Course Code:	EC3T01	Semester:	III	Total Marks	60
Course Name:	NETWORK THEORY			Time:	3 hr.

Answer the following questions.

A. Choose the correct answer. (1x10=10)

1. In an ac circuit, the current
   (a) is always in-phase with the emf
   (b) always lags the emf
   (c) always leads the emf
   (d) any of the above, depending upon the elements of the circuit.

2. Which is the following statement is not necessarily valid for ac current: Alternating current
   (a) interferes with the communication line
   (b) provides better safety as compared to d.c.
   (c) is suitable for charging batteries
   (d) develops eddy current losses

3. In an ac circuit, power is consumed only in
   (a) inductance   (b) capacitance   (c) resistance   (d) all the given above

4. A closed path made by several branches of the network is known as
   (a) Junction   (b) loop   (c) circuit   (d) node

5. In an ac source R=36Ω, frequency=50Hz, L=0.12 H, then phase difference between current and voltage nearly
   (a) 90°   (b) 45°   (c) 60°   (d) 75°

6. An inductor stores energy in
   (a) electrostatic field   (b) magnetic field   (c) core   (d) electromagnetic field

7. At $t = 0^+$ with zero initial condition, which of the following act as open circuit
   (a) Inductor   (b) capacitor   (c) resistance   (d) all the above

8. At resonance, in series LCR circuit, which relation is not valid
   (a) $\omega = \frac{1}{LC}$ (b) $\omega = \frac{1}{\sqrt{LC}}$ (c) $L\omega = \frac{1}{\omega C}$ (d) $\omega = \frac{1}{\omega L}$

9. In a cut set graph, number of branches are B=4, number of nodes are N=3. Number of links will be
   (a) 4   (b) 3   (c)   (d) 1

10. Kirchhoff's law is applicable to
    (a) ac circuits only
    (b) dc circuits only
    (c) ac as well as dc circuits
    (d) passive network only

B. Answer any five questions. (5x4=20)

1. What are the properties of tree in a graph? Define the following terms of network graph branch; chord; degree of node; cut-set.

2. A series RLC circuit has R = 10Ω, L = 60 mH and C farad capacitance. At a frequency of 25 Hz, the power factor of the circuit is 45° lead. At what frequency will the circuit be resonant?

3. State Substitution Theorem and Maximum Power Transfer Theorem.
4. Discuss is the effect of resistance on the frequency response curve of a series resonance circuit.
5. Give the properties of resonance of RLC series and parallel circuit.
6. A dc voltage of 100 V is applied to a coil having $R = 10\ \Omega$ and $L = 10$ H. What is the value of the current 0.1 sec later the switching on? What is the time taken by the current to reach half of its final value?
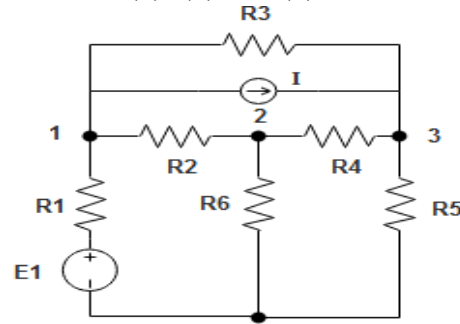7. Develop nodal equation in nodes (1), (2) and (3) in the circuit given in fig.1

figure 1

C. **Answer any four questions.** (4x7.5=30)
8. What is transient time? Explain transient response of series RL circuit having DC excitation. Show its exponential rise of current expression.
9. What is resonance? Derive the relation between Q-factor, BW and resonance frequency of a series resonating circuit.
10. From the given network in fig. 2, draw its graph. Select a suitable tree and obtain the tie-set matrix. Write the KVL equation from the tie-set matrix.
11. Using Thevenin's theorem, find the current in 5Ω resistance in the circuit as shown in fig. 3
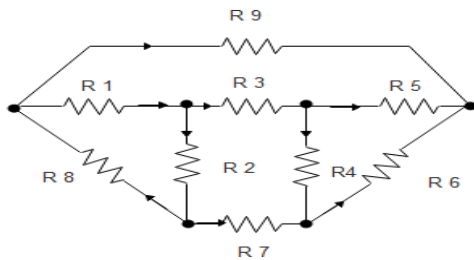

figure 2   *figure 3*
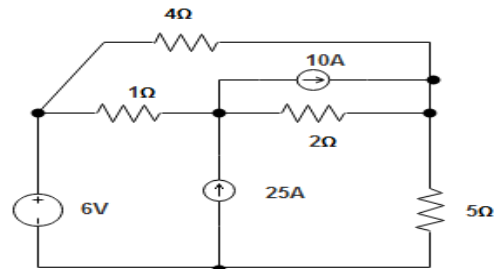
12. Using mesh analysis, obtain the current through the 10V battery for the circuit shown in figure 4.
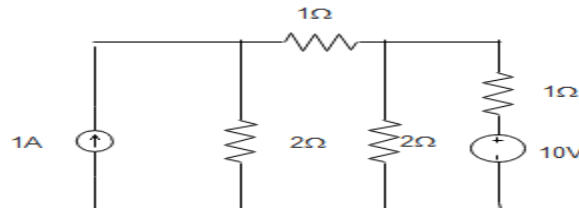

figure 4

13. A 15 μF capacitor is connected in series with a 1.1 MΩ resistor. This series combination is connected across a 120 V dc supply. Calculate
    (i)   The time constant of the circuit
    (ii)   The initial value of the charging current

(iii)   The initial rate of rise of voltage across the capacitor.

(iv)   The voltage across the capacitor after a time equal to the time constant.

(v)   The voltage across the capacitor at 4 sec after switch-on.

(vi)   The time taken by the capacitor voltage to reach 60 V

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