

CBCS SCHEME

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.

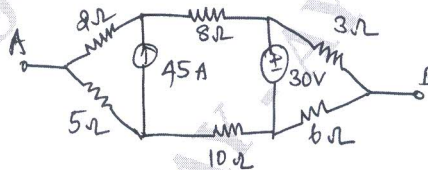


Fig.Q1(b)

(06 Marks)

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

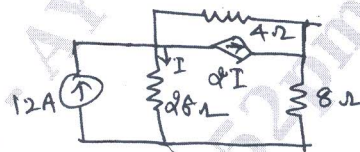


Fig.Q1(c)

(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.

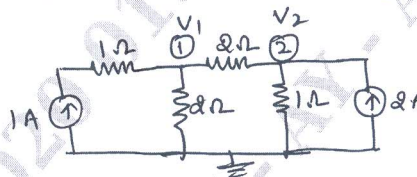


Fig.Q2(a)

(06 Marks)

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

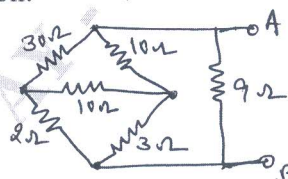


Fig.Q2(b)

(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.

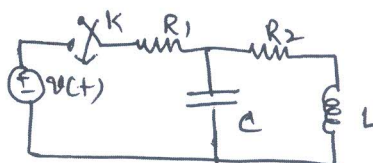


Fig.Q2(c)

(08 Marks)

Module-2

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

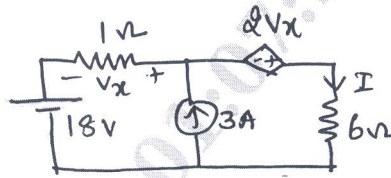


Fig.Q3(a)

(06 Marks)

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

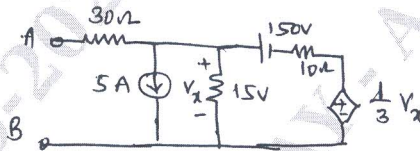


Fig.Q3(b)

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

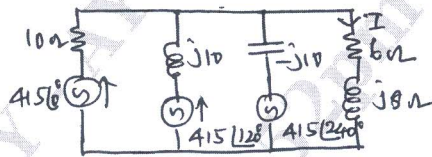


Fig.Q4(b)

(06 Marks)

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

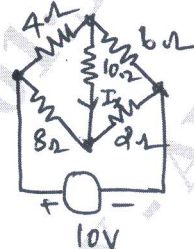


Fig.Q4(c)

(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 $t = 0^+$.

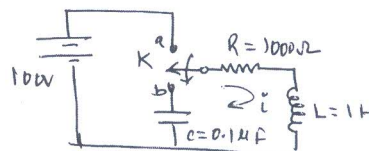


Fig.Q5(b)

(08 Marks)

- c. A series RLC circuit consists of $R = 10 \Omega$, $L = 0.01 H$, $C = 0.01 \mu F$ 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 $t = 0^+$. $i_1(t)$, $i_2(t)$, $\frac{di_1}{dt}(t)$.

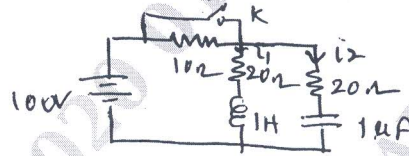


Fig.Q6(b)

(08 Marks)

- c. For the circuit show in Fig.Q6(c), find the value of capacitance 'C' so that the circuit will resonate at $\omega_0 = 5K$ rad/sec.

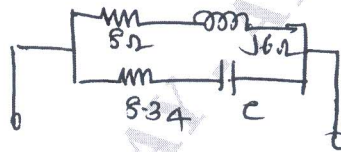


Fig.Q6(c)

(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).

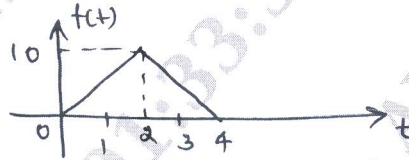


Fig.Q7(c)

(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).

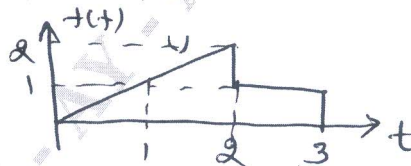


Fig.Q8(b)

(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 $t = 0$.

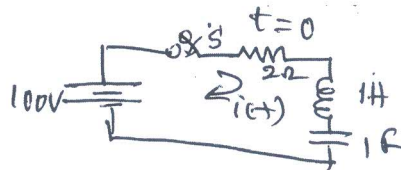


Fig.Q8(c)

(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 $Z_R = 4\angle 30^\circ \Omega$, $Z_Y = 10\angle 45^\circ \Omega$, $Z_B = 10\angle 60^\circ \Omega$. The phase sequence is RYB. (08 Marks)
 c. Find Y-Parameters for the circuit shown in Fig.Q9(c).

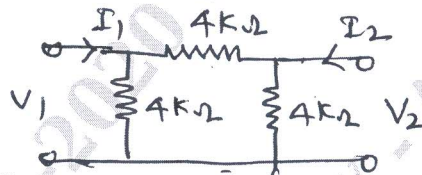


Fig.Q9(c)

(06 Marks)

OR6

- 10 a. Obtain hybrid parameters in terms of impedance parameters. (06 Marks)
 b. Obtain Z-parameters of the circuit shown in Fig.Q10(b).

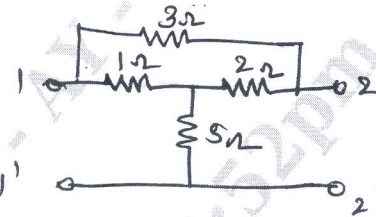


Fig.10(b)

(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.

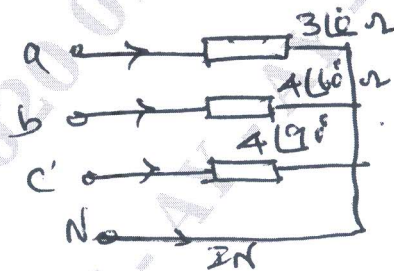


Fig.10(c)

(06 Marks)
