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B.E / B.TECH (Full Time) DEGREE END SEMESTER EXAMINATIONS, April - May 2014

ELECTRONICS AND COMMUNICATION ENGINEERING

SECOND SEMESTER
EC 8251 CIRCUIT THEORY

(REGULATIONS 2012)

Common to B.E. Biomedical Engineering

Time: 3hour **Max Marks: 100**

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. An electrical appliance consumes 1.2 kWh in 30 minutes at 120 V. What is the current drawn by the appliance ?

2. Calculate the equivalent resistance between the terminals "a" and "b" , in Fig. 1.

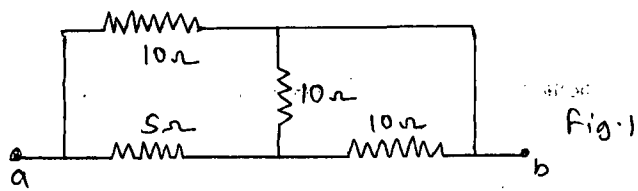
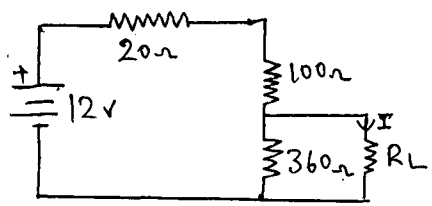


Fig.1

3. Calculate the value of I_N for the circuit, shown in Fig.2



4. State Maximum Power transfer theorm for DC networks.
5. Given a circuit with an impedance Z = 3 + j4 and an applied voltage V = 100∠30 volt. Draw the power triangle.

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6. A 4 Ω resistor is in parallel with a j3 Ω reactance . Obtain a series equivalent such that the circuit draws the same current for a given voltage.

7. A coil of resistance 2.2 Ω and an inductance 0.01 H is connected in series with a capacitor across a 220 V mains. Find the value of capacitance such that maximum current flows in the circuit at a frequency of 190 Hz. Also find the maximum caurrent.

8. A 50μF capacitor is discharged through a 100 KΩ resistor. If the capacitor is initially charged to 400V, determine the initial energy.

9. Calculate the total inductance of the circuit, if the coefficient of coupling (k) between the two coils is 0.6, as shown in Fig.3

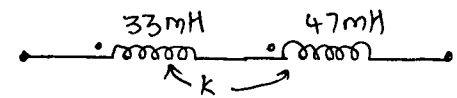

Fig.3

10. What do you understand by graph of a network ?

Part – B (5 x 16 = 80 Marks)

11. (i) Using node analysis, find the node voltages and the currents through all the resisitors, for the circuit shown in Fig.4. (12)

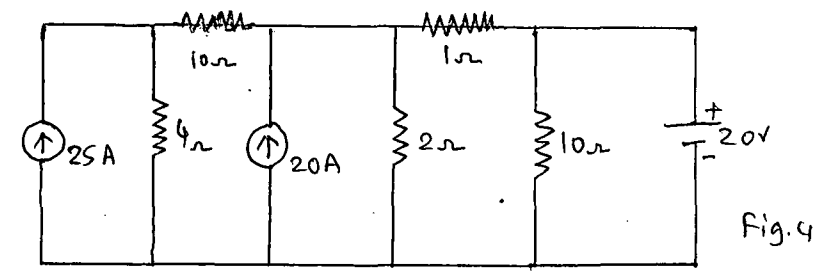

Fig.4

(ii)Find the equivalent resistance between the terminals "a" and "b" for the network shown in Fig.5 (4)

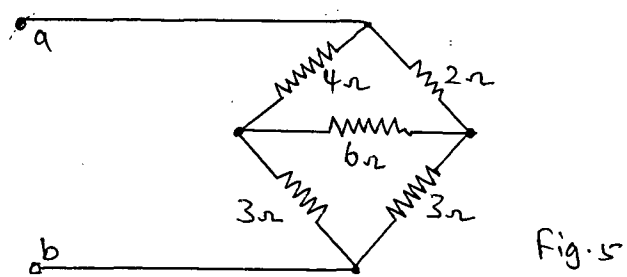

Fig.5

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12.a.Find the current , I, through the 20 Ω resisitor shown in Fig.6, using Thevenin's theorem. (16)

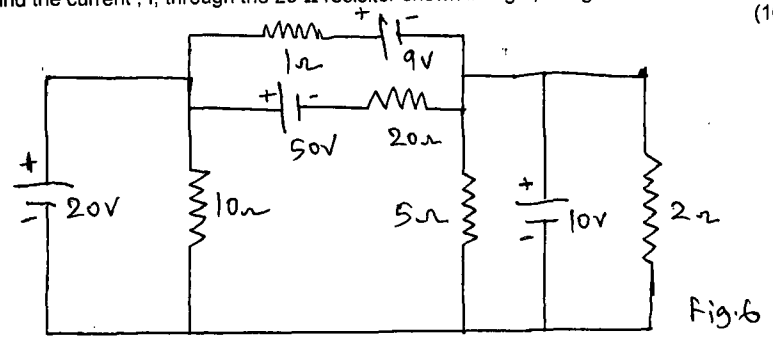

Fig.6

(Or)

b. Find the current through 5 Ω resistor using Superposition theorem, in the circuit shown in Fig.7. (16)

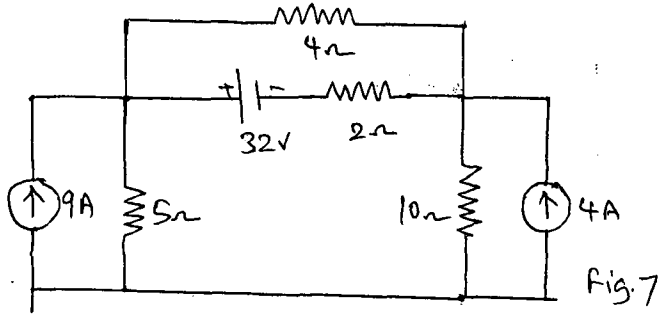

Fig.7

13.a.Determine the input impedance, admittance for the circuit, shown in Fig.8. Also draw the power triangle for the circuit. (16)

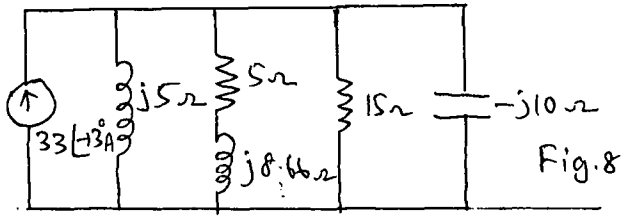

Fig.8

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(Or)

b.(i) Determine the value of "L" in the circuit shown in Fig.9. (6)

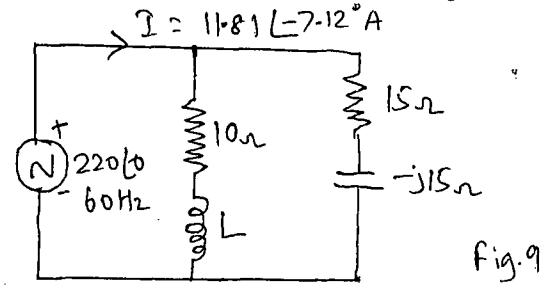

Fig.9

(ii) Obtain the Norton Equivalent circuit for the network external to branch " a – b " in Fig. 10. (10)

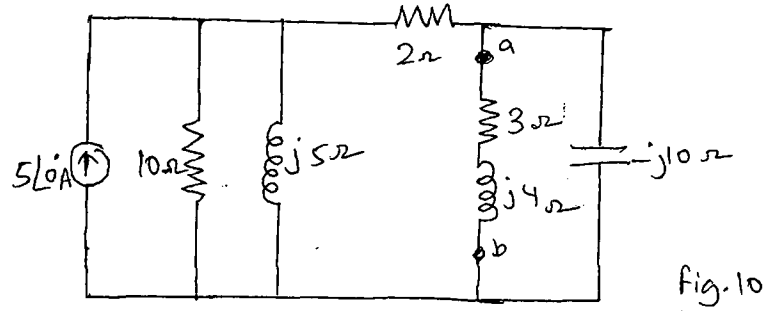

Fig.10

14.a.(i) Impedance Z_1 and Z_2 are parallel and this combination is in series with an impedance Z_3, connected to a 100V, 50 Hz ac supply. $Z_1 = (5 - jXc)\Omega$, $Z_2 = (5 + j\,0)\Omega$, $Z_3 = (6.25 + j\,1.25)\ \Omega$. Determine the value of capacitance such that the total current of the circuit will be in phase with the total voltage. Find the circuit current and power. (10)

(ii)A circuit consisting of a capacitor in parallel with a coil whose inductance and resistance are 1.05 mH and 100 Ohms respectively, is driven at its resonance frequency of 600 KHz from a constant current source of 2.30 mA, 600 KHz. The current source has a 60 K Ohm source resistance. Determine the Q of the coil and the capacitance. (6)

(Or)

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b. (i) A series RLC circuit is connected to a voltage source by closing a switch.Determine the transient expression for current for all cases. (10)

(ii) The switch in the circuit shown in Fig. 11 is moved from position 1 to 2 at t = 0. Find the expression for voltage across resistance and capacitor, energy in the capacitor for t > 0. (6)

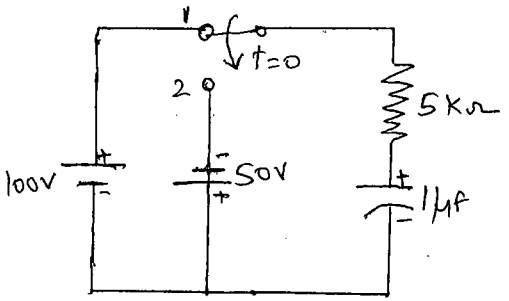

Fig.11

15.a.(i) For a magnetically coupled circuit, derive the expression for Mutual inductance (M) in terms of L_1 and L_2. (6)

(ii) For the coupled circuit shown in Fig.12, Find the value of V_2 so that the current $I_1 = 0$. (10)

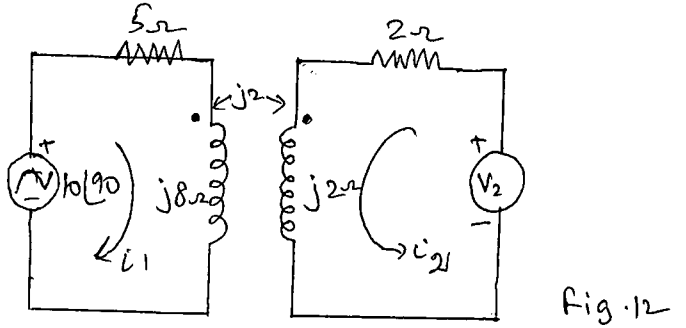

Fig.12

(Or)

b.Outline the procedure for obtaining the branch voltages and currents using Tie Set procedure. Also verify the same using a simple two loop dc circuit. (16)