b) i) Calculate the current in the 4Ω resistor in the given Fig. 16. b. using superpositition theorem. (8)

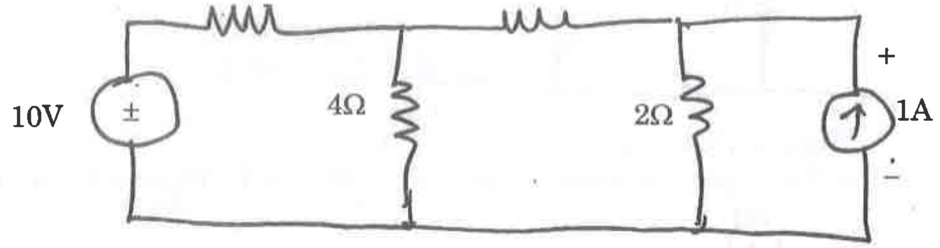

Fig. 16. b

ii) For the circuit given in Fig. 16. b. (ii). Find the value of R for max power transfer. Also calculate the maximum power. (7)

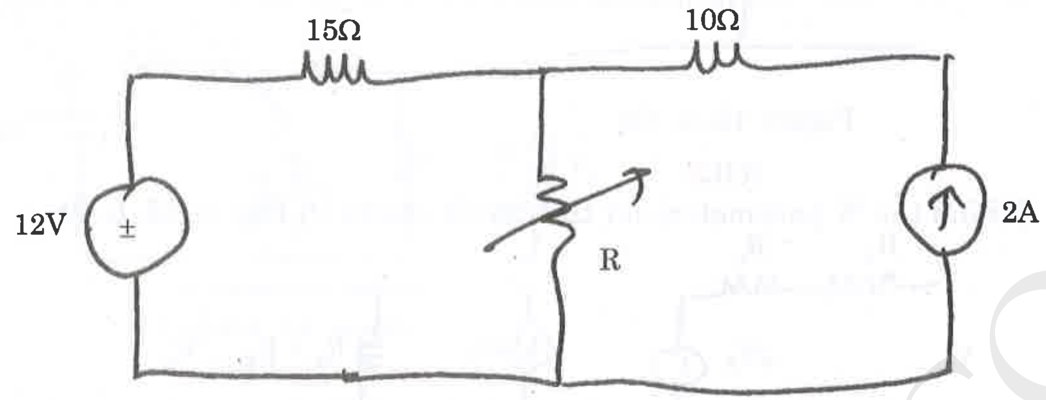

Fig. 16. b. (ii)

07/06/18 (FN)

Reg. No. :

Question Paper Code : 40034

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Second Semester

Biomedical Engineering

EC8251 – CIRCUIT ANALYSIS

(Common to : Electronics and Communication Engineering/Electronics and Telecommunication Engineering/Medical Electronics Engineering)

(Regulations 2017)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define oriented graph.

2. Define Kirchoff's voltage law.

3. Determine the current flow through the capacitor shown in Figure 3.

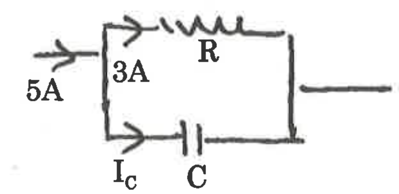

Figure 3

4. Draw equivalent delta circuit shown in Figure 4.

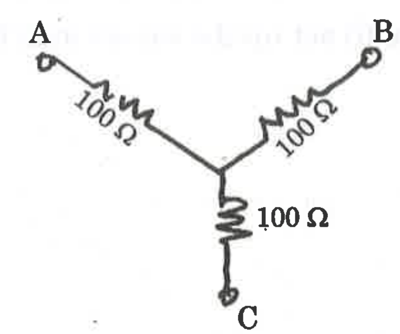

Figure 4

5. A coil of 20 Ohm resistance and inductance of 0.2H is connected in parallel with 100μF capacitor. Calculate the frequency at which the circuit will act as non-inductive resistance of 'R'. Find also the value of 'R'.

6. Find overall inductance of the circuit shown in Figure 6.

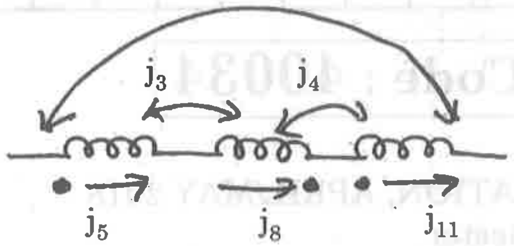

Figure 6

7. The switch 'S' is shown in Figure 7 is thrown to position 'A' at t = 0. At t = 1 second, the switch is thrown to position 'B'. Find the voltage across the capacitor for t= 1sec.

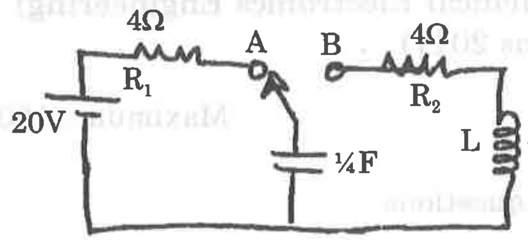

Figure 7

8. Find the value of i(o) and di/dt for the circuit shown in Figure 8.

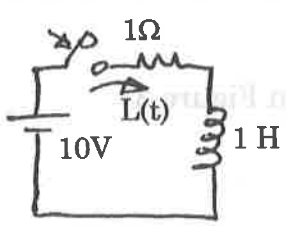

Figure 8

9. Define ABCD parameters.

10. Draw the h-parameter model.

PART – B (5×13=65 Marks)

11. a) i) For the resistive network shown in Figure 11. a. (i) set up the tie-set matrix and obtain KVL equations. (5)

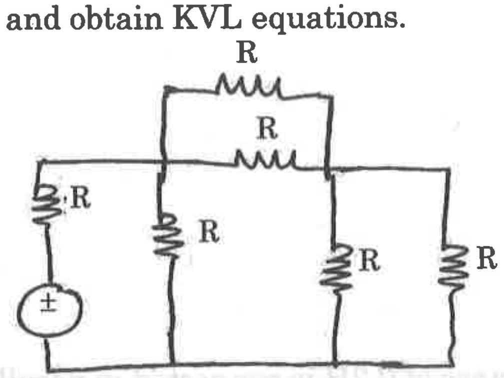

Figure 11. a. (i)

ii) Find the expression for the time-domain currents i_2 and i_2 in the circuit given in Figure 11. a. (ii). (8)

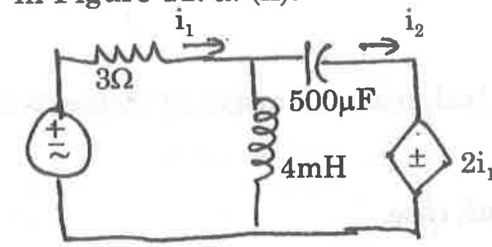

Figure 11. a. (ii)

(OR)

b) i) Find the three node voltages in the circuit of Figure 11. b. (i). (8)

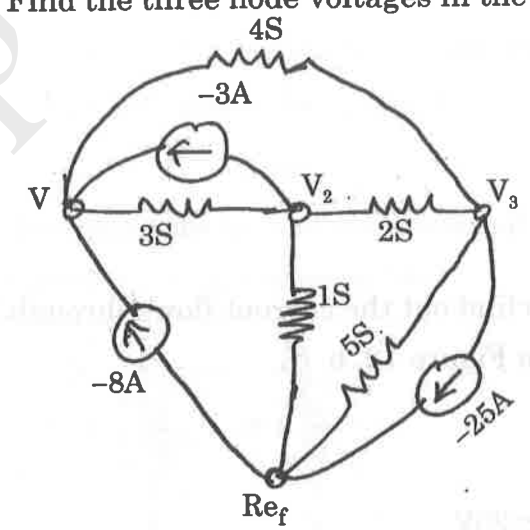

Figure 11. b. (i)

ii) Obtain the cutest matrix for the following network shown in Figure 11. b. (ii). (5)

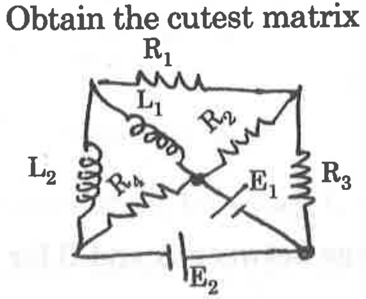

Figure 11. b. (ii)

12. a) i) Determine the current through the load resistance of 8Ω in the circuit shown in Figure 12. a. (i). using Norton's theorem. (8)

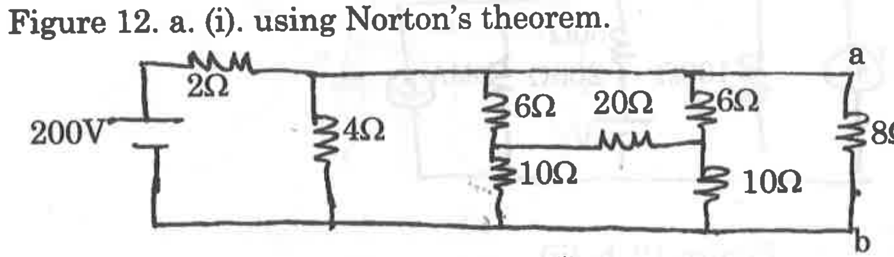

Figure 12. a. (i)

ii) Find the value of Z_L (vide Figure 12. a. (ii)) for the Maximum Power transfer to it

if (x) Z_L is the pure resistance

(y) Z_L is the complex impedance with both real and imaginary elements as variable

Determine Maximum Power transfer in each case. **(5)**

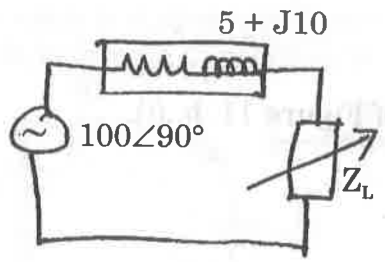

Figure 12. a. (ii)

(OR)

b) i) Apply Super Position Principle to find out the current flows through 2Ω resistance for the circuit shown in Figure 12. b. (i). **(7)**

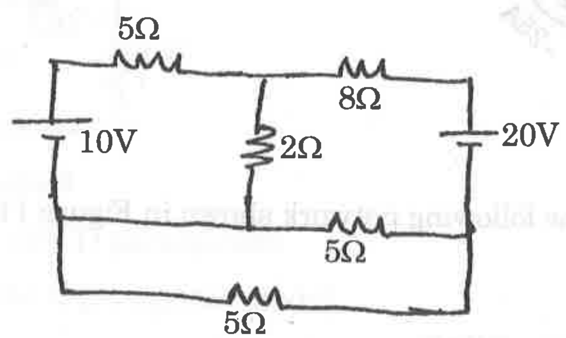

Figure 12. b. (i)

ii) Use Millman's theorem to calculate the voltage between A and B for the circuit shown in Figure 12. b. (ii). **(6)**

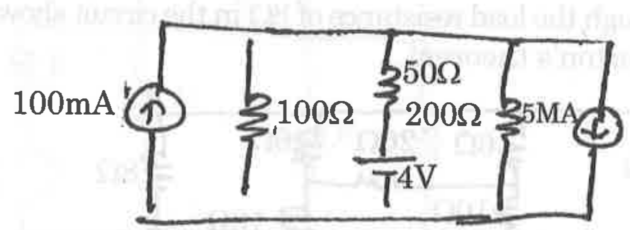

Figure 12. b. (ii)

13. a) i) Determine the resonant frequency of LC parallel circuit shown in Figure 13. a. (i). **(9)**

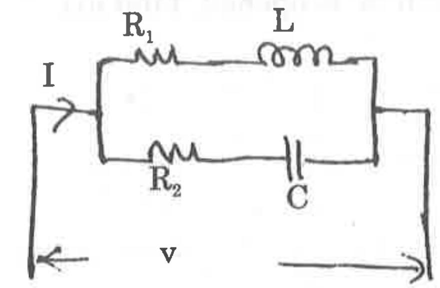

Figure 13. a. (i).

ii) A series RLC circuit with Q = 250 resonance at 1.5 MHz. Find the bandwidth and its half power frequencies. **(4)**

(OR)

b) i) Determine the overall inductance of the two coils connected in parallel (Vide Figure 13. b. (i).) Assume M#1. **(8)**

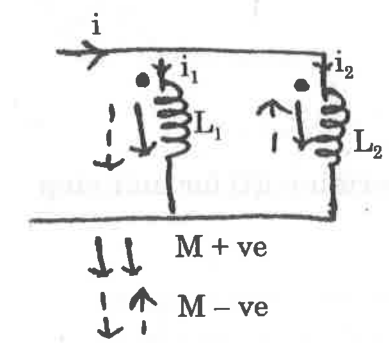

Figure 13. b. (i)

ii) Calculate I_2 for which I_1 will be zero in the circuit shown in Figure 13. b. (ii). Also calculate V_2 for this condition. **(5)**

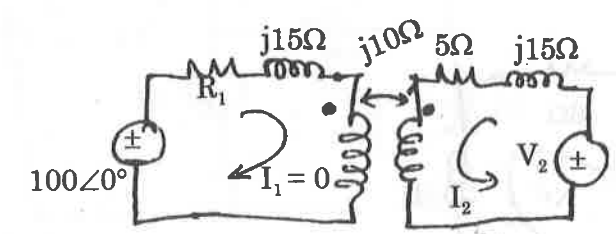

Figure 13. b. (ii)

14. a) i) Steady state condition for the circuit in Figure 14. a. (i). was established with the switch 'K' is closed. At t = 0, the switch 'K' is opened. Find i(t). **(7)**

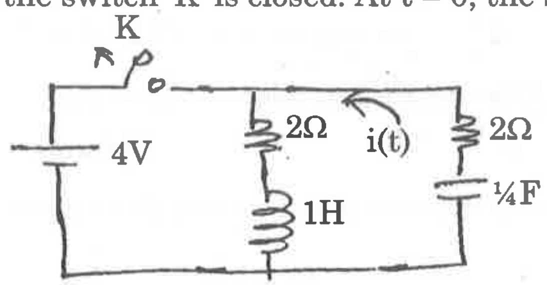

Figure 14. a. (i)

ii) The circuit shown in Figure 14. a. (ii). was initially in steady state with switch in position – A at t = 0. The switch goes from 'A' to 'B' at t > 0. Find an expression for voltage V_0 for t > 0. Initial current in the inductor $L_2 = 0$. **(6)**

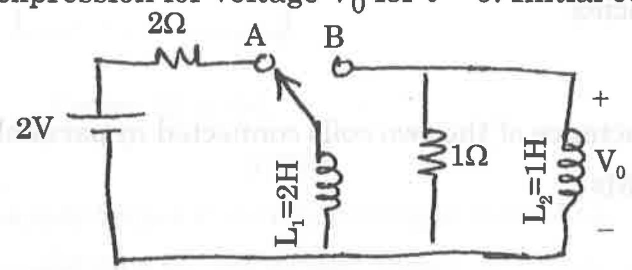

Figure 14. a. (ii)

(OR)

b) i) For the circuit shown in Figure 14.b. (i)., determine i(t) for unit step function. **(6)**

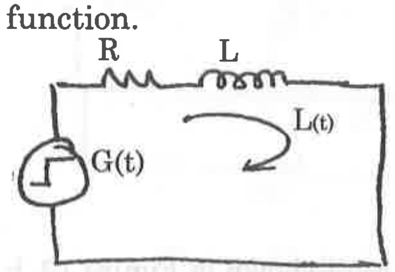

Figure 14.b. (i)

ii) Find the current in the circuit shown in Figure 14. b. (ii). at any instant after opening the switch. The current through the inductor was 1A just before opening of the switch. **(7)**

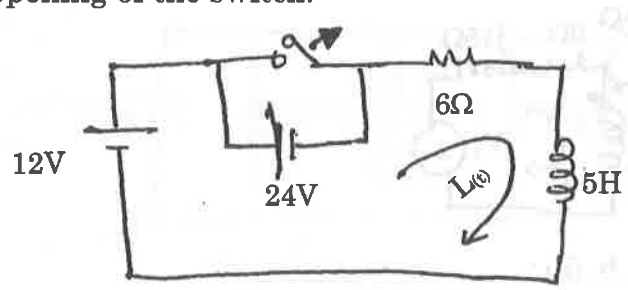

Figure 14. b. (ii)

15. a) i) Find the 'z' parameters of the circuit shown in Figure 15. a. (i). **(6)**

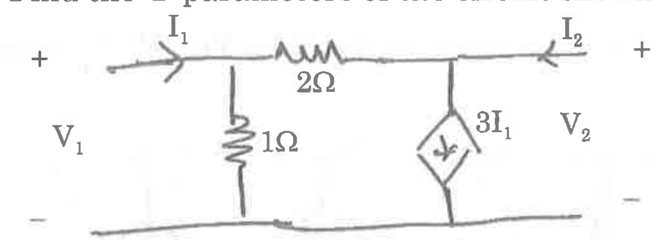

Figure 15. a. (i)

ii) Determine the 'y' parameters of the circuit shown in Figure 15. a. (ii). **(7)**

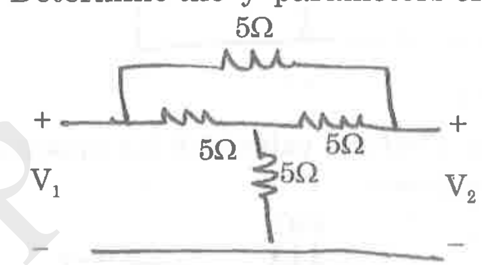

Figure 15. a. (ii)

(OR)

b) i) Find the 'h' parameters for the circuit shown in Figure 15. b. (i). **(5)**

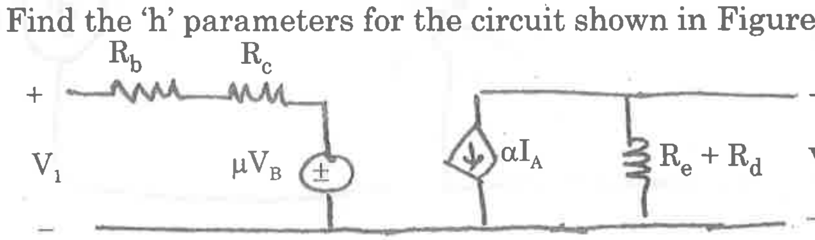

Figure 15. b. (i)

ii) Two transmission lines with parameters $A_1B_1C_1D_1$ and $A_2B_2C_2D_2$ are connected in series. Find overall parameters of the series connected system. **(8)**

PART – C **(1×15=15 Marks)**

16. a) Use the technique of mesh analysis to evaluate the three unknown mesh current shown in Figure 16 (a). **(15)**

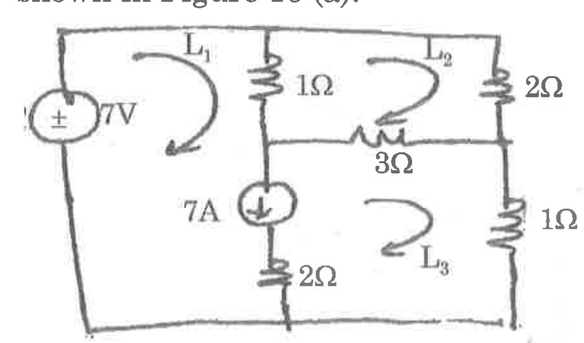

Figure 16 (a)

(OR)

15. (a) Define Z-parameters and Y-parameters and derive the equation to obtain one set of parameters from other set.

Or

(b) Define transmission parameters and write its significance Also, find the transmission parameter of resultant if two networks with transmission parameters T_A and T_B are connected in series.

PART C — (1 × 15 = 15 marks)

16. (a) Consider a parallel RLC circuit energized by a current source $i(t)$ from time $t=0$. Assume the components are initially relaxed.

(i) Discuss the voltage and current associated with the R, L and C at time $t=0+$ and $t=\infty$ if, the source $i(t)$ is a 5A DC source. (6)

(ii) Derive the formula for resonant frequency. (3)

(iii) Discuss the voltage and current associated with the R, L and C for the following cases. The source $i(t)$ is an AC source while the frequency is lesser than / equal to / greater than resonant frequency of the circuit. (6)

Or

(b) Consider a series RLC circuit with L = 1 mH and C = 1 μF. Assume the components are initially relaxed.

(i) If the circuit is energised by a voltage source from time $t=0$, discuss the voltage and current associated with the R, L and C at time $t=0+$ and $t=\infty$. (6)

(ii) Derive the formula for resonant frequency. (3)

(iii) Discuss the ranges for the resistor values to operate the circuit in overdamped, underdamped and critically damped modes. (6)

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14/05/19

Reg. No. :

Question Paper Code : 80108

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Second Semester

Electronics and Communication Engineering

EC 8251 — CIRCUIT ANALYSIS

(Common to Medical Electronics/B.E. Bio Medical Engineering and Electronics and Telecommunication Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the formula to find the equivalent resistance offered by 'N' number of arbitrary valued resistors connected in series.

2. A 3A current source has internal resistance of 2Ω. Find the voltage experienced by a load of 3Ω while connected to the source.

3. Write maximum power transformation theorem related to circuits those contain resistive and reactive components.

4. If a 10V voltage source has internal resistance of 50Ω, find the maximum current that can be supplied by the source.

5. Comment on the phase difference between voltage and current in a load at resonance.

6. A series RLC load has R = 1 kΩ, C = 1 pF and L = 10 mH. Find the Q factor of the load.

7. What is the meaning of forced response?

8. Let a parallel LR network is connected to a DC source. Find the voltage across the resistor 'R' at steady state.

9. Relate voltage and current in a two port network using Z-parameters.

10. Let two 2-port networks have same admittance parameters as given as $\begin{pmatrix} 5 & 10 \\ 10 & 5 \end{pmatrix}$. If these networks are connected in parallel, find the admittance parameter of resultant network.

PART B — (5 × 13 = 65 marks)

11. (a) Obtain the equivalent resistance experienced by the source and power delivered by the source shown in Figure Q.11 (a).

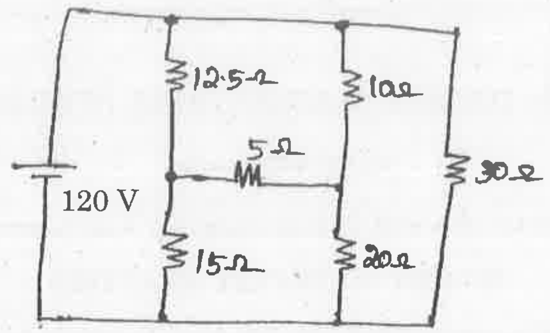

Figure Q.11 (a)

Or

(b) Find node voltages in the circuit shown Figure Q.11 (b) and find the power delivered by the independent current source.

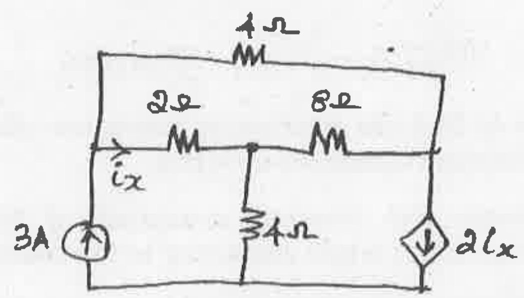

Figure Q.11 (b)

12. (a) Derive Norton and Thevenin equivalent circuit across the terminals a-b shown in Figure Q.12 (a).

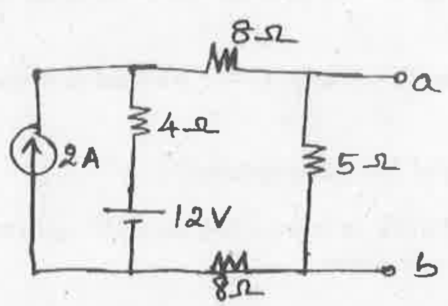

Figure Q.12 (a)

Or

(b) Find the optimum value of load impedance Z_L to derive maximum average power from the circuit shown in Figure Q.12 (b). Also find the maximum average power.

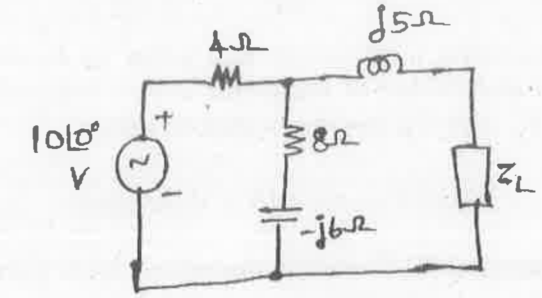

Figure Q.12 (b)

13. (a) Draw the circuit of series RLC circuit and derive the formulae for resonant frequency, half power frequencies, bandwidth and quality factor.

Or

(b) Consider a linear transformer with coil self inductances L_1, L_2 and mutual inductance M between the coils. Derive equivalent T network, π network and express the respective components with the transformer parameters.

14. (a) Let, the switch in the circuit shown in Figure Q.14 (a) maintains its position A for a long time. At $t = 0$, the switch moves to B. Determine $v(t)$ for $t > 0$ and calculate its value at $t = 1$ s and 4s.

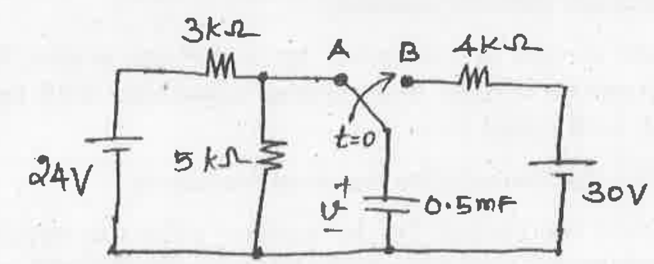

Figure Q.14 (a)

Or

(b) Let the switch in the circuit shown in Figure Q.14 (b) is opened at $t = 0$. Find the voltage across the inductor for all values of 't'.

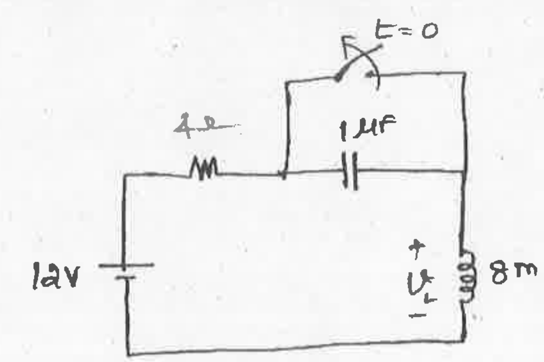

Figure Q.14 (b)