Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 60032

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Second Semester

Electronics and Communication Engineering

EC 3251 — CIRCUIT ANALYSIS

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Ten coulombs of charge flow past a given point in a wire in 2s. How many amperes of current is flowing?
2. Define active and passive elements and give examples.
3. State Maximum power transfer theorem.
4. Draw the dual of the network shown in Figure 1

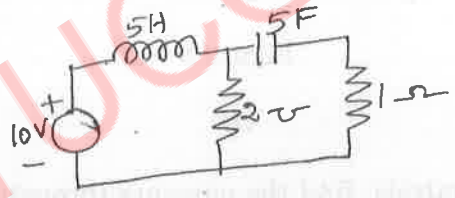

Figure 1

5. Determine the average power delivered to the circuit consisting of an impedance $z = (5 + j8)\Omega$ when the current flowing through the circuit is $I = 5\angle 30$ Amps.
6. For the circuit shown in Figure 2, find the average power delivered by the dependent current source.

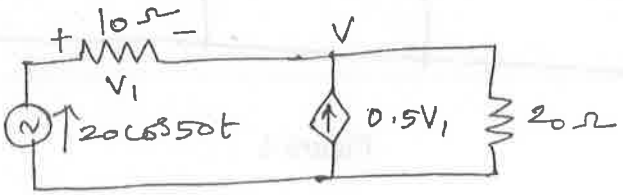

Figure 2

7. Write the mathematical expression for unit step function and draw the pattern of it.

8. Determine the Quality factor of a coil for the series circuit consisting of R = 10Ω, L = 0.1H and C = 10 μF.

9. Two inductively coupled coils have self inductances L_1 = 50 mH and L_2 = 200 mH. If the co-efficient of coupling is 0.5, find the value of mutual inductance between the coils.

10. List out the properties of tree of a graph.

PART B — (5 × 13 = 65 marks)

11. (a) Using mesh analysis determine the voltage *Vs* which given a voltage of 50 V across the 10Ω resistor as shown in Figure 3

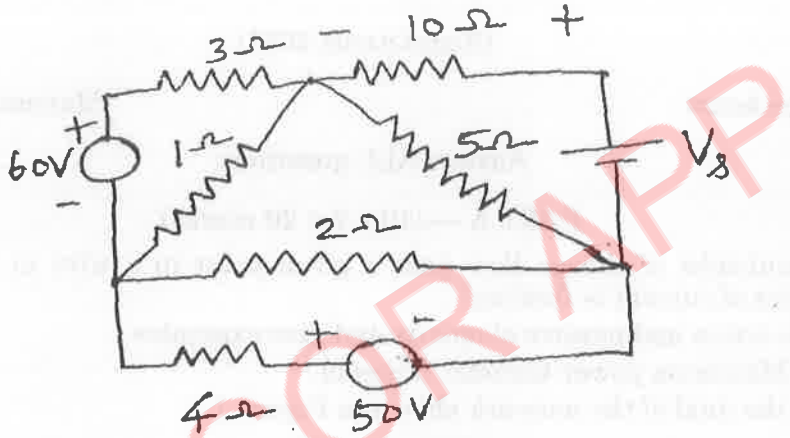

Figure 3

Or

(b) Using nodal analysis, find the currents through the resistances R_3 and R_4 for the circuit shown in Figure 4

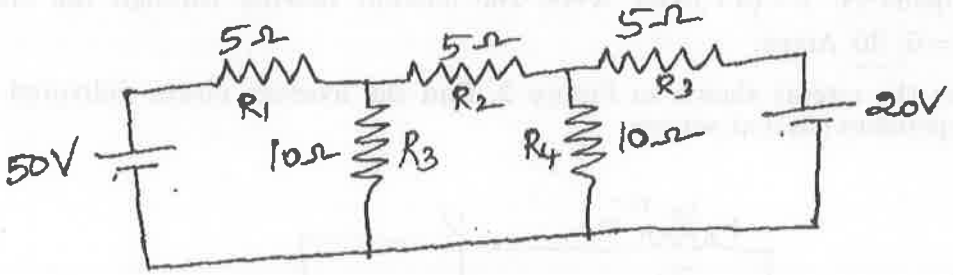

Figure 4

12. (a) Find the voltage across the 2Ω resistor shown in Figure 5 using superposition theorem.

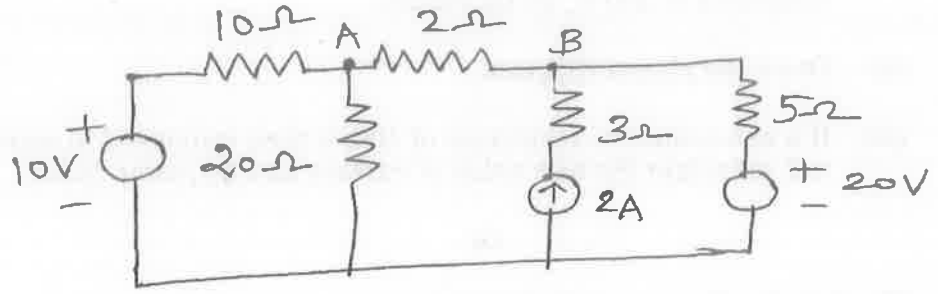

Figure 5

Or

(b) (i) Determine the resistance between nodes A and B in the circuit shown in Figure 6 (8)

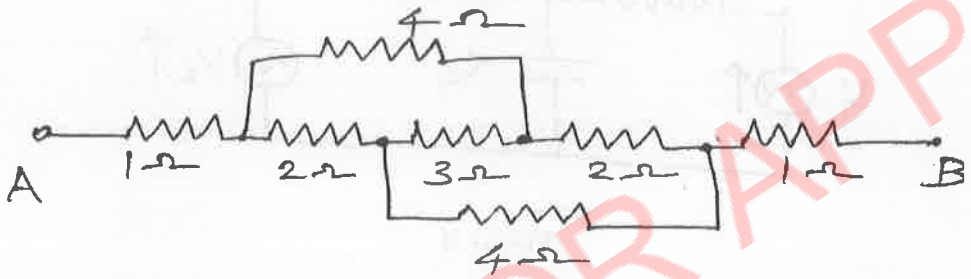

Figure 6

(ii) Consider the bridge circuit shown in Figure 7. Determine the resistance between nodes A and B and the current supplied by the 24V supply. (8)

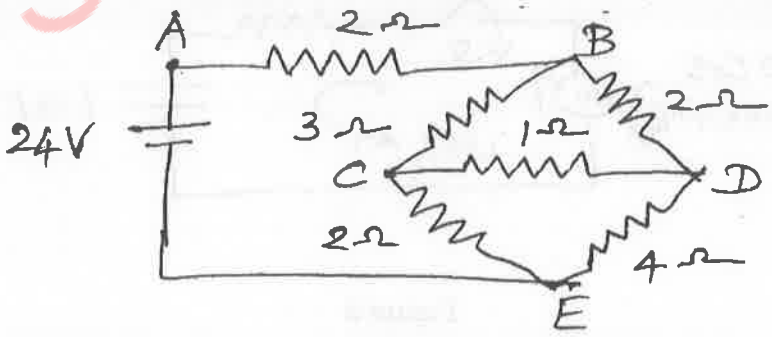

Figure 7

13. (a) A coil has a resistance of 5Ω and an inductance of 31.8 mH.

(i) Calculate the current taken by the coil and power factor when connected to 200 V, 50 Hz supply.

(ii) Draw the phasor diagram.

(iii) If a non-inductive resistance of 10Ω is then connected in series with coil, calculate the new value of current and its power factor.

Or

(b) The data for the two mesh circuit are

$V_1 = 110\angle 0^\circ\, V$ and $V_2 = -120\angle 45^\circ\, V$, $R = 4\Omega$, $X_L = 4\Omega$, $X_C = 3\Omega$

Determine the current through and voltage across the capacitance

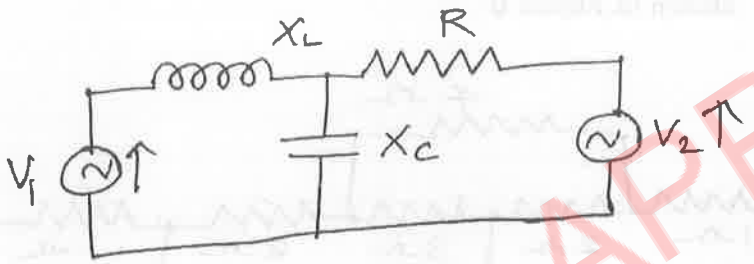

Figure 8

14. (a) In the circuit shown in Figure 9, determine the complete solution for the current when the switch S is closed at $t = 0$. Applied voltage is $v(t) = 50\cos\left(10^2 t + \frac{\pi}{4}\right)$ volts, Resistance $R = 10\Omega$ abd capacitance $C = 1\mu F$.

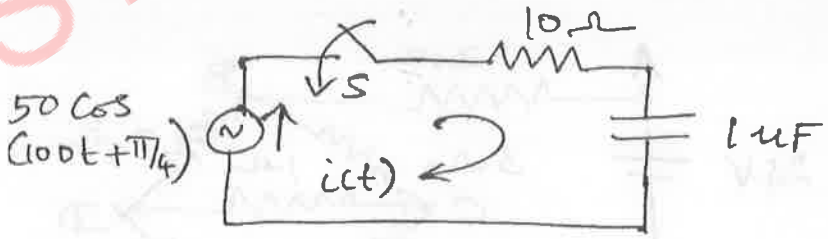

Figure 9

Or

(b) (i) Find the value of L at which the circuit resonates at a frequency of 1000 rad/sec in the circuit shown in Figure 10. (10)

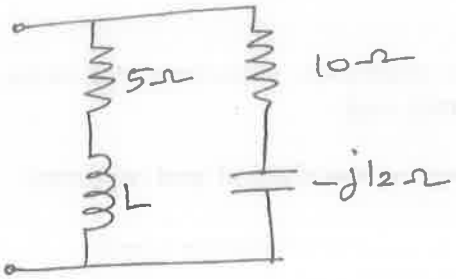

Figure 10

(ii) Explain parallel resonance and derive the resonance frequency. (6)

15. (a) With relevant diagrams explain the characteristics of an ideal transformer.

Or

(b) For the electrical network shown in Figure 11, draw its topological graph and any four possible trees.

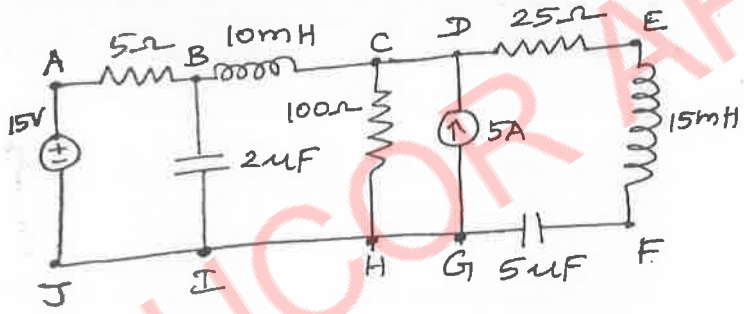

Figure 11

PART C — (1 × 15 = 15 marks)

16. (a) A resistance of 100 Ω is connected m series with a $50\,\mu F$ capacitor. When the supply voltage is 200V, 50 Hz, find the

(i) Impedance, current and power factor

(ii) The voltage across the resistor and across capacitor. Draw the phasor diagram.

Or

(b) A coil of resistance 10Ω and inductance 0.1 H is connected in series with 150 μF capacitor across 200V, 50 Hz supply.

Calculate :

(i) Inductive reactance; capacitive reactance, impedance, current and power factor and

(ii) The voltage across the coil and capacitor.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 70082

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Second Semester

Electronics and Communication Engineering

EC 3251 – CIRCUIT ANALYSIS

(Common to: Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Summarize the basic mesh analysis procedure.

2. State Ohm's law and its limitations.

3. Three resistors $10\Omega, 5\Omega$ and 20Ω are connected in star. What are the equivalent delta resistors?

4. Define dual networks. List out four pairs of dual quantities.

5. What is admittance? What are its components?

6. Give the relation between apparent power, average power and relative power.

7. An RLC series circuit has $R = 10\Omega, XC = 62.833\Omega$. Find the value of L for resonance at 50HZ.

8. Write the characteristics of series resonance.

9. Define mutual inductance and write an expression for it.

10. State the dot rule for coupled circuit.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Define the terms Nodes, Branches, Loops and Meshes. (5)

(ii) Find the number nodes, branches, loops and meshes present in the given circuit. (8)

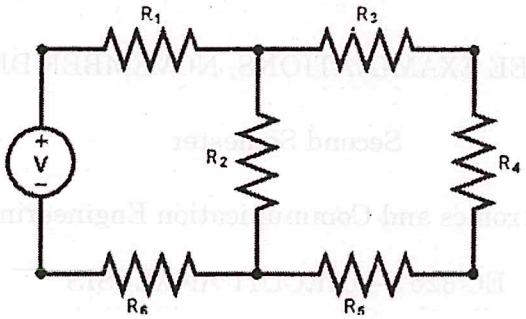

Fig. Q. 11 (a)

Or

(b) (i) State and Explain Kirchhoff's laws. (10)

(ii) List the difference between series and parallel circuits. (3)

12. (a) Determine the current I in the network by using Thevenin's theorem. (13)

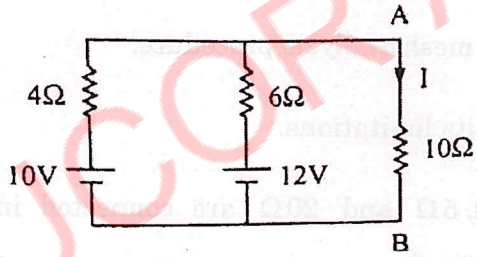

Fig. Q. 12 (a)

Or

(b) Find the current through 23 Ω resistor of the given circuit using superposition theorem. (13)

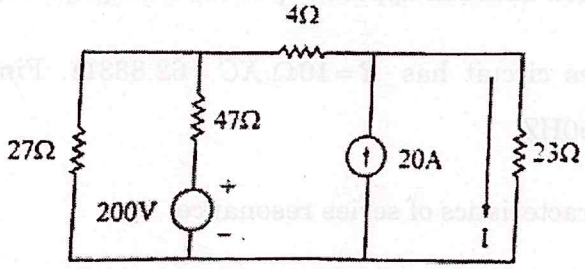

Fig. Q. 12 (b)

13. (a) In a RLC series circuit, the applied voltage is 5V. Drops across the resistance and inductance are 3V and 1V respectively. Calculate the voltage across the capacitor. Draw the phasor diagram. (13)

Or

(b) Use nodal voltage method to find the power dissipated in the 10Ω resistor on the circuit shown in the figure. Q. 13 (b) (13)

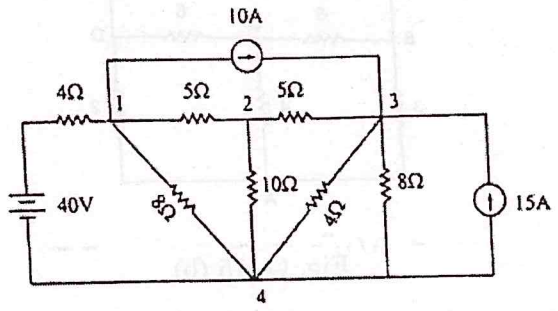

Fig. Q. 13 (b)

14. (a) A series RLC circuit has R =50Ω, L = 0.2H and C =50 μF. Constant voltage of 100V is impressed upon the circuit at t = 0. Find the expression for the transient current assuming initially relaxed conditions. (13)

Or

(b) For the circuit shown, determine the currents i_1 and i_2 when the switch is closed at t =0. Assume that the initial current through the inductor is 0. (13)

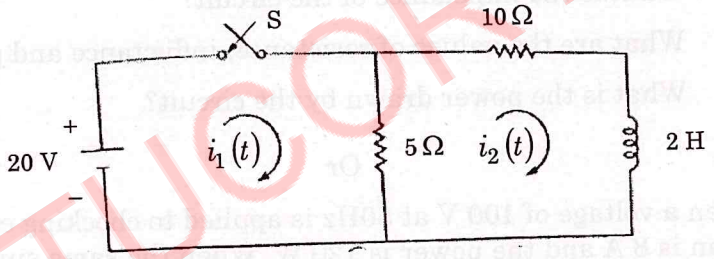

Fig. Q. 14 (b)

15. (a) For the given coupled circuit, find the voltage across the 5 Ω resistor. (13)

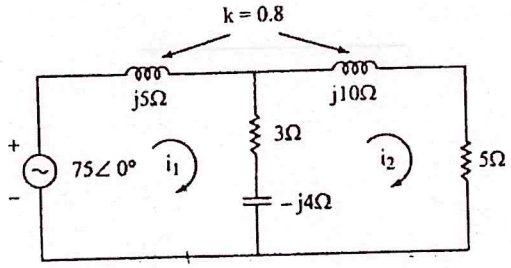

Fig. Q. 15 (a)

Or

(b) For the network given, draw the graph and a tree. Show the link currents. Write the tie-set schedule for the tree, the equations for branch currents in terms of link currents. Also write independent equations. (13)

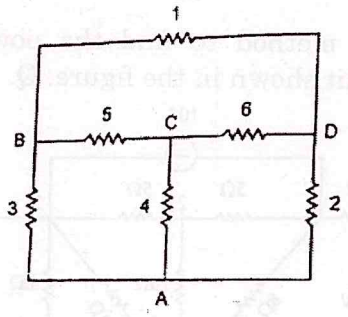

Fig. Q. 15 (b)

PART C — (1 × 15 = 15 marks)

16. (a) A series circuit containing pure resistance and pure inductance the current and voltages are $i(t)=5\sin\left(314+\frac{2\pi}{3}\right)$ and $v(t)=20\sin\left(314+\frac{5\pi}{6}\right)$

(i) What is the impedance of the circuit?

(ii) What are the values of resistance, inductance and power factor?

(iii) What is the power drawn by the circuit?

Or

(b) When a voltage of 100 V at 50Hz is applied to chocking coil 1, the current taken is 8 A and the power is 120 W. When the same supply is applied to chocking coil 2, the current is 10 A and the power is 500 W. Find the current and power when the supply is applied to two coils connected in series.

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

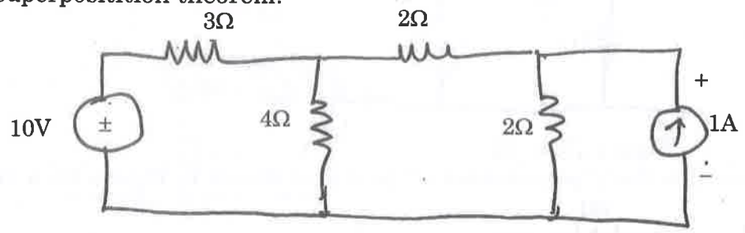

Fig. 16. b

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)**

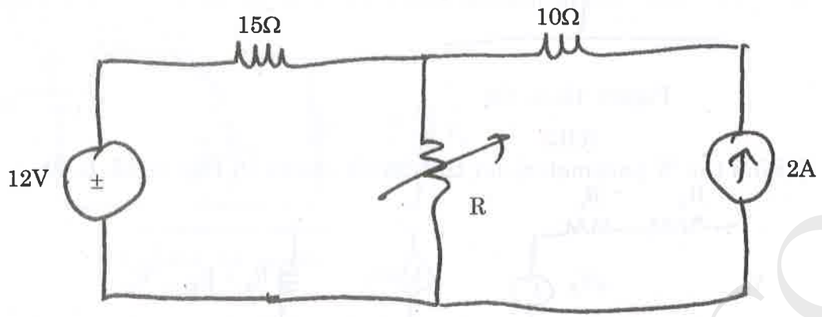

Fig. 16. b. (ii)

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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.

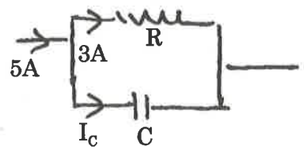

Figure 3

4. Draw equivalent delta circuit shown in Figure 4.

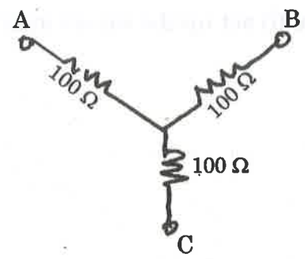

Figure 4

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.

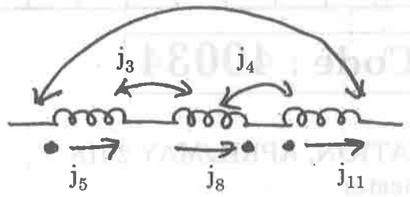

Figure 6

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.

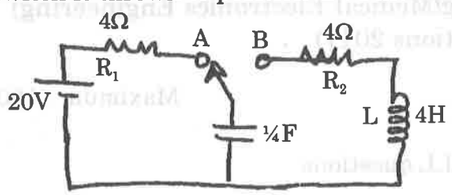

Figure 7

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

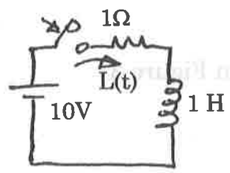

Figure 8

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)

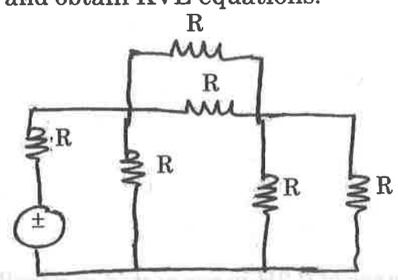

Figure 11. a. (i)

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

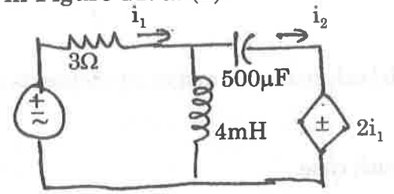

Figure 11. a. (ii)

(OR)

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

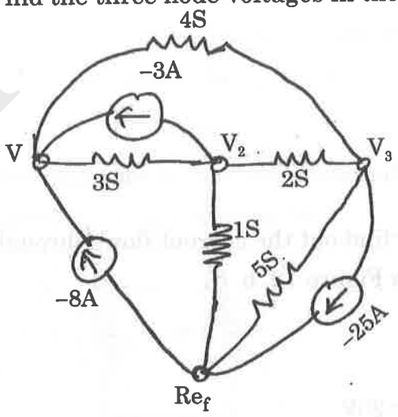

Figure 11. b. (i)

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

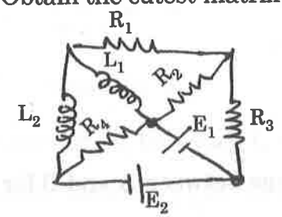

Figure 11. b. (ii)

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)

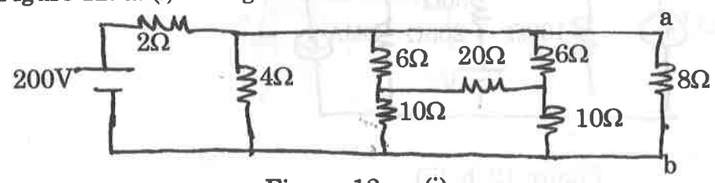

Figure 12. a. (i)

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)**

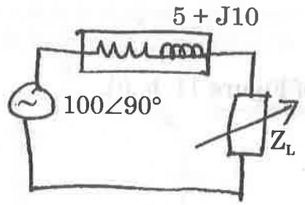

Figure 12. a. (ii)

(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)**

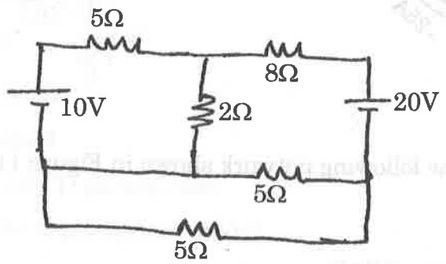

Figure 12. b. (i)

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

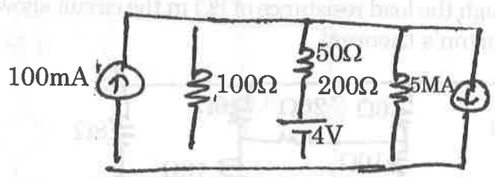

Figure 12. b. (ii)

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

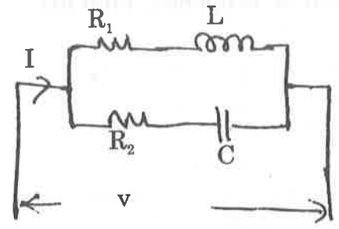

Figure 13. a. (i).

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)**

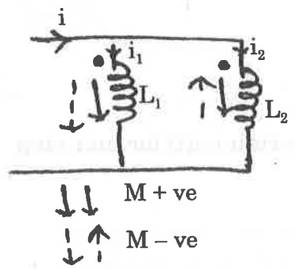

Figure 13. b. (i)

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)**

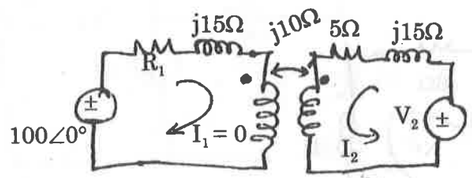

Figure 13. b. (ii)

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)**

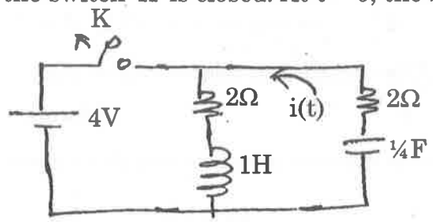

Figure 14. a. (i)

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)**

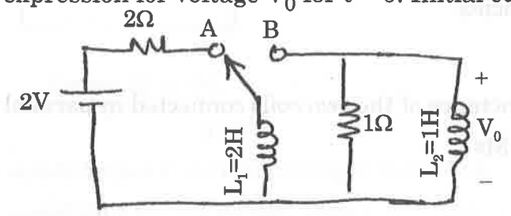

Figure 14. a. (ii)

(OR)

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

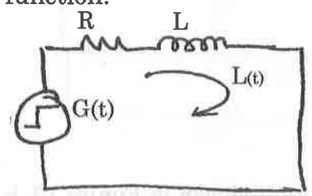

Figure 14.b. (i)

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)**

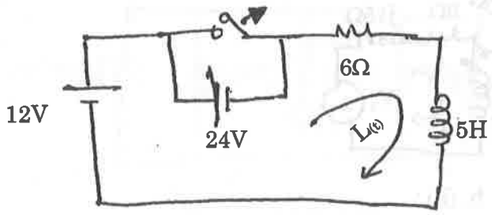

Figure 14. b. (ii)

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

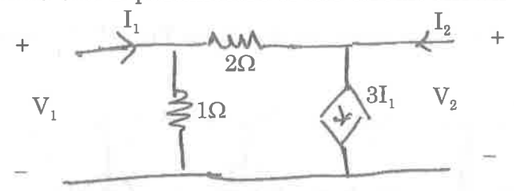

Figure 15. a. (i)

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

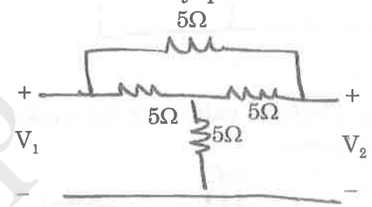

Figure 15. a. (ii)

(OR)

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

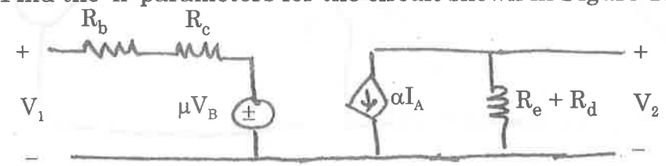

Figure 15. b. (i)

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)**

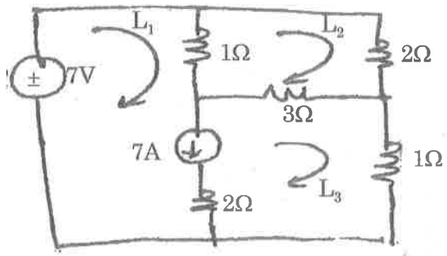

Figure 16 (a)

(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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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).

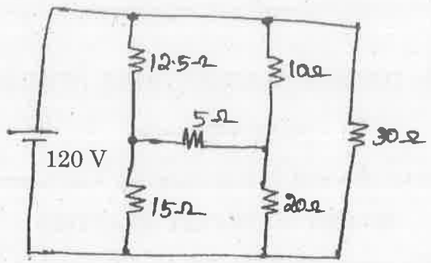

Figure Q.11 (a)

Or

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

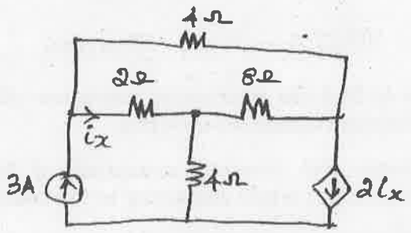

Figure Q.11 (b)

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

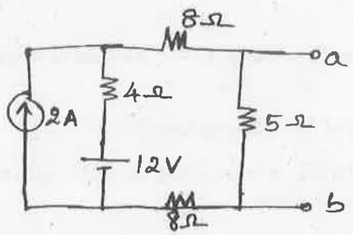

Figure Q.12 (a)

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.

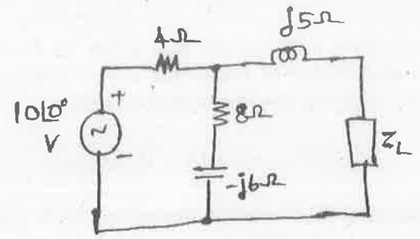

Figure Q.12 (b)

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.

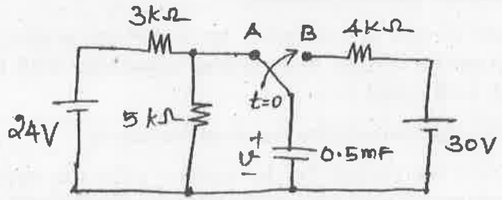

Figure Q.14 (a)

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'.

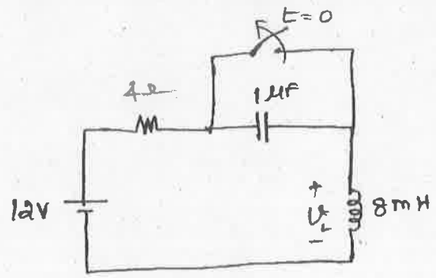

Figure Q.14 (b)