Register Number: ……..

B.E DEGREE EXAMINATIONS: MAY/JUNE 2014

(Regulation 2009)

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. Approximately how many mill amperes of current flow through a circuit with a 40 V source and 6.8 kΩ of resistance?
   a) 27.2 mA b) 59 mA
   c) 5.9 mA d) 590 mA
2. A voltage divider consists of two 68 kΩ resistors and a 24 V source. The unknown output voltage is
   a) 12 V b) 24 V
   c) 6 V d) 0 V
3. Superposition theorem is applicable only to networks that are
   a) Linear. b) Passive.
   c) Nonlinear. d) Time-invariant.
4. A network N is to be connected to load of 500 ohms. If the Thevenin's equivalent voltage and Norton's equivalent current of N are 5Volts and 10mA respectively, the current through the load will be
   a) 10 mA b) 2.5 mA
   c) 5 mA d) 1 mA
5. The phasor diagram for an ideal inductance having current I through it and voltage V across it is

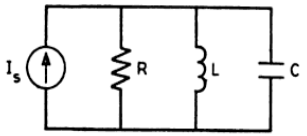
   a) 

   b) 

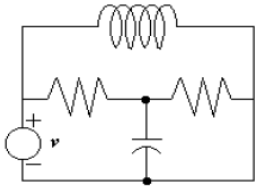
   c) 

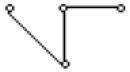
   d) 

6. An L-C impedance or admittance function
   a) Have simple poles and zeros in the left half of the s-plane. b) Has no zero or pole at the origin or infinity.
   c) Have all poles on the negative real axis of the s-plane. d) Is an odd rational function.
7. A series R-L-C circuit under resonance condition is called
   a) is always 50 % b) is infinity
   c) depends on the circuit parameters d) is 100 %
8. Referring to figure, given R = 5 , L = 1/5 , C= 1/5 and Is = sin $\omega_o t$, where ω_o is the resonant frequency. The magnitude of current through C is given by



   a) 1/5 b) 1
   c) 0 d) 5
9. The mutual inductance M associated with the two coupled inductances L1 and L2 is related to the coefficient of coupling K as follows
   a) M = K √L1L2 b) M = K / √L1L2
   c) M = K / L1L2 d) M = KL1L2
10. A possible tree of the topological equivalent of the network of Figure is



   a) 
   b) 
   c) Neither (A) nor (B) d) Both (A) and (B)

PART B (10 x 2 = 20 Marks)

11. Three resistors R1 = 3Ω R_2 = 4Ω R_3 = 8Ω are connected to current source of 5A in parallel. Apply Kirchhoff's current law and justify it.
12. Define mesh analysis of a circuit.
13. Compare Thevenin's theorem and Norton's theorem
14. Write some applications of Maximum power transfer theorem.
15. Draw the phasor diagram for RL and RC circuits
16. Distinguish between real power and reactive power
17. Write the conditions for resonance in series RLC circuits
18. What is meant by parallel resonance?
19. What is the maximum possible mutual inductance of two inductively coupled coils with self inductance L_1=25mH and L_2=100mH?
20. What is duality?

PART C (5 x 14 = 70 Marks)

21. a) In the circuit shown in the fig.1, determine the current through the 2 ohm resistor and the total current delivered by the battery. Use Kirchhoff's laws.

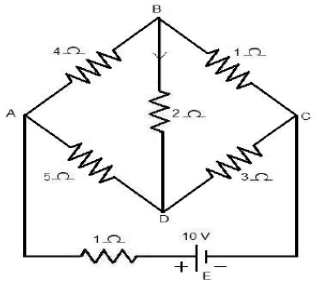


fig.1

(OR)

b) Determine the current delivery by the source in the circuit shown in the fig.2 below

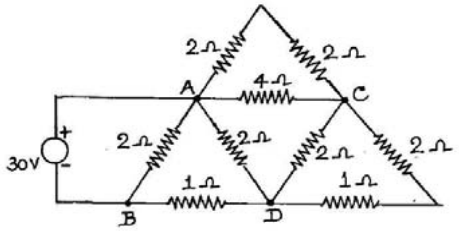


fig.2

22. a) (i) Determine the equivalent Norton network at the terminals a and b of the circuit shown in Fig.3 below. (7)

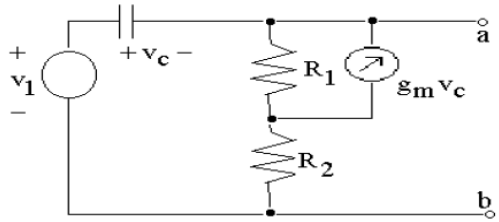


fig.3

(ii) Use the Thevenin equivalent of the network shown in Fig.4 to find the value of R which will receive maximum power. Find also this power. (7)

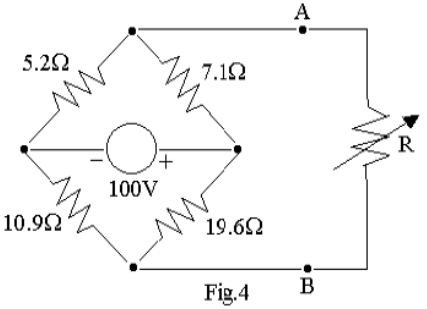


Fig.4

(OR)

b) (i) Using superposition theorem for the network shown in Fig.5, find the value of i_x . (7)

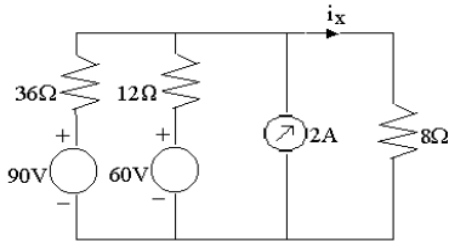


fig.5

(ii) Explain procedure of delta-wye(Δ - Y) conversion with necessary circuit (7)

23. a) (i) What are the advantages of sinusoidal AC supply? List the characteristics of sinusoidal function. (7)

(ii) Draw the phasor diagram for R, L, C series circuit when it is excited by Sinusoidal voltage? (7)

(OR)

b) Two impedance Z1 = (5 + j6) Ω and Z2 = (8 + j12) Ω are connected in parallel across a 230V, 50 Hz supply. Calculate (i) total impedance and admittance (ii) over all power factor of the given circuit (iii) apparent, active and reactive power (iv) current drawn by the circuit and (v) the capacitance required in parallel with the circuit to make the power factor unity.

24. a) A series RLC circuit consists of R=100 ohm, L = 0.02 H and C = 0.02 microfarad. Calculate frequency of resonance. A variable frequency sinusoidal voltage of constant RMS value of 50V is applied to the circuit. Find the frequency at which voltage across L and C is maximum. Also calculate voltage across L and C is maximum. Also calculate voltages across L and C at frequency of resonance. Find maximum current in the circuit.

(OR)

b) For the parallel circuit shown in fig. 6. Find the resonance frequency.

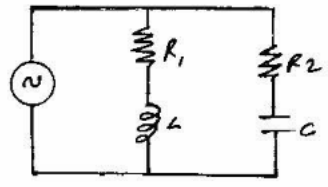


fig.6

25. a) In the coupled circuit shown in fig. 7. find the voltage and current across 5 ohm resistance

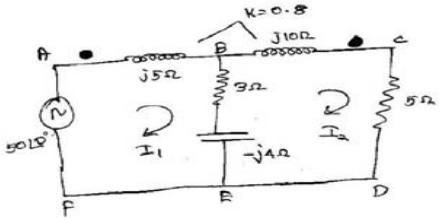


fig.7

(OR)

b) (i) Using nodal analysis, determine the Power supplied by 8V Voltage source. (7)
(fig.8)

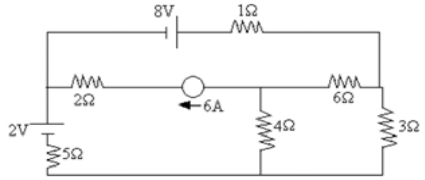


fig.8

(ii) Two identical coils with L=0.02H have a coefficient of coupling of 0.8. Find mutual inductance and the two equivalent inductances with the two coils connected in series aiding and series opposing. Derive the equations employed. (7)

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