

CBCS SCHEME

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17EE32

Third Semester B.E. Degree Examination, June/July 2019

Electric Circuit Analysis

Time: 3 hrs.

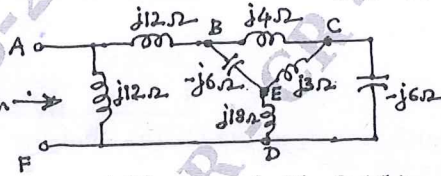
Max. Marks: 100

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

Module-1

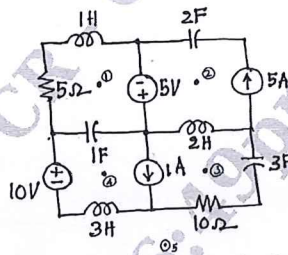
- 1 a. Find the input impedance Z_{in} for the network shown in Fig.Q.1(a) (06 Marks)

Fig.Q.1(a)



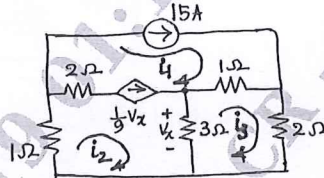
- b. Construct the exact dual of the network N_1 shown in Fig.Q.1(b) using dot method. (08 Marks)

Fig.Q.1(b)



- c. Find the loop currents i_1 , i_2 and i_3 using Mesh analysis for the network shown in Fig.Q.1(c) (06 Marks)

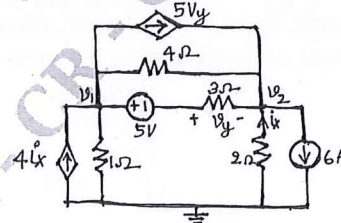
Fig.Q.1(c)



OR

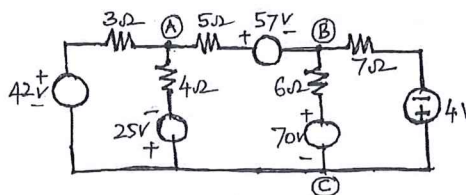
- 2 a. Write a system of nodal equations for the circuit of Fig.Q.2(a) using the nodal voltages V_1 and V_2 as the variables. What power is furnished by the dependent sources? (10 Marks)

Fig.Q.2(a)



- b. Find the voltage across the 5Ω resistor of Fig.Q.2(b) using source transformation technique. (06 Marks)

Fig.Q.2(b)

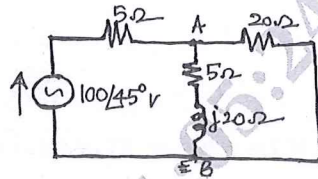


Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. For the network shown in Fig.Q.2(c). Find the voltage V_{AB} using the nodal method.

(04 Marks)

Fig.Q.2(c)

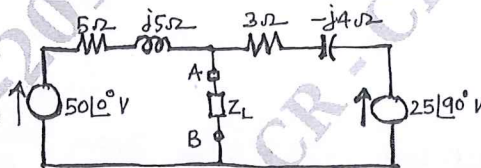


Module-2

- 3 a. In the network shown in Fig.Q.3(a) two voltage sources act on the load impedance connected to the terminals AB. If this load is variable in both reactance and resistance, what load Z_L will receive maximum power? What is the value of this maximum power?

(06 Marks)

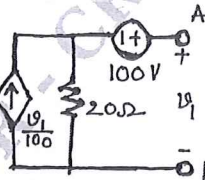
Fig.Q.3(a)



- b. For the network shown in Fig.Q.3(b), find the Thevenin's equivalent network across the terminals A and B.

(08 Marks)

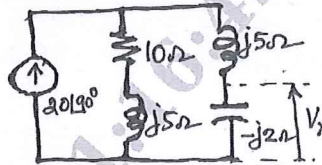
Fig.Q.3(b)



- c. In the network shown in Fig.Q.3(c), determine the voltage ' V_x '. Then apply the reciprocity theorem and compare the two voltages.

(06 Marks)

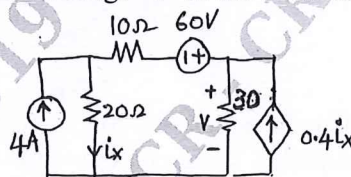
Fig.Q.3(c)



OR

- 4 a. Use superposition theorem to find voltage ' V ' in the network shown in Fig.Q.4(a) (06 Marks)

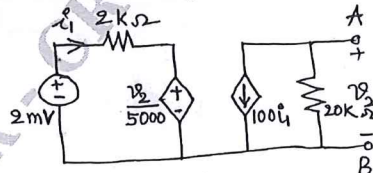
Fig.Q.4(a)



- b. Fig.Q.4(b) shows one form of the equivalent circuit of a transistor amplifier. Obtain its Thevenin's equivalent network across the output terminals 'A' and 'B'.

(08 Marks)

Fig.Q.4(b)

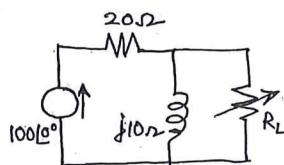


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- c. Find the value of R_L of the network of Fig.Q.4(c) that will absorb a maximum power and specify the value of that power.

(06 Marks)

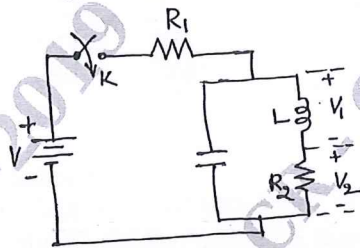
Fig.Q.4(c)



Module-3

- 5 a. A series RLC circuit has $Q_0 = 5.1$ at its resonant frequency of 100kHz. Assuming the power dissipation of the circuit is 100W when drawing a current of 0.8A, find: i) R,L,C ii) Band width (Δf) of the circuit and iii) Half-power frequencies. (08 Marks)
- b. Fig.Q.5(b) shows a network with zero capacitor voltage and zero inductor current when the switch 'K' is open. At $t = 0$ the switch 'K' is closed. Solve for i) V_1 and V_2 at $t = 0^+$ ii) $\frac{dv_1}{dt}$ and $\frac{dv_2}{dt}$ at $t = 0^+$ iii) $\frac{d^2v_2}{dt^2}$ at $t = 0^+$ (12 Marks)

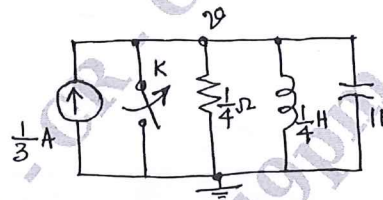
Fig.Q.5(b)



OR

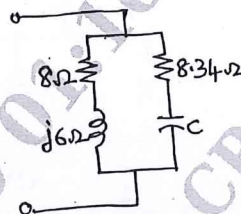
- 6 a. Fig.Q.6(a) shows a RLC parallel circuit excited by a dc current source. At $t = 0$, the switch 'K' is opened. Find $v(t)$. (12 Marks)

Fig.Q.6(a)



- b. For the circuit of Fig.Q.6(b), find the value of capacitance so that the circuit resonates at $\omega_0 = 5K$ rad/s. (08 Marks)

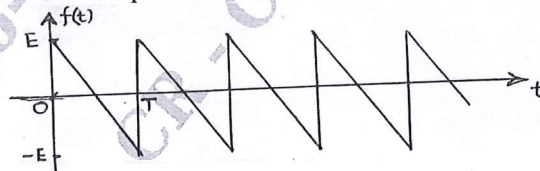
Fig.Q.6(b)



Module-4

- 7 a. Find the Laplace transform of the periodic Saw tooth wave shown in Fig.Q.7(a). (12 Marks)

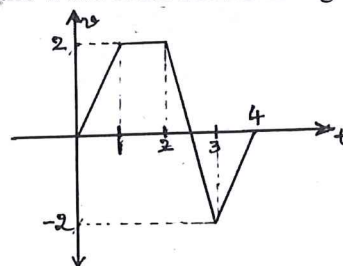
Fig.Q.7(a)



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- b. Find the Laplace transform for the wave form shown in Fig.Q.7(b). (08 Marks)

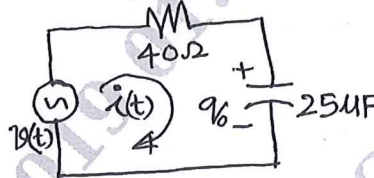
Fig.Q.7(b)



OR

- 8 a. State and prove initial – value and final – value theorems in Laplace transformation. (10 Marks)
- b. Fig.Q.8(b) shows an R-C circuit excited by a sinusoidal voltage $V(t) = 200 \sin(2000t + \phi)$. The capacitor has an initial charge of $1.25 \times 10^{-3} \text{C}$ with polarity as shown. Find the current if the circuit is switched on at $\phi = 90^\circ$, using Laplace transformation technique. (10 Marks)

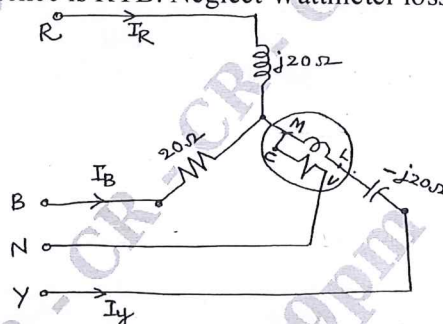
Fig.Q.8(b)



Module-5

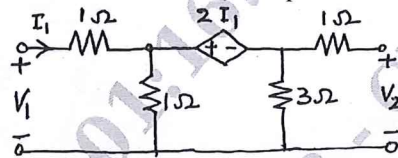
- 9 a. Find the reading on the Wattmeter in Fig.Q.9(a) when the circuit is connected to a 400V, 3- ϕ supply. The phase sequence is RYB. Neglect Wattmeter losses. (10 Marks)

Fig.Q.9(a)



- b. Obtain the y-parameters of the circuit shown in Fig.Q.9(b). Find its equivalent circuit using y-parameters and find whether the network is i) reciprocal ii) symmetrical. (10 Marks)

Fig.Q.9(b)

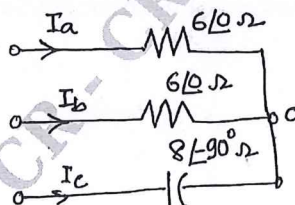


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OR

- 10 a. In a 3-phase 3-wire 400 $\angle 0^\circ$ system abc, loads $6\angle 0^\circ$, $6\angle 0^\circ$ and $8\angle -90^\circ \Omega$ are connected to phases a, b, c respectively as shown in Fig.Q.10(a). Find : i) Line currents and ii) Voltage V_{ao} , V_{bo} and V_{co} . (10 Marks)

Fig.Q.10(a)



- b. Find the transmission or ABCD parameters of network shown in Fig.Q.10(b). Find whether the network is i) Reciprocal ii) Symmetrical. (10 Marks)

Fig.Q.10(b)

