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).

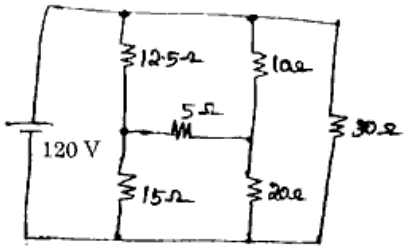

Figure Q.11 (a)

Or

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

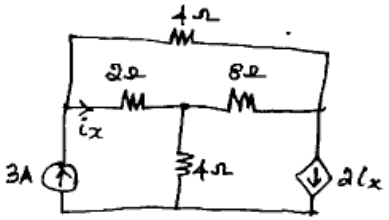

Figure Q.11 (b)

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

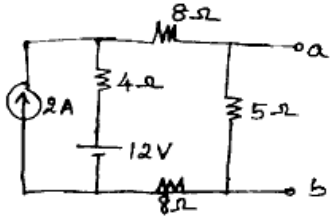

Figure Q.12 (a)

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.

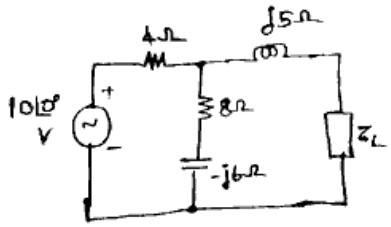

Figure Q.12 (b)

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.

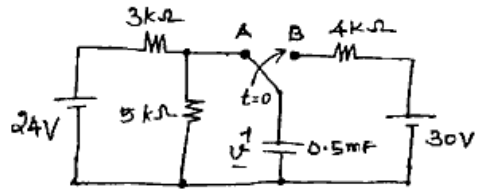

Figure Q.14 (a)

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'.

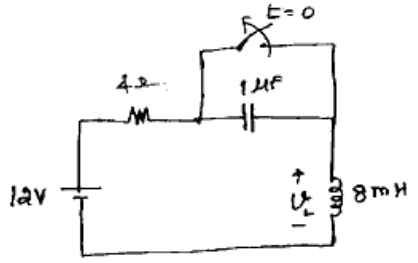

Figure Q.14 (b)