Total No. of printed pages = 5

EI-401/ECN/4th Sem/2016/N

ELECTRICAL CIRCUIT AND NETWORK

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer question No.1 and any *four* from the rest.

1. Fill in the blanks : 1×10=10

(i) The power equation of R-L-C series circuit is P = ———.

(ii) Admittance is equal to the reciprocal of ———.

(iii) Super position theorem can be applied only in ——— circuit.

(iv) In delta connected three-phase system, the line voltage = ———.

(v) VI sin ϕ is called ——— power.

(vi) A linear circuit is one whose parameters are constant, they do not change with ——— or ———.

[Turn over

(vii) Number of cycles per second is called ———.

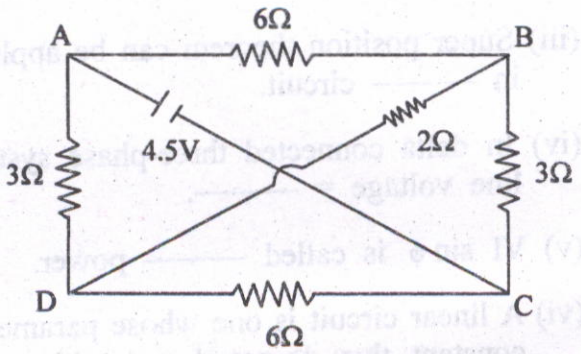
(viii) An ideal voltage source has ——— internal resistance.

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

(x) Equivalent dynamic impedance of parallel circuit at resonance is given by ———.

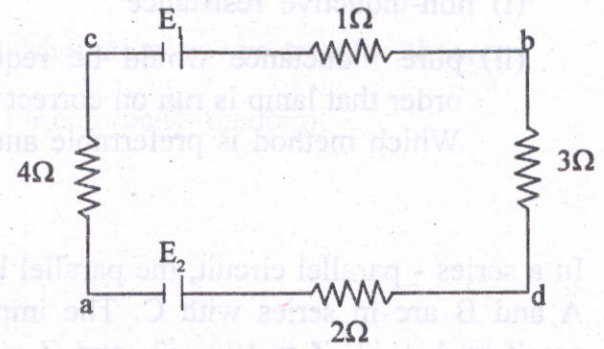
2. (a) State and explain the Thevenin's theorem. 7

(b) ABCD is a rectangle whose opposite sides AB, DC represent resistance of 6Ω each, while AD and BC represent 3Ω each. A battery of e.m.f 4.5V and negligible resistance is connected between diagonal points A and C and 2Ω resistance between B and D. Find the magnitude and direction of current in the 2Ω resistor by using Thevenin's theorem. 8



3. (a) State and explain Kirchhoff's laws. 7

(b)



In the above figure, the voltage rise from a to b is 16.0 volt and that from c to d is 17.4 volt. Determine

(i) the magnitude of each e.m.f E_1 and E_2.

(ii) the daily energy output in watt-hour of the part cb. 8

4. (a) Define the following terms : 2×3=6

(i) Phase difference

(ii) Form factor

(iii) J-operator.

(b) A 120V, 60W lamp is to be operated on 220V, 50 Hz supply mains. Calculate what value of

(i) non-inductive resistance

(ii) pure inductance would be required in order that lamp is run on correct voltage. Which method is preferrable and why ? 9

5. In a series - parallel circuit, the parallel branches A and B are in series with C. The impedances are $Z_A = 4 + j3$, $Z_B = 10 - j7$, and $Z_C = 6 + j5$.

If the voltage applied to the circuit is 200V at 50 Hz, calculate

(a) Current I_A, I_B and I_C

(b) The total p.f for the whole circuit. 15

6. (a) Establish the relationship between 8

(i) Line current and phase current

(ii) Line voltage and phase voltage of three phase star and delta connected system.

(b) Prove that the resonance frequency of a parallel circuit is given by 7

$$f_r = \frac{1}{2\pi}\sqrt{\frac{1}{LC} - \frac{R^2}{L^2}}$$

7. Write short notes on any *two* : $7\frac{1}{2} \times 2 = 15$

(i) Transient response in R-L circuit

(ii) Maximum power transfer theorem

(iii) Reciprocity theorem.