CBCS SCHEME

USN | | | | | | | | | | |

17EE32

Third Semester B.E. Degree Examination, Aug./Sept. 2020
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Distinguish between:i) Active and passive elements ii) Ideal and practical sources. **(06 Marks)**

b. Using source transformation and source shift method, reduce the network shown in Fig.Q1(b) to a single voltage source in series with a resistance.

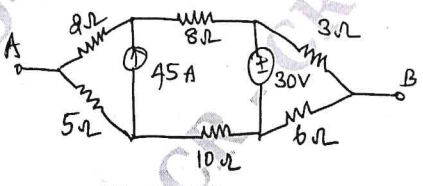

Fig.Q1(b) **(06 Marks)**

c. Find the current I using Mesh analysis for the circuit shown in Fig.Q1(c).

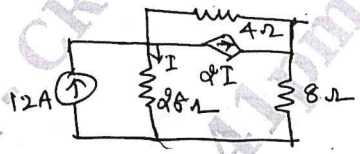

Fig.Q1(c) **(08 Marks)**

OR

2 a. Find the node voltages V_1 and V_2 for the circuit shown in Fig.Q2(a) using nodal analysis.

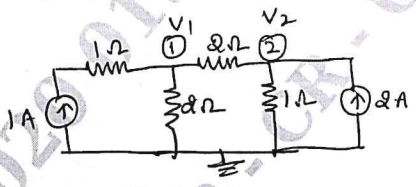

Fig.Q2(a) **(06 Marks)**

b. Determine the equivalent resistance between the terminals AB for the circuit shown in Fig.Q2(b) using Y-Δ transformation.

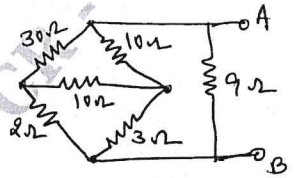

Fig.Q2(b) **(06 Marks)**

c. For the networks shown in Fig.Q2(c) draw the dual of the circuit. Also write the nodal equations for the dual network.

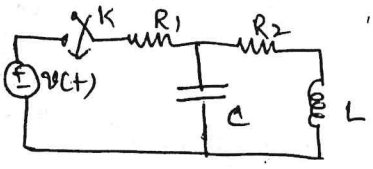

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Using superposition principle, find the current in 6 ohm resistor in the network shown Fig.Q3(a).

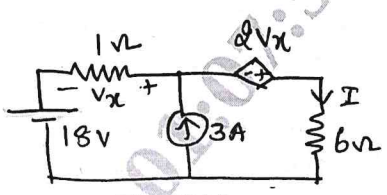

Fig.Q3(a) **(06 Marks)**

b. Calculate the Thevenin's equivalent circuit across AB for the network shown in Fig.Q3(b).

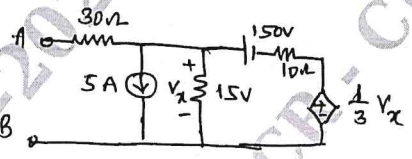

Fig.Q3(b) **(08 Marks)**

c. State and explain Norton's theorem. **(06 Marks)**

OR

4 a. State and prove maximum power transfer theorem for AC circuit. **(08 Marks)**

b. Find he current 'I' using Millman's theorem for the Fig.Q4(b).

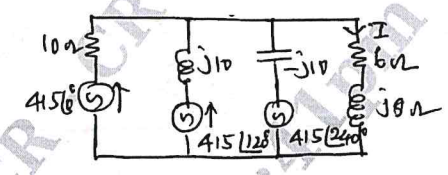

Fig.Q4(b) **(06 Marks)**

c. Find 'I_x' and verify reciprocity theorem for Fig.Q4(c).

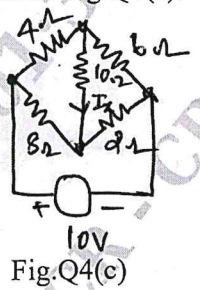

Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Derive an expressions for resonant frequency, half power frequencies, band width and quality factor for series resonant circuits. **(06 Marks)**

b. In the networks shown in Fig.Q5(b), switch 'K' is changed from position a to b at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

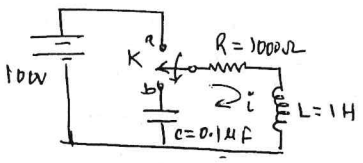

Fig.Q5(b) **(08 Marks)**

c. A series RLC circuit consists of R = 10Ω, L = 0.01H C = 0.01 μF is connected to 10mV supply. Determine : i) f_0 ii) Q – factor iii) band width iv) f_1 and f_2 v) I_0. **(06 Marks)**

OR

6 a. Discuss the behavior of R, L, C elements at :
i) The time of switching ($t = 0^+$) ii) the time of steady state ($t = \infty$). **(06 Marks)**

b. In the circuit shown in Fig.Q6(b) a steady state is reached with switch 'K' is open. At time $t = 0$, the switch is closed. Find the currents at $t = 0^+$. $i_1(t)$, $i_2(t)$, $\frac{di_1}{dt}(t)$.

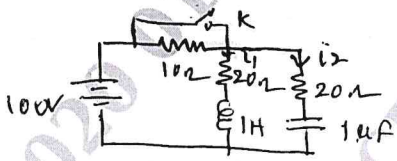

Fig.Q6(b) **(08 Marks)**

c. For the circuit show in Fig.Q6(c), find the value of capacitance 'C' so that the circuit will resonates at $W_0 = 5K$ rad/sec.

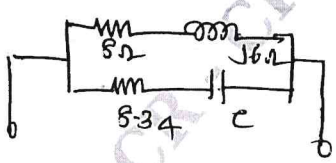

Fig.Q6(c) **(06 Marks)**

Module-4

7 a. State and prove initial value and final value theorem. **(06 Marks)**

b. Find the Laplace transform of the following : i) $\sin \omega t$ ii) $\cos \omega t$ iii) $e^{-at} \sin \omega t$ iv) $e^{-at} \cos \omega t$. **(08 Marks)**

c. Obtain the Laplace transform of the following function shown in Fig.Q7(c).

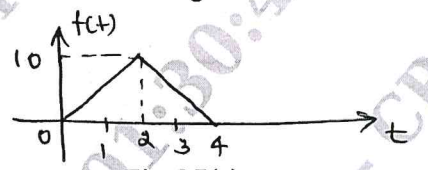

Fig.Q7(c) **(06 Marks)**

OR

8 a. Find the inverse Laplace transform of the following :

i) $F(s) = \frac{s+2}{s(s+3)(s+4)}$ ii) $F(s) = \frac{(s-2)}{s(s+1)^3}$. **(06 Marks)**

b. Find the Laplace transform of the following waveform shown in Fig.Q8(b).

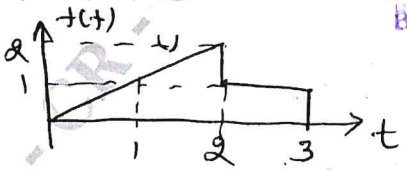

Fig.Q8(b) **(08 Marks)**

c. Using Laplace transform define the current i(t) in the circuit shown in Fig.Q8(c). When switch 'S' is closed at $t = 0$.

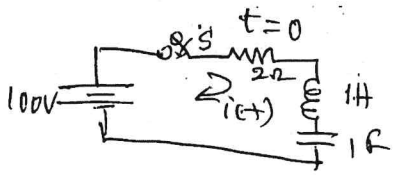

Fig.Q8(c) **(06 Marks)**

Module-5

9 a. Define Z and Y parameters with equivalent diagram. **(06 Marks)**

b. Determine the line currents in an unbalanced star connected load supplied from a symmetrical 3-phase, 440V, system. The branch impedance are $Z_R = 4\angle 30° \Omega$, $Z_Y = 10\angle 45 \Omega$, $Z_B = = 10\angle 60° \Omega$. The phase sequence is RYB. **(08 Marks)**

c. Find Y-Parameters for the circuit shown in Fig.Q9(c).

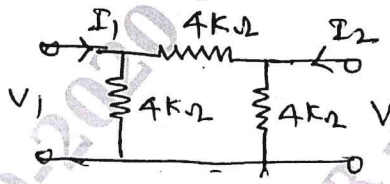

Fig.Q9(c) **(06 Marks)**

OR6

10 a. Obtain hybrid parameters interms of impedance parameters. **(06 Marks)**

b. Obtain Z-parameters of the circuit shown in Fig.Q10(b).

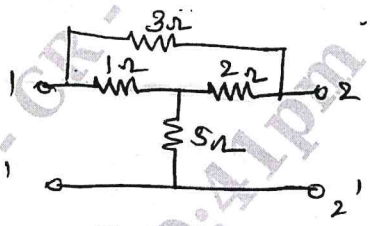

Fig.10(b) **(08 Marks)**

c. The circuit shown in Fig.Q10(c) is supplied by a 240V, 3phase, 4 wire system. Taking V_{ab} reference, calculate : i) phase voltage ii) Line and phase currents.

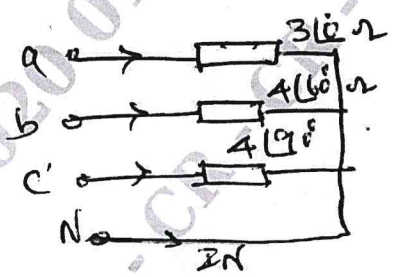

Fig.10(c) **(06 Marks)**

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