CBCS SCHEME

USN

17EE32

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

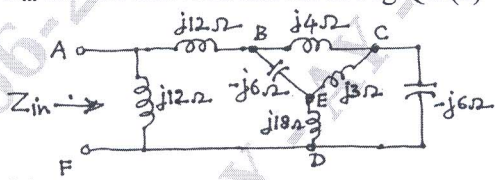
Time: 3 hrs. Max. Marks: 100

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

Module-1

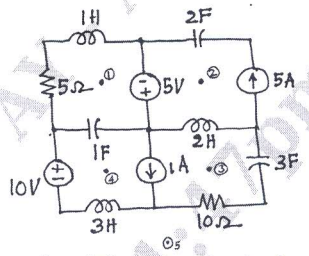
1 a. Find the input impedance Z_{in} for the network shown in Fig.Q.1(a) **(06 Marks)**

Fig.Q.1(a)



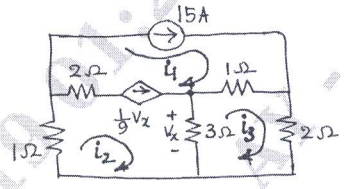
b. Construct the exact dual of the network N_1 shown in Fig.Q.1(b) using dot method. **(08 Marks)**

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)**

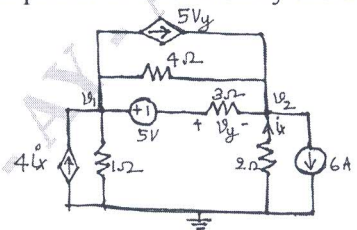
Fig.Q.1(c)



OR

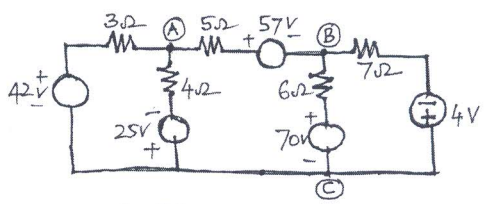
2 a. Write a system of nodal equations for the circuit of Fig.Q.2(a) using the nodal voltages V_1 and V_2 as the variables. What power is furnished by the dependent sources? **(10 Marks)**

Fig.Q.2(a)



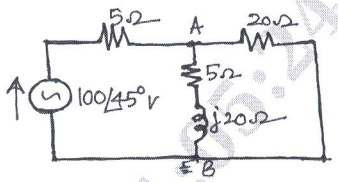
b. Find the voltage across the 5Ω resistor of Fig.Q.2(b) using source transformation technique. **(06 Marks)**

Fig.Q.2(b)



c. For the network shown in Fig.Q.2(c). Find the voltage V_{AB} using the nodal method. **(04 Marks)**

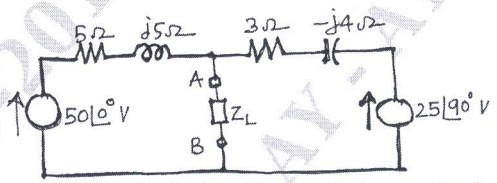
Fig.Q.2(c)



Module-2

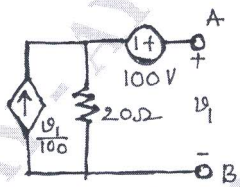
3 a. In the network shown in Fig.Q.3(a) two voltage sources act on the lead impedance connected to the terminals AB. If this load is variable in both reactance and resistance, what load Z_L will receive maximum power? What is the value of this maximum power? **(06 Marks)**

Fig.Q.3(a)



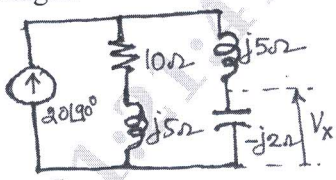
b. For the network shown in Fig.Q.3(b), find the Thevenin's equivalent network across the terminals A and B. **(08 Marks)**

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)**

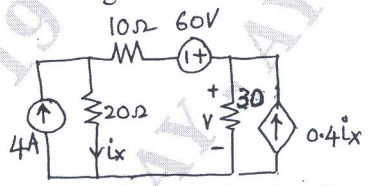
Fig.Q.3(c)



OR

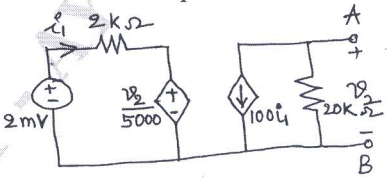
4 a. Use superposition theorem to find voltage 'V' in the network shown in Fig.Q.4(a) **(06 Marks)**

Fig.Q.4(a)



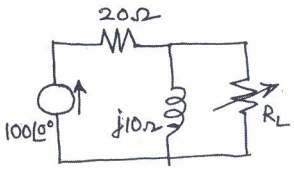
b. Fid.Q.4(b) shows one form of the equivalent circuit of a transistor amplifier. Obtain its Thevenin's equivalent network across the output terminals 'A' and 'B'. **(08 Marks)**

Fig.Q.4(b)



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)

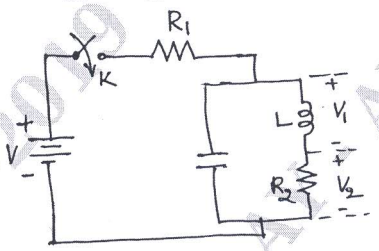


Module-3

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)**

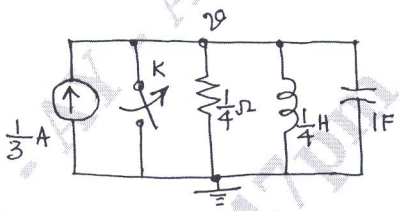
Fig.Q.5(b)



OR

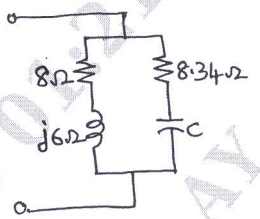
6 a. Fig.Q.6(a) shows a RLC parallel circuit excited by a dc current source. At t = 0, the switch 'K' is opened. Find v(t). **(12 Marks)**

Fig.Q.6(a)



b. For the circuit of Fig.Q.6(b), find the value of capacitance so that the circuit resonates at $W_0 = 5K$ rad/s. **(08 Marks)**

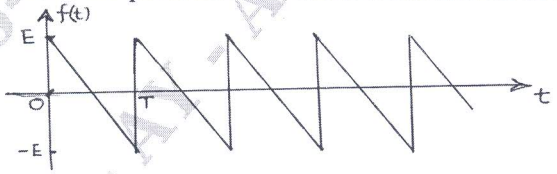
Fig.Q.6(b)



Module-4

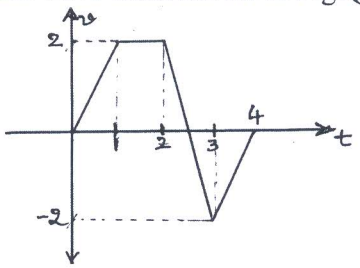
7 a. Find the Laplace transform of the periodic Saw tooth wave shown in Fig.Q.7(a). **(12 Marks)**

Fig.Q.7(a)



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

Fig.Q.7(b)

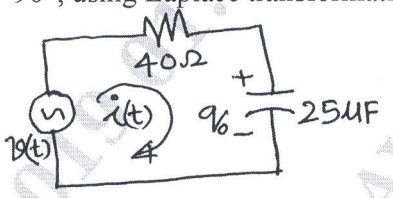


OR

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 1.25×10^{-3}C with polarity as shown. Find the current if the circuit is switched on at $\phi = 90°$, using Laplace transformation technique. **(10 Marks)**

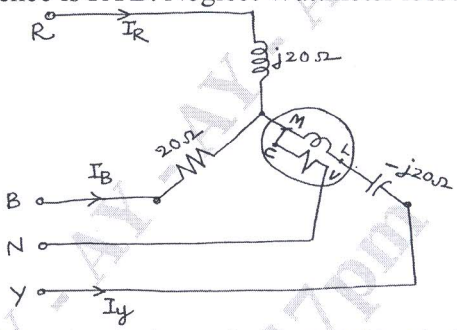
Fig.Q.8(b)



Module-5

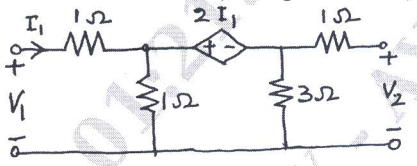
9 a. Find the reading on the Wattmeter in Fig.Q.9(a) when the circuit is connected to a 400V, 3-ϕ supply. The phase sequence is RYB. Neglect Wattmeter losses. **(10 Marks)**

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)**

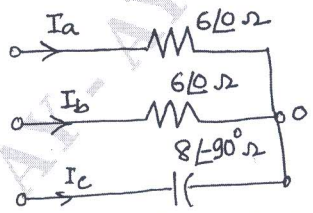
Fig.Q.9(b)



OR

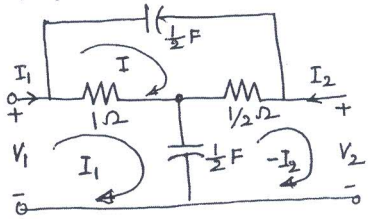
10 a. In a 3-phase 3-wire 400 $\angle 0°$ system abc, loads $6\angle 0°$, $6\angle 0°$ and $8\angle -90°$ Ω are connected to phases a, b, c respectively as shown in Fig.Q.10(a). Find : i) Line currents and ii) Voltage V_{ao}, V_{bo} and V_{co}. **(10 Marks)**

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)



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