ROLL NO.										✓

B.E. / B.TECH (FULL TIME) DEGREEE END SEMESTER EXAMINATIONS, MAY 2013

ELECTRONICS AND COMMUNICATION ENGINEERING

SECOND SEMESTER REGULATIONS: R-2012

EC 8251 – CIRCUIT THEORY

(Common to B.E.Biomedical Engineering II Semester)

Time: 3 Hours **Answer ALL Questions** **Max.Marks: 100**

Part-A (10 x 2 = 20 Marks)

1. A car battery supplies 48J of energy at 12 V over a certain period of time. Determine the charge moved during this period.
2. Calculate the resistances of 110 V light bulbs rated at 25, 40 and 100 W.
3. State superposition theorem.
4. Convert the given circuit (Fig.Q4) to the frequency domain.
5. Draw the phasor diagrams of the following sinusoids;

   $v_1(t) = 10 \cos(4t-60^0)$ V

   $v_2(t) = -4 \cos(4t)$ V

   and $v_3(t) = 5 \sin(4t+40^0)$ V
6. A source delivers 40 KVA to a load with a power factor of 0.5 leading. Draw the power triangle.
7. Find the time constant of the circuit given in Fig.Q7.
8. Determine the damping condition for the series RLC circuit with R = 50 Ω, L = 0.1 H, C = 50 μF and V_{in} = 50 V.
9. A 480 /2400 V_{rms} step-up ideal transformer delivers 50 KW to a resistive load. Calculate the turns ratio, the primary current and the secondary current.
10. Two coils with inductances in the ratio of four to one have a coupling coefficient k = 0.6. When these coils are connected in series aiding, the equivalent inductance is 44.4 mH. Find L1, L2 and M.

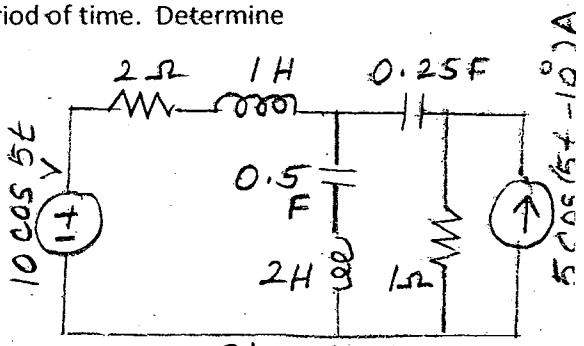

Fig. Q. 4

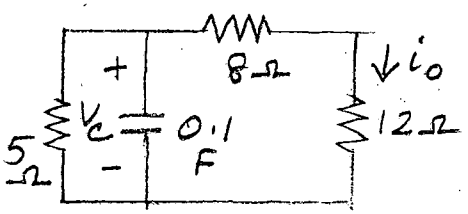

Fig. Q.7

Part-B (5 x 16 = 80 Marks)

11.(i) Use mesh analysis for the circuit given in Fig.Q.11(i) to determine I_1, I_2 and I_3. **(10)**

(ii) Find R_{eq} at terminals a-b for the circuit given in Fig.Q.11(ii) **(6)**

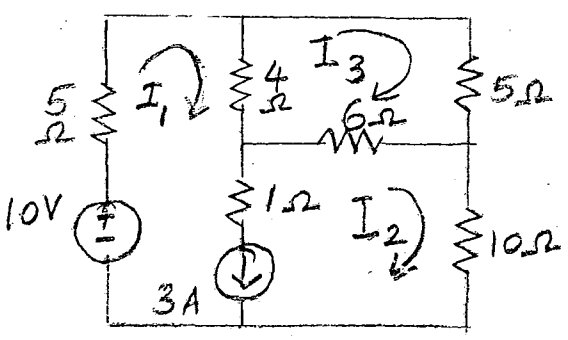

Fig. Q. 11(i)

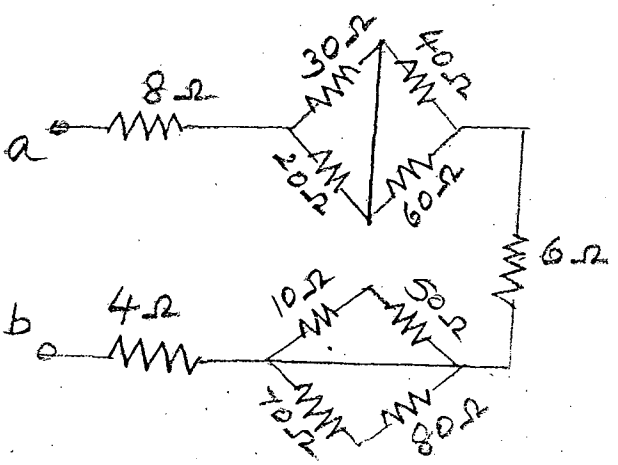

Fig. Q. 11(ii)

12.(a)(i) Using source transformation and wye-delta transformation for the circuit given in Fig.Q.12(a)(i), calculate the current through 9 Ω. **(12)**

(ii) Draw the dual circuit for the circuit given in Fig.Q.12(a)(ii) **(4)**

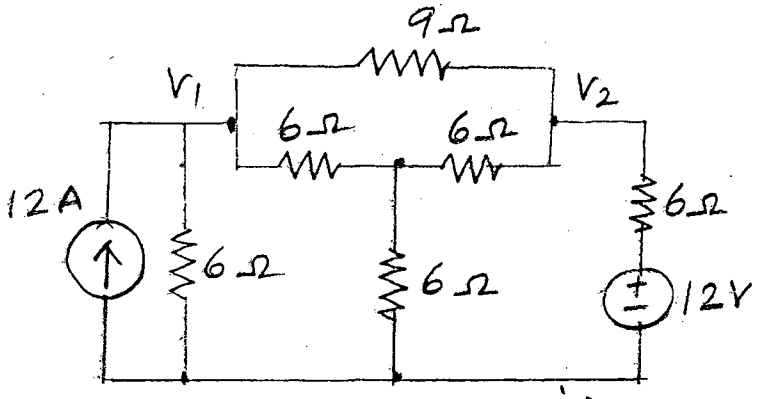

Fig. Q.12 a(i)

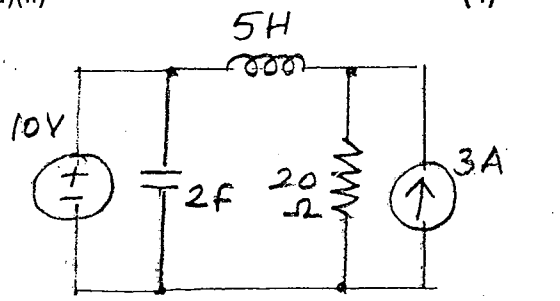

Fig. Q. 12a(ii)

OR

12.(b) Find the Thevenin and Norton equivalent circuits at terminals a-b of the circuit shown in Fig.Q.12(b). For what value of R is the power dissipated in R maximum?. Calculate that power.

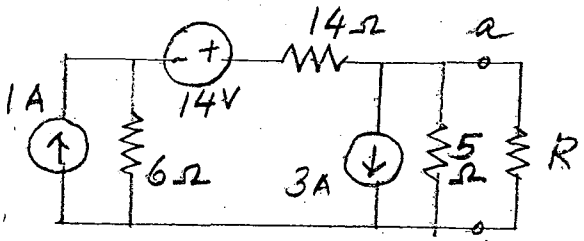

Fig. Q. 12(b)

13.(a)(i) Determine the input admittance Y_{in} of the given circuit. (Fig.Q.13(a)(i)) **(8)**

(ii) For the circuit shown in Fig.(Q.13(a)(ii)) if R = 8 Ω, X_L = 12 Ω and Xc = 6 Ω and **I** = 10 $\angle 0^0$ A, find $\mathbf{V_R}$, $\mathbf{V_L}$, $\mathbf{V_C}$ and **V** in rectangular and polar forms. **(8)**

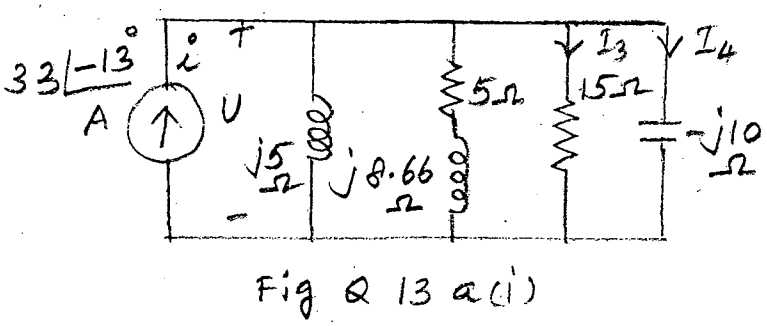

Fig Q 13 a(i)

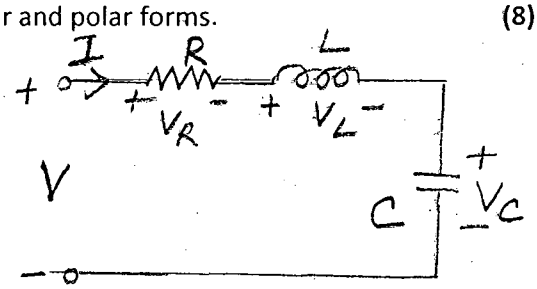

Fig. Q.13 a(ii)

OR

13.(b) Determine the current through 1 Ω resistor of the given circuit (Fig.Q.13.(b)) by Thevenin's theorem. What should be the load Z_L to be connected across terminals a-b for maximum power transfer and hence find the maximum average power delivered to the load.

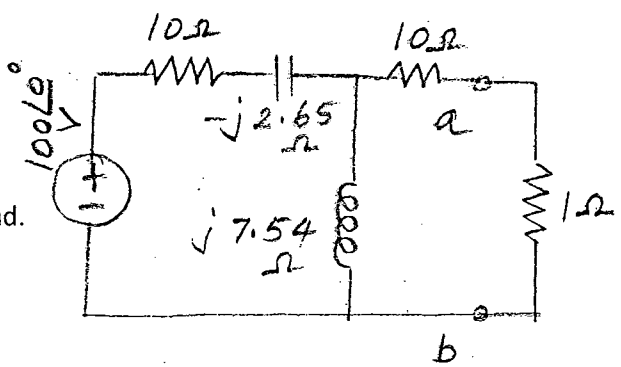

Fig Q 13(b)

14.(a)(i) Give the relevant mathematical expressions with which the DC transient responses (step response) of RL and RC circuits i(t) and v(t) respectively are evaluated using their initial and final values. (4)

(ii) The switch in the circuit (Fig.Q.14(a)(ii)) has been closed for a long time. At t = 0, the switch is opened. Calculate i(t) for t>0. (12)

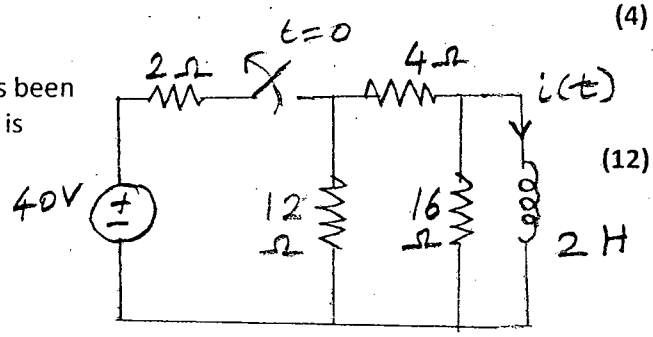

Fig. Q.14 a(ii)

OR

14.(b)(i) Obtain the expression for the half power frequencies f_1 and f_2 of a series RLC resonant circuit and hence the bandwidth. (8)

(ii) For the tank circuit given in Fig.Q.14.(b)(ii), determine the capacitance required to make the circuit resonate at 1.65 MHz. Find the quality factor Q of the coil at resonance. (8)

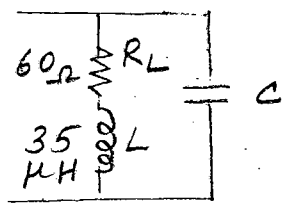

Fig Q.14.b(ii)

15.(a) Obtain a conductively coupled equivalent circuit for the mutually coupled circuit Shown in Fig.Q.15.(a) and find the voltage across 5 Ω resistor.

OR

15.(b) Obtain the branch currents and voltages for the circuit shown in Fig.Q.15.(b) using tie-set approach.

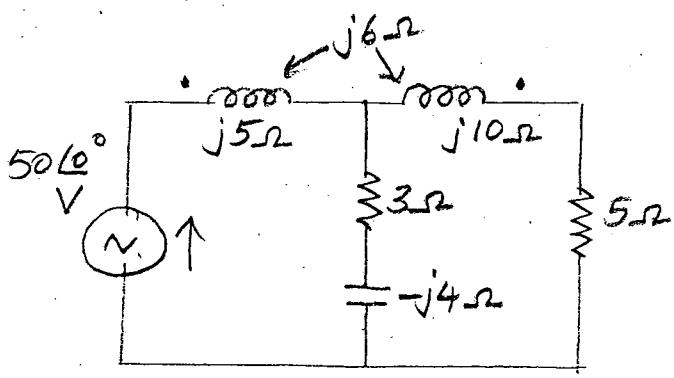

Fig. Q.15(a)

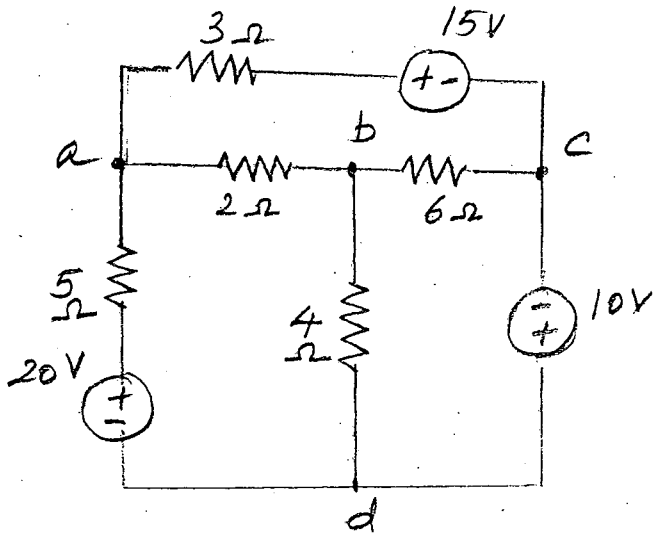

Fig. Q.15(b)

— X —