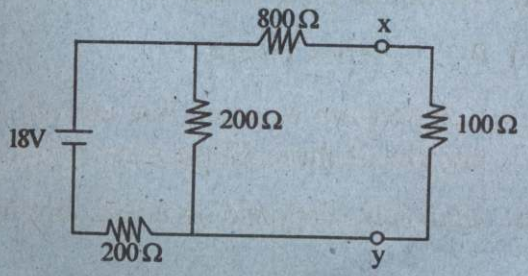
Answer any *three* questions.

4. (a) Define parameters, non-linear circuit, bilateral circuit and active network. 6

(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 the power dissipated in 12Ω resistance is 36 W. Determine the value of "R" and power absorbed in the parallel group. 9

5. (a) Prove the reciprocity theorem. 5

(b) Find the voltage across 10 ohm resistor by constructing Norton's equivalent circuit in the figure to the left of terminals x-y. 10



6. (a) A coil of resistance 12Ω and inductive reactance of 25Ω is connected in series with a capacitive reactance of 15Ω. The combination is connected to a supply of 230V, 50 Hz. Find 9

(i) Circuit impedance

(ii) Current

(iii) Power consumed.

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

7. 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 50 Hz. calculate : 15

(a) Current I_A, I_B and I_C.

(b) The total power factor for the whole circuit.

8. Write short notes on any *three* : 5×3=15

(a) Maximum power transfer theorem

(b) R-L-C series circuit

(c) Relationship between line current and phase current of three phase star-connect system.

(d) Transient response on a R-L circuit.