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B.E DEGREE EXAMINATIONS: JUNE 2013

Second Semester

ECE101: CIRCUIT THEORY

(Common to ECE & EIE)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The impedance of a ideal current source should be
   a) 0 b) ∞
   c) Greater than 0 but less than ∞ d) Less than 0
2. When two resistorsR1 and R2 (R1<R2) are in parallel the resultant R is
   a) Sum of R1 and R2 b) Less than R1
   c) Between R1 and R2 d) Greater than R2
3. Maximum power transfer occurs at the efficiency of
   a) 25% b) 100%
   c) 50% d) 75%
4. Given V TH = 20 V and R TH= 4 Ω the current in the load resistance is
   a) 4A b) Less than 4A
   c) 4A or less d) Greater than 4A
5. In RL circuit the phase angle difference between voltage and current is
   a) 30 º b) 90 º
   c) 180 º d) Greater than 0º but less than 90 º
6. The average power delivered to the reactive load is
   a) zero b) v(t)+ i(t)
   c) VI sin φ d) VI
7. The transient currents is associated with the
   a) Changes in the stored energy in the inductors and capacitors Impedance of the circuit
   c) Applied voltage of the circuit Resistance of the circuit
8. A series resonant circuit at resonance is called
   a) An accepter circuit b) A rejecter circuit
   c) An oscillator circuit d) A damped circuit
9. The inductance of the coil can be increased by
   a) Increasing core length b) Decreasing the diameter of the coil
   c) Decreasing number of turns d) Choosing the core material having high relative permeability
10. Two networks can be dual when
    a) their nodal equations are the same b) the loop equations of one network are the nodal equations of the other
    c) their loop equations are the same d) none of these

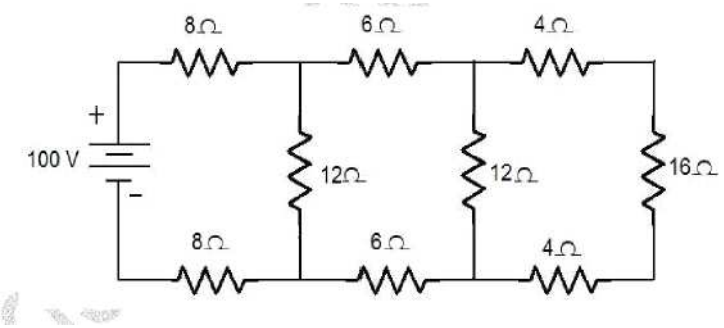
PART B (10 x 2 = 20 Marks)

11. Name different network elements.
12. What are the differences between loop analysis and nodal analysis?.
13. State superposition theorem.

14. Give the expressions for star to delta transformation.
15. Define R.M.S value.
16. Calculate the power factor if $V(t) = V \sin \omega t$ and $I(t) = I \sin (\omega t - 45^{o})$
17. What is meant by resonance? What is its significance?
18. What is the time constant of RC circuit? What does it represent?
19. Define coefficient of coupling.
20. What are trees and chords?

PART C (5 x 14 = 70 Marks)

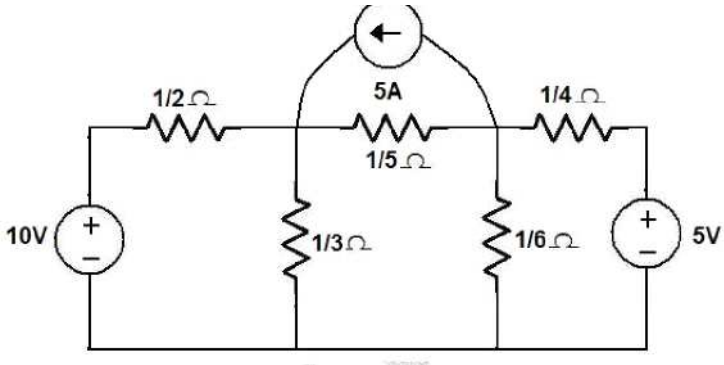
21. a) (i) Calculate a) the equivalent resistances across the terminals of the supply, b) total current supplied by the source and c) power delivered to 16 ohm resistor in the circuit shown in figure (9)



(ii) Discuss voltage and current division principles. (5)

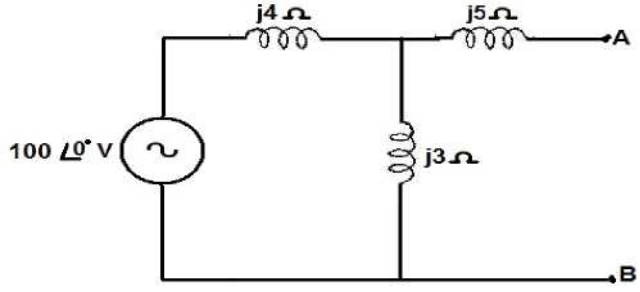
(OR)

b) (i) Using the node voltage analysis, find all the node voltages and currents in 1/3 ohm and 1/5 ohm resistances of figure (10)



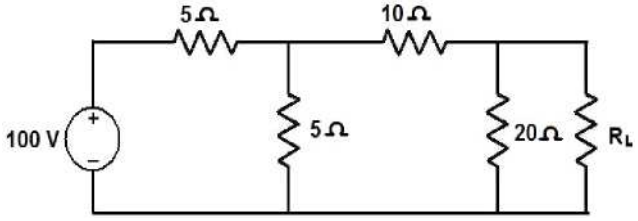
ii) For the mesh-current analysis, explain the rules for constructing mesh impedance matrix and solving the matrix equation [Z] I = V. (4)

22. a) (i) Determine the Norton's equivalent circuit (7)



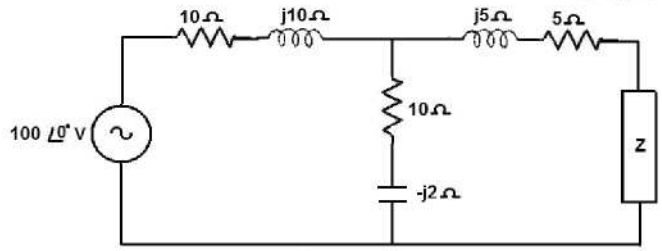
(ii) Using superposition theorem calculate current through (2+j3) ohm impedance (7)

branch of the circuit shown

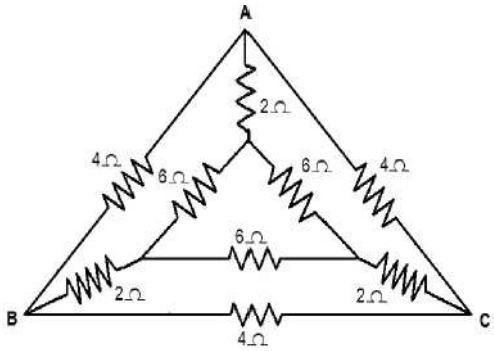


(OR)

b) (i) Find the value of impedance Z so that maximum power will be transferred from source to load for the circuit shown. (7)



(ii) Find the equivalent resistance between B and C in figure (7)



23. a) (i) An impedance consumes a power of 60 watts and takes a current of (10-j8)A when connected to a source of (a+j5) Volts. Find a and the circuit elements. (4)

(ii) Two impedances Z1 and Z2 are connected in parallel across a 230V, 50 Hz supply. Z1 consists of a 40 Ω resistor in series with a 0.2 H inductor, and Z2 consists of a 10 Ω resistor in series with a 0.073 H inductor. Draw the phasor diagram of the total current. Determine the power dissipated in each branch and the resultant power factor. (10)

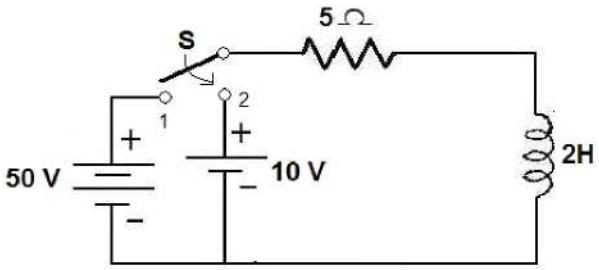
(OR)

b) (i) In a circuit, two impedances Z1= (10+j20)Ω and Z2= (15-j15)Ω are connected in parallel across a 200V, 50 Hz supply. Find Zeq and Yeq. (7)

(ii) Three impedances Z1= 5∟30º, Z2= 4∟60º and Z3= 10∟-20º are connected in series with 100 ∟0º voltage source. Verify kirchoff's voltage law. (7)

24. a) (i) Derive the necessary equations for the response of RL circuit to step input. (4)

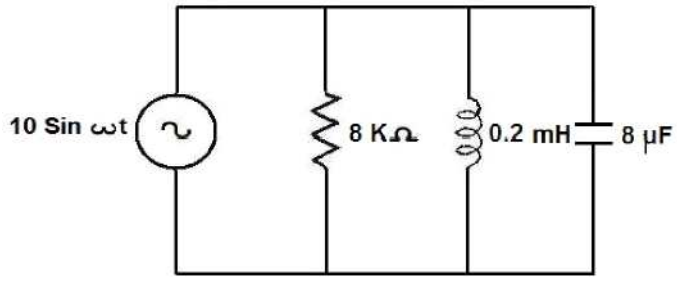
(ii) In the circuit shown in figure, switch S is in position 1 for a long time and brought to position 2 at time t=0. Determine the circuit current (10)



(OR)

b) (i) A series RLC circuit has Q = 75 and a pass band (between half power frequencies) of 160 Hz. Calculate the resonant frequency and the upper and lower frequencies of the pass band (7)

(ii) In the parallel RLC circuit, calculate resonant frequency, bandwidth and Qfactor (7)



25. a) (i) Explain the principle of duality. How do we find the dual of a given network?. (7)

(ii) What is an ideal transformer. Draw it's equivalent circuit. (7)

(OR)

b) (i) Draw the graph corresponding to the given incidence matrix: (7)

$$A = \begin{bmatrix} -1 & 0 & 0 & 0 & +1 & 0 & +1 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 & -1 & +1 \\ 0 & 0 & -1 & -1 & 0 & -1 & 0 & -1 \\ 0 & 0 & 0 & 0 & -1 & +1 & 0 & 0 \\ -1 & +1 & +1 & +1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

(ii) Define tie-set. With the help of a suitable example, explain the term 'tie-set matrix' used in network analysis. (7)

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