CBCS SCHEME

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18EE32

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

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Solve for the Mesh currents I_1, I_2 and I_3 using Mesh analysis for the circuit given in Fig.Q1(a).

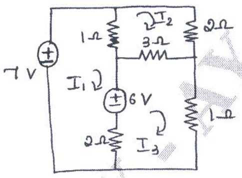

Fig.Q1(a) **(08 Marks)**

b. Find the equivalent resistance across terminals 'a' and 'b' for the circuit given in Fig.Q1(b).

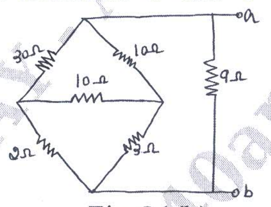

Fig.Q1(b) **(06 Marks)**

c. Use the node voltage method to find how much power the 2A source extract in Fig.Q1(c).

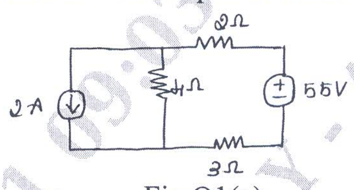

Fig.Q1(c) **(06 Marks)**

2 a. For the circuit given in Fig.Q2(a). Using source transformation. Find the equivalent voltage source across terminals a and b.

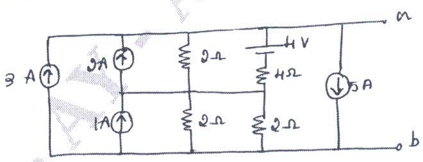

Fig.Q2(a) **(10 Marks)**

b. For the circuit given in Fig.Q2(b), using Nodal analysis. Solve for the node voltages.

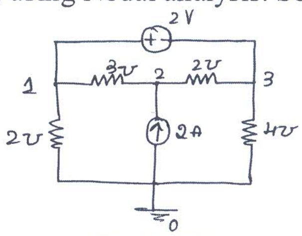

Fig.Q2(b) **(10 Marks)**

3 a. Calculate for 'I_x' using superposition theorem for the circuit shown in Fig.Q3(a).

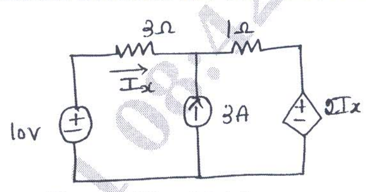

Fig.Q3(a) **(08 Marks)**

b. Deduce Thevenin's equivalent across terminals a and b for circuit shown in Fig.Q3(b).

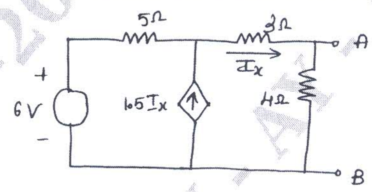

Fig.Q3(b) **(06 Marks)**

c. Deduce Norton's equivalent across terminals a and b for the circuit shown in Fig.Q3(c).

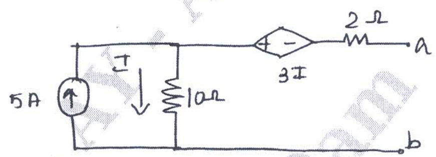

Fig.Q3(c) **(06 Marks)**

4 a. Verify reciprocity theorem for the circuit shown in Fig.Q4(a).

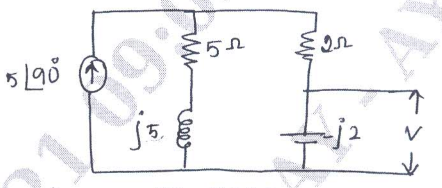

Fig.Q4(a) **(06 Marks)**

b. Calculate the maximum power in Z_L using MPT theorem for circuit shown in Fig.Q4(b).

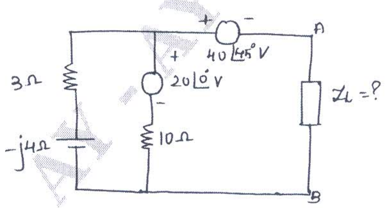

Fig.Q4(b) **(06 Marks)**

c. Find the Thevinin's equivalent circuit across A and B for the circuit shown in Fig.Q4(c).

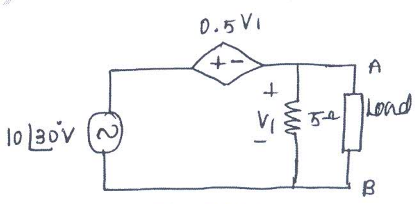

Fig.Q4(c) **(08 Marks)**

5 a. Derive for resonant circuit, the resonant frequency $f_0 = \sqrt{(f_1 f_2)}$ where f_1 and f_2 are the two half power frequencies. **(06 Marks)**

b. A series resonance network consisting of a resistor of 30Ω a capacitor of 247 an inductor of 20mH is connected across a sinusoidal supply voltage of 9 volts at all frequencies. Calculate the resonant frequency of the current at resonance, the voltage across the inductor and capacitor at resonance the quality factor and bandwidth of the circuit. **(06 Marks)**

c. Determine $\frac{di(t)}{dt}, \frac{d^2i(t)}{dt^2}$ at $t = 0^+$ when the switch K is closed at t = 0 with zero current in the inductor for the circuit shown in Fig.Q5(c).

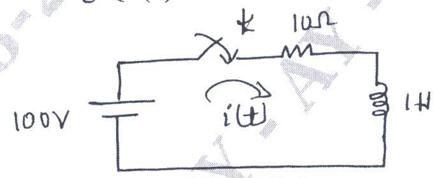

Fig.Q5(c) **(08 Marks)**

6 a. In the given network in Fig.Q6(a), switch K is open at t = 0 and $t = 0^+$, solve for the value of $v, \frac{dv}{dt}, \frac{d^2v}{dt^2}$. If I = 2A, R = 100Ω and L = 1H.

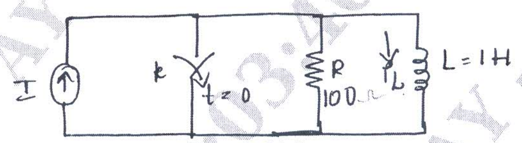

Fig.Q6(a) **(10 Marks)**

b. In the circuit shown in Fig.6(b), the steady state is reached with switch K open, the switch is closed at t = 0. Determine i, i_2, $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0^+$.

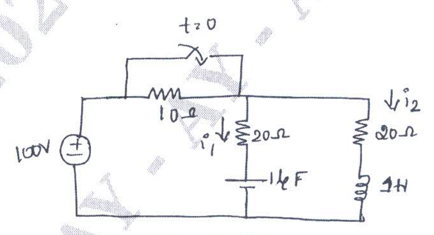

Fig.Q6(b) **(10 Marks)**

7 a. State and prove initial value theorem and final value theorem. **(10 Marks)**

b. Obtain the laplace transform of the periodic signal shown in Fig.Q7(b).

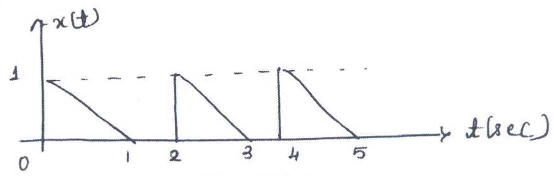

Fig.Q7b) **(10 Marks)**

8 a. Find inverse Laplace transform of the following :

i) $\dfrac{s^2 + 2s + 5}{(s+3)(s+5)^2}$

ii) $\dfrac{2s+4}{s^2+4s+3}$. **(10 Marks)**

b. For the circuit shown in Fig.Q8(b). Determine the step response $V_C(t)$ for the voltage across the capacitor.

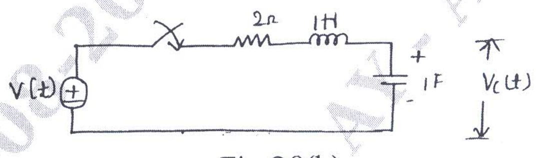

Fig.Q8(b) **(10 Marks)**

9 a. The network shown in Fig.Q9(a) contains both dependent current source and dependent voltage source. For the element values given, determine the y – z parameters.

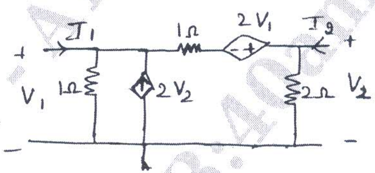

Fig.Q9(a) **(08 Marks)**

b. Find y_{11}, z_{21}, A, and W from $2V_1 + 4I_2 = I_1$, $8I_2 = V_2 + 6V_1$. **(06 Marks)**

c. A 440V, 3ϕ, 4 wire unbalanced load has impedances $Z_r = 10\Omega$, $Z_y = j5\Omega$, $Z_b = -j5\Omega$. Calculate for the line currents, total active power and total reactive power. **(06 Marks)**

10 a. Obtain relationship between Z interms of Y parameters and Y in terms of Z parameter. **(08 Marks)**

b. A Δ-connected load with $Z_{RY} = 10\angle 30°\Omega$, $Z_{YB} = 25\angle 0°$, $Z_{BR} = 20\angle -30°\Omega$ is connected to a 3ϕ. 3 wire 500V RYB system. Determine the line current and total power absorbed. **(06 Marks)**

c. Find the transmission parameters of the network shown in Fig.Q10(c).

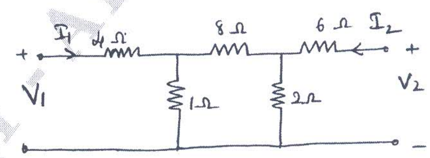

Fig.Q10(c) **(06 Marks)**

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