

B.E DEGREE EXAMINATIONS DEC 2012

Second Semester

ECE101 CIRCUIT THEORY

(Common to ECE/EIE)

Time: Three Hours

Maximum Marks:100

Answer ALL Questions:-

PART A (10x1=10 Marks)

1. In general, there will be ----- independent KCL equations in an n node circuit.
a) n-1 b) n c) 2n-1 d) 2n
2. Current through a capacitor with constant voltage across it is -----
a) maximum b) Zero c) minimum d) constant
3. If the load circuit is a single resistor of value R_L , then condition for maximum power transfer reduces to.
a) $R_L = R_0$ b) $R_L = - R_0$ c) $R_L = 0$ d) $R_L = \infty$
4. A circuit is linear if all the circuit variables in it obey-----principle.
a) homogeneity b) superposition c) both a & b d) reciprocity
5. Instantaneous power delivered to an element is a ----- function of time in general.
a) varying b) constant c) average d) not
6. The ratio between active and ----- power is called as power factor of the circuit.
a) real b) true c) apparent d) reactive
7. The power factor of a given circuit is lagging. Then the circuit is
a) inductive b) capacitive c) resistive d) active
8. The dual element of a series inductor is
a) Series capacitor b) Parallel capacitor c) Series resistor d) Parallel resistor
9. At resonant frequency the amplitude is relatively
a) zero b) maximum c) minimum d) infinity
10. If a current enters a dotted terminal it induces _____ voltage at the dotted terminal of the second coil.
a) Less b) More c) positive d) negative

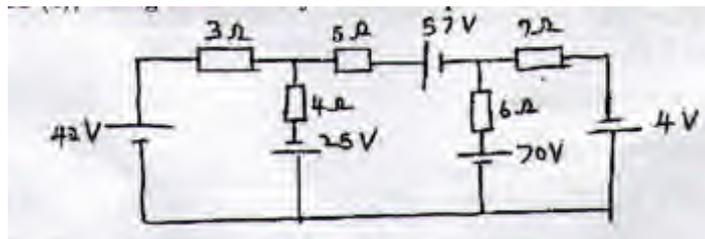
PART B (10 x 2 = 20 Marks)

11. Define Kirchoff's voltage law.

12. How resistance is affected by change of frequency?
13. State reciprocity theorem.
14. Give the equivalent circuit of a voltage source of 100V with series resistance of 2Ω .
15. Enumerate the significance of phasor diagrams.
16. A $2\text{ k}\Omega$ resistor in series with a $0.1\ \mu\text{F}$ capacitor is given an input of 10 V rms, sine wave signal at 500 Hz. Determine the total impedance.
17. Define resonance.
18. Sketch the transient current $i(t)$ Vs t graph for a series RL circuit.
19. State Dot rule for coupled circuits.
20. What is duality?

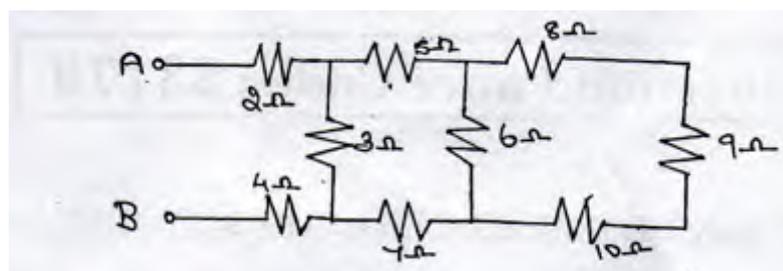
PART C (5 x 14 = 70 Marks)

21. a) Find the current in $4\ \Omega$ resistor in the circuit shown in fig below, using mesh analysis technique.

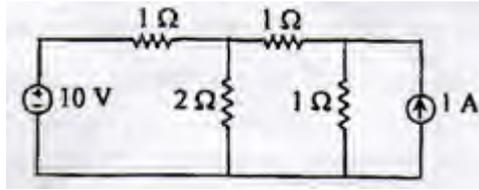


(OR)

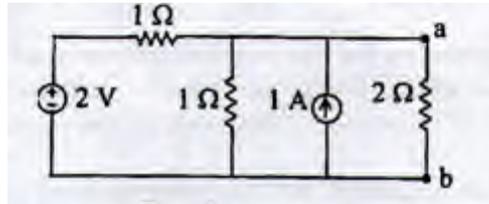
- b) Find the current through $6\ \Omega$ resistor.



22. a) (i) Calculate the current through the 2 resistor in the circuit using super position theorem. (8)

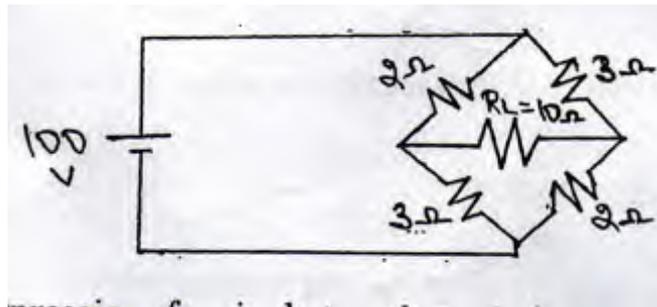


(ii) Calculate the current through the 2 resistor in the circuit using Thevenin's theorem.(6)

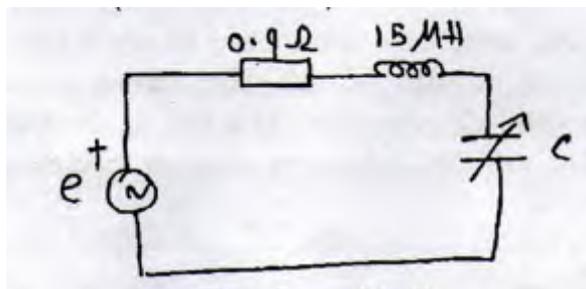


(OR)

b) Find the current through resistor R_L using Norton's theorem and draw the equivalent circuit.

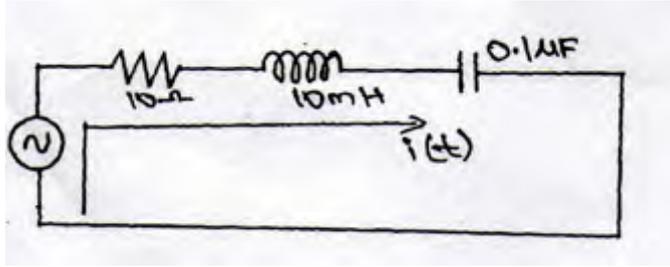


23. a) The signal voltage in the circuit shown below is $e(t) = 0.01 \sin(2 \times 455 \times 10^3 t)$ V. What should be the value of C in order that the circuit would resonate at this signal frequency? At this condition, find the values of I, V_c , Q and bandwidth of the circuit.



(OR)

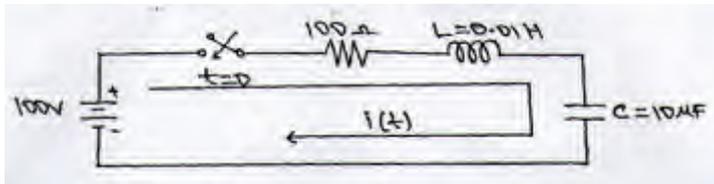
b) In the given circuit with 100 V ac supply at resonance, find resonant frequency, current and voltages across R,L and C. Also find the quality factor and bandwidth.



24. a) Derive the expression for transient response in RL circuit excited by DC source with suitable waveform.

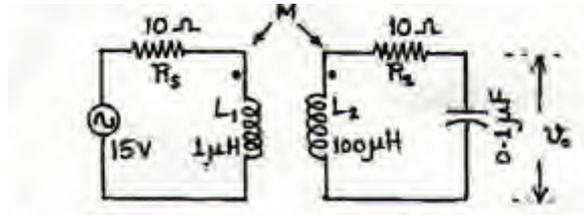
(OR)

b) For a given series RLC circuit find transient current when switch is closed at $t = 0$. Assume relaxed initial conditions.



25. a) (i) Derive the relationship between self inductance, mutual inductance and coefficient of coupling. (6)

(ii) Consider the single tuned circuit and determine resonant frequency, output voltage at resonance. Assume $R_s \gg \omega L$ and $K = 0.9$. (8)



(OR)

b) Draw the dual network of the given network.

