CBCS SCHEME

USN | | | | | | | | | | 17EC35

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Network Analysis

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a. Define controlled source and mention its types. Also, mention its applications. **(05 Marks)**
    b. Using source shift and source transformations, determine the voltage across the current source in Fig Q1(b).
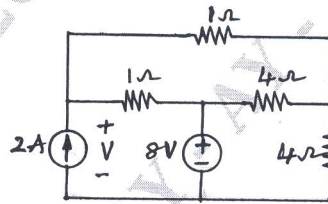

Fig Q1(b)   **(05 Marks)**

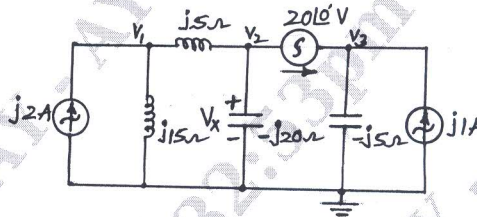   c. For the circuit of Fig Q1(c), use nodal analysis to determine the voltage labeled V_x

Fig Q1(c)   **(10 Marks)**

OR

2   a. Define and explain supermesh.   **(04 Marks)**
    b. Use Star-Delta transformations to find the equivalent resistance at AB in Fig Q2(b).

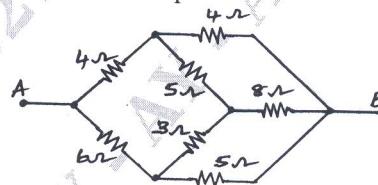Fig Q2(b)   **(06 Marks)**

    c. Use Mesh analysis to determine V_1 and the power being supplied by the dependent current source in the circuit shown in Fig Q2(c).
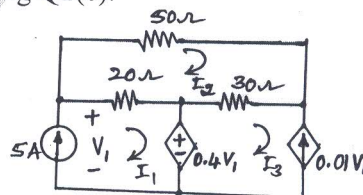

Fig Q2(c)   **(10 Marks)**

Module-2

3   a.   State and explain Millman's theorem for AC circuit.   (05 Marks)

     b.   Use superposition on the circuit shown in Fig Q3(b) to find the current i_x.
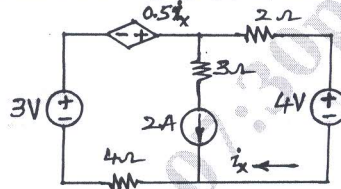
Fig Q3(b)   (05 Marks)

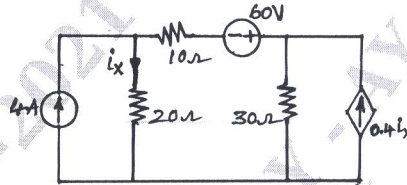   c.   Use Norton's theorem for the circuit of Fig Q3(c) to determine the power absorbed by the 20Ω resistor.

Fig Q3(c)   (10 Marks)

OR

4   a.   State and prove maximum power transfer theorem for AC voltage source with internal impedance connected to variable impedance.   (06 Marks)

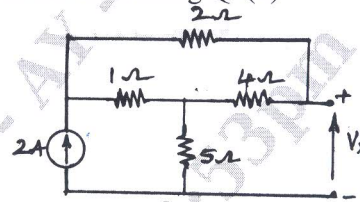   b.   Verify reciprocity theorem for the circuit of Fig Q4(b).

Fig Q4(b)   (04 Marks)

     c.   For the circuit of Fig Q4(c), what value of R_L will absorb a maximum average power, and what is the value of this power?
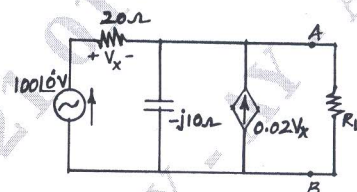
Fig Q4(c)   (10 Marks)

Module-3

5   a.   Explain the behavior of R, L and C elements for transients. Mention their representation at $t = 0^+$ (06 Marks)

     b.   In the network of the Fig Q5(b), is in the steady state with the switch K closed. At t = 0, the switch is opened. Find the values of $v_1, v_2, \dfrac{dv_1}{dt}$ and $\dfrac{dv_2}{dt}$ at $t = 0^+$.
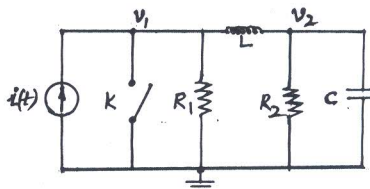
Fig Q5(b)   (08 Marks)

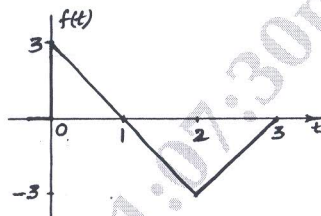c. Find the Laplace transform of the waveform shown in Fig Q5(c)

Fig Q5(c) **(06 Marks)**

OR

6 a. In the network of the Fig Q6(a), a steady state is reached with the switch K open. AT time $t = 0$, the switch is closed. Find the values of i_1, i_2, $\dfrac{di_1}{dt}$ and $\dfrac{di_2}{dt}$ at $t = 0^+$.
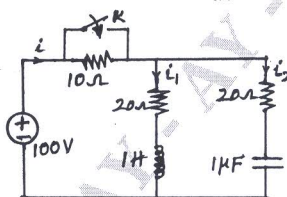

Fig Q6(a) **(10 Marks)**

b. In the network of the Fig Q6(b), the switch K is closed at $t = 0$ a steady state having previously excited. Draw the transform network and find the current $i(t)$, using the Laplace transformation method.
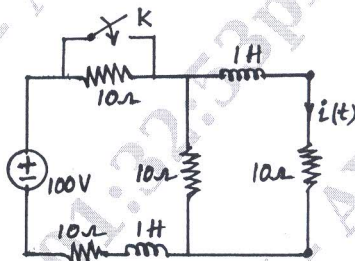

Fig Q6(b) **(10 Marks)**

Module-4

7 a. In a series resonant circuit, show that resonant frequency is equal to the geometric mean of half-power frequencies. **(06 Marks)**

b. An R-L-C series circuit of 8Ω resistance should be designed to have a bandwidth of 50Hz. Determine the values of L and C, so that the system resonates at 250Hz. Also determine the half power frequencies. **(06 Marks)**

c. For the network shown in Fig Q7(c), determine the value of C at which it resonates when $f = 100$Hz. Also find the values of R_L and R_C at which the circuit resonates at all frequencies.
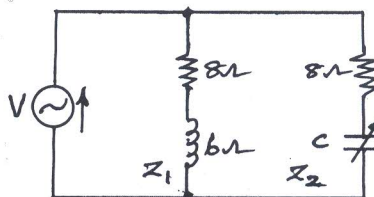

Fig Q7(c) **(08 Marks)**

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OR

8 a. Define the following terms pertaining to a series R-L-C circuit, i) Resonance ii) Quality factor iii) Bandwidth iv) Selectivity.   **(04 Marks)**

    b. A series R-L-C circuit with an input voltage $5 \lfloor 0°$ V resonates at a frequency of 8400Hz. The peak value of current is 500mA at resonance and the bandwidth is 120Hz. Determine the values of R, L, C and cut-off frequencies.   **(06 Marks)**

    c. For the network shown in Fig Q8(c), determine: i) Resonance frequency ii) Input admittance iii) Quality factor iv) Bandwidth and v) half power frequencies.
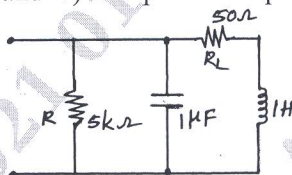

Fig Q8(c)   **(10 Marks)**

Module-5

9 a. Obtain Y-parameters in terms of z-parameters.   **(06 Marks)**

    b. Find hybrid parameters for the two part shown in Fig Q9(b). What value of K in the two-part of figure shown will produce reciprocal network.
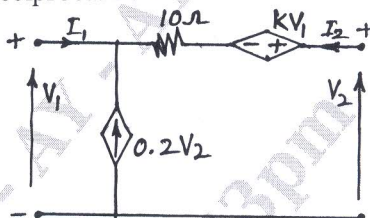

Fig Q9(b)   **(06 Marks)**

    c. Determine the ABCD parameters for the network of Fig Q9(c).
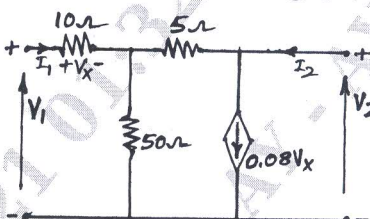

Fig Q9(c)   **(08 Marks)**

OR

10 a. Explain h-parameters with equivalent circuit. Also obtain t-parameters in terms of h-parameters and hence show that $AD - BC = 1$.   **(10 Marks)**

    b. Find the Z-parameters and the Y-parameters for the network of Fig Q10(b)
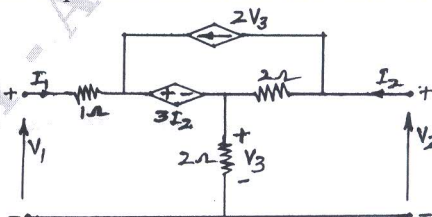

Fig Q10(b)   **(10 Marks)**

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