

CBCS Scheme

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15EE32

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017

Electric Circuit Analysis

Time: 3 hrs.

Max. Marks: 80

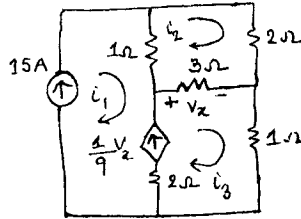
Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Find the three unknown currents in the circuit shown in Fig.Q.1(a) using mesh analysis.

(08 Marks)

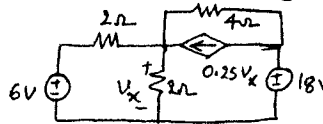
Fig.Q.1(a)



- b. Find V_x in the circuit diagram shown in Fig.Q.1(b) using source transformation.

(08 Marks)

Fig.Q.1(b)

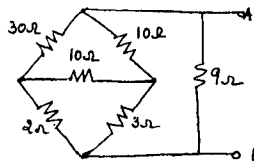


OR

- 2 a. Determine the equivalent resistance between the terminals AB for the network shown in Fig.Q.2(a).

(05 Marks)

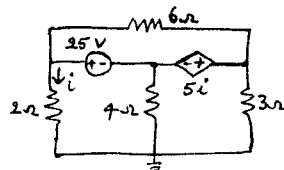
Fig.Q.2(a)



- b. Find the node voltage V_1 , V_2 and V_3 in circuit diagram shown in Fig.Q.2(b) using nodal analysis.

(06 Marks)

Fig.Q.2(b)



- c. A series connected RLC circuit has $R = 4\Omega$, $L = 25\text{mH}$. Calculate the value of C such that $Q = 50$. Also find resonant frequency, half power frequencies.

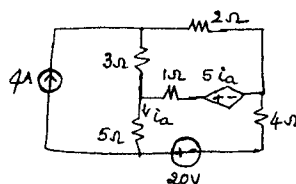
(05 Marks)

Module-2

- 3 a. Find the current i_a in the circuit shown in Fig.Q.3(a) by applying superposition theorem.

(06 Marks)

Fig.Q.3(a)



- b. Obtain the condition for an alternating voltage source to transfer maximum power to the load when the load impedance is the complex conjugate of the source impedance.

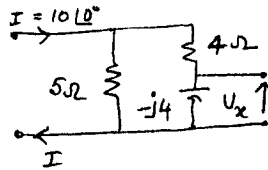
(04 Marks)

Important Note: In completing our question, avoid scribbles, avoid diagonal cross marks on the remaining blank pages. 2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Find the voltage 'V_x' and apply reciprocity theorem to the network shown in Fig.Q.3(c).

(06 Marks)

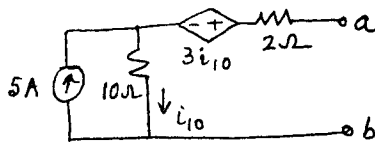
Fig.Q.3(c)



OR

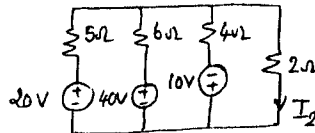
- 4 a. For the network shown in Fig.Q.4(a), obtain the Norton's equivalent as seen from the terminals a – b. (08 Marks)

Fig.Q.4(a)



- b. Determine the current I₂ by applying Millman's theorem for the network shown in Fig.Q.4(b). (08 Marks)

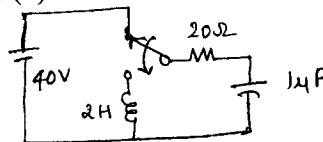
Fig.Q.4(b)



Module-3

- 5 a. Show the behaviour of R, L, C elements at the time of switching at t = 0 both at t = 0⁺ and t = ∞. (08 Marks)
- b. Determine i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0⁺ when the switch K is moved from position 1 to 2 at t = 0 for the network shown in Fig.Q.5(b). (08 Marks)

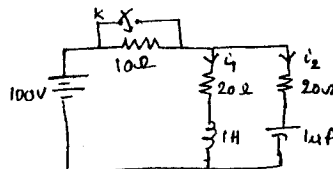
Fig.Q.5(b)



OR

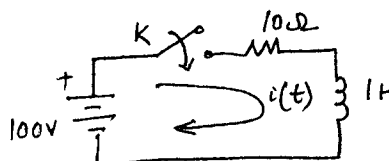
- 6 a. In the network shown in Fig.Q.6(a) a steady state is reached with switch 'K' open. At time t = 0, the switch is closed. Find at t = 0⁺, i₁(t), i₂(t) and $\frac{di_1(t)}{dt}$. (08 Marks)

Fig.Q.6(a)



- b. In the network shown Fig.Q.6(b) K is closed at t = 0 with zero current in the inductor. Find: i(t), $\frac{di(t)}{dt}$ at t = 0⁺ and obtain an expression for i(t) at t ≥ 0⁺ by classical method. (08 Marks)

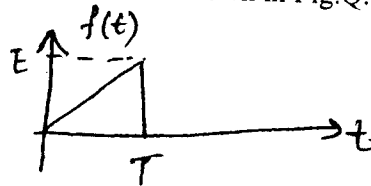
Fig.Q.6(b)



Module-4

- 7 a. State and prove shifting theorem. (06 Marks)
 b. Find the Laplace transform of the waveform shown in Fig.Q.7(b). (06 Marks)

Fig.Q.7(b)

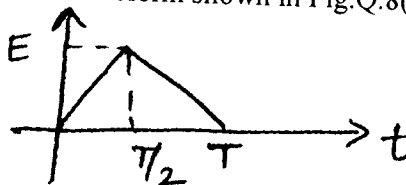


- c. Apply the initial and final value theorem respectively to the s-domain equations of $I_1(s)$ and $I_2(s)$ given,
 i) $I_1(s) = \frac{6.67(s+250)}{s(s+166.7)}$ ii) $I_2(s) = \frac{6.67}{s+166.7}$ (04 Marks)

OR

- 8 a. Find the Laplace transform of the shifted function given i) $10 u(t-2)$ ii) $10 \delta(t-2)$
 iii) $10 r(t-2) u(t-2)$ iv) $10 \sin(t-2) u(t-2)$. Also sketch these functions. (08 Marks)
 b. Find the Laplace transform of the waveform shown in Fig.Q.8(b). (08 Marks)

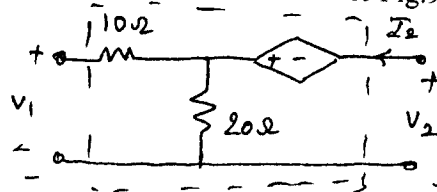
Fig.Q.8(b)



Module-5

- 9 a. An unbalanced 3-phase, 4-wire star connected load, has balanced voltages of 208V with ABC phase sequence. Calculate the line currents and the neutral current.
 $Z_A = 10\Omega$, $Z_B = 15 \angle 30^\circ \Omega$, $Z_C = 10 \angle -30^\circ \Omega$. (06 Marks)
 b. Define Z and Y parameters. (04 Marks)
 c. Find the T parameters for the 2-port network shown in the Fig.9(c). (06 Marks)

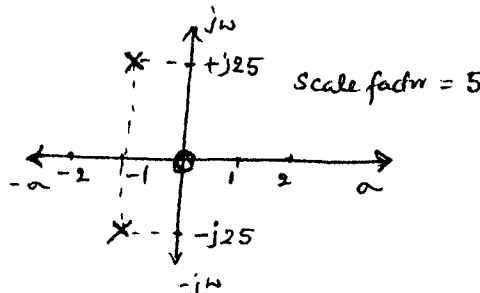
Fig.Q.9(c)



OR

- 10 a. A series RLC circuit has for its driving point admittance pole-zero diagram as shown in Fig.Q.10(a). Find the values of R - L - C. (08 Marks)

Fig.Q.10(a)



- b. Find the response $i(t)$ when input signal i) $5\delta(t-2)$ ii) $5u(t-2)$ is given to a R - L series circuit. Assume initial current through the inductor to be zero. (08 Marks)
