CBCS SCHEME

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17EC35

Third Semester B.E. Degree Examination, July/August 2021
Network Analysis

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Using source transformation techniques, find 'v' for the circuit in Fig.Q1(a).

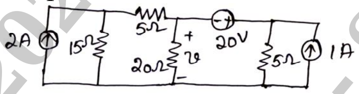

Fig.Q1(a) **(07 Marks)**

b. Obtain equivalent resistance R_{ab} for the circuit in Fig.Q1(b) and hence find 'i'.

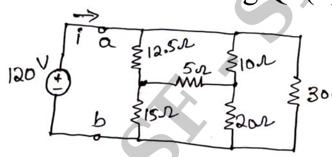

Fig.Q1(b) **(07 Marks)**

c. Explain ideal and practical current sources. **(06 Marks)**

2 a. Determine the current I_0 in the circuit of Fig.Q2(a) using Mesh analysis.

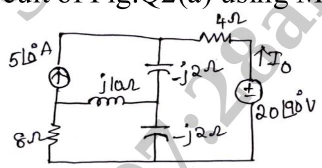

Fig.Q2(a) **(08 Marks)**

b. Use nodal analysis to find v_0 in the network of Fig.Q2(b).

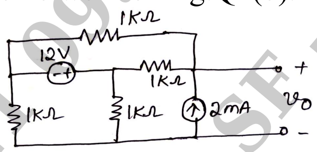

Fig.Q2(b) **(08 Marks)**

c. Explain the concept of super node with an illustration. **(04 Marks)**

3 a. State and prove Reciprocity theorem. **(06 Marks)**

b. Use superposition theorem to find i_0 in the circuit shown in Fig.Q3(b).

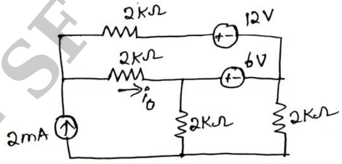

Fig.Q3(b) **(06 Marks)**

c. Find Thevenin's equivalent circuit across the terminals a – b for the circuit shown in Fig.Q3(c). **(08 Marks)**

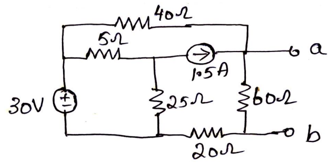

Fig.Q3(c)

4 a. State and prove maximum power transfer theorem for the case of AC source, hence show that $\rho_{max} = \dfrac{|V_{TH}|^2}{8R_L}$ **(08 Marks)**

b. Find the current through 16 Ω resistor using Norton's theorem in Fig.Q4(b).

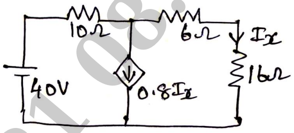

Fig.Q4(b) **(08 Marks)**

c. Find the current through (10 – 3j)Ω using Millman's theorem in Fig.Q4(c). **(04 Marks)**

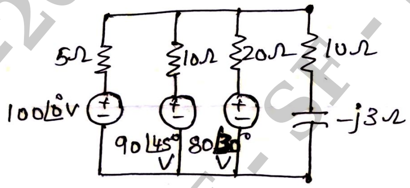

Fig.Q4(c)

5 a. The switch 'K' is changed from position 1 to position 2 at t = 0. Steady state condition having been reached at position 1. Find the values of i, $\dfrac{di}{dt}$ and $\dfrac{d^2i}{dt^2}$ at $t = 0^+$. [Refer Fig.Q5(a)] **(06 Marks)**

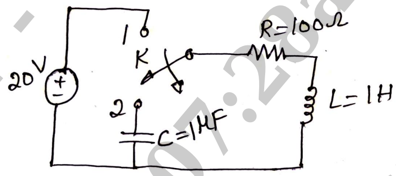

Fig.Q5(a)

b. In the network shown in Fig.Q5(b), $V_1(t) = e^{-t}$ for $t \geq 0$ and is zero for all $t < 0$. If the capacitor is initially uncharged. Determine the value of $\dfrac{d^2v_2}{dt^2}$ and $\dfrac{d^3v_2}{dt^3}$ at $t = 0^+$.

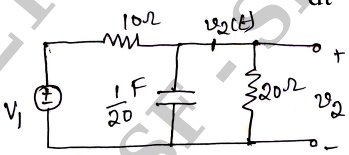

Fig.Q5(b) **(08 Marks)**

c. Explain initial and final conditions in case of a capacitor. **(06 Marks)**

6 a. For the circuit shown in Fig.Q6(a),
(i) Find the differential equation for $i_L(t)$
(ii) Find Laplace transform of $i_L(t)$
(iii) Solve for $i_L(t)$

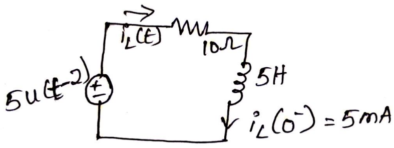

Fig.Q6(a) **(08 Marks)**

b. For the circuit shown in Fig.Q6(b), (i) Find the differential equation for $i_L(t)$, (ii) Find Laplace transform of $i_c(t)$, (iii) Solve for $i_L(t)$. **(08 Marks)**

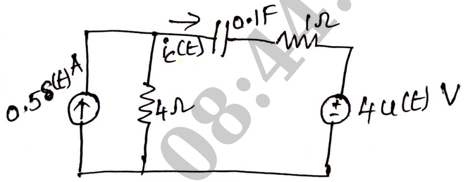

Fig.Q6(b)

c. Obtain Laplace transform for a decaying exponential signal. **(04 Marks)**

7 a. Prove that the resonant frequency is the geometric mean of the two half power frequencies i.e., Show that $\omega_0 = \sqrt{\omega_1 \omega_2}$ **(08 Marks)**

b. Obtain an expression for quality factor of an capacitor. **(07 Marks)**

c. In a series circuit, R = 6 Ω, $\omega_0 = 4.1\times10^6$ rad/sec, bandwidth = 10^5 rad/sec. Compute L, C half power frequencies and Q. **(05 Marks)**

8 a. Obtain an expression for the resonant frequency in a parallel resonant circuit. **(08 Marks)**

b. Show that a two branch parallel resonant circuit is resonant at all frequencies when

$$R_L = R_C = \sqrt{\frac{L}{C}}$$ **(07 Marks)**

c. Find the value of R_L for which the circuit is at resonance, as shown in Fig.Q8(c). **(05 Marks)**

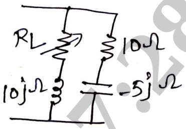

Fig.Q8(c)

9 a. Obtain an expression for h-parameters in terms of Z-parameters. **(08 Marks)**

b. Find Z and Y parameters for the network shown in Fig.Q9(b). **(08 Marks)**

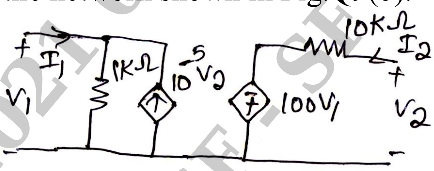

Fig.Q9(b)

c. Explain ABCD parameters. **(04 Marks)**

10 a. Obtain an expression for Y-parameters in terms of ABCD parameters. **(08 Marks)**

b. Find ABCD parameters for the network shown in Fig.Q10(b).

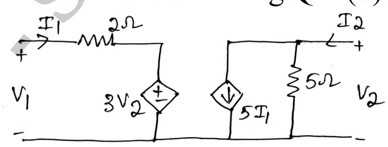

Fig.Q10(b) **(08 Marks)**

c. State reciprocity condition for
(i) Z – parameters
(ii) Y – parameters
(iii) h – parameters
(iv) ABCD – parameters **(04 Marks)**

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