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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (R, S) / S1 (PT) (S, FE) Examination December 2023 (2019 Scheme)

Course Code: EET201

Course Name: CIRCUITS AND NETWORKS

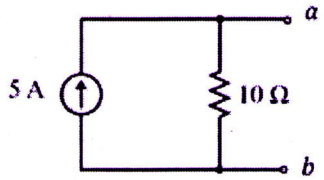
Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1 State and explain Reciprocity Theorem. (3)

2 Find the value of the load resistance to be connected at a - b so that maximum power is transferred by the source. What is the maximum power delivered to the load? (3)

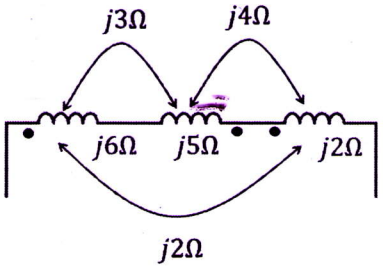


3 A series RL circuit with $R = 20\ \Omega$ and $L = 10\ H$ has a constant voltage $V = 40\ V$ applied through switch S at $t = 0$. Determine the current equation in the network. (3)

4 What is the time constant of a series RC circuit with $R = 10\ \Omega$ and $C = 1\ \mu F$? (3)

5 Derive the s-domain equivalent circuit of an inductor having an initial current of I_o. (3)

6 Obtain the equivalent inductive reactance. (3)



7 Line currents through a 3-phase 4-wire unbalanced star-connected load are $I_A = 9.24\angle 0°A$, $I_B = 21\angle -100°A$ and $I_C = 15.4\angle 110°A$. Find the current through the neutral wire. (3)

8 For a series RLC circuit show the variation of impedances with frequency graphically. (3)

9 Two identical sections of transmission line with $A = 2, B = 3, C = 1, D = 2$ parameters are cascaded. Calculate the transmission parameters of the resultant network. (3)

10 A two-port network is described by the equation, (3)

$$V_1 = 4I_1 + 2I_2 \text{ and } V_2 = 2I_1 + I_2.$$

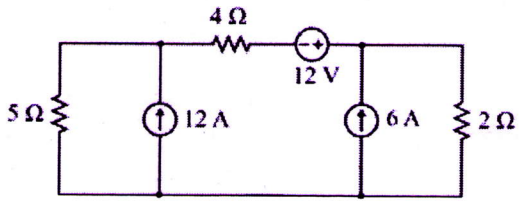
A load impedance of 3Ω is connected at port 2. Calculate the value of input impedance.

PART B

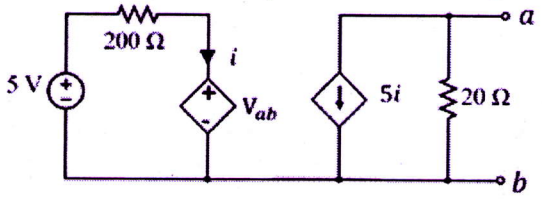
Answer any one full question from each module. Each question carries 14 marks

Module 1

11 Apply superposition theorem to find the power dissipated in the 5 Ω resistor in the circuit shown below. (14)

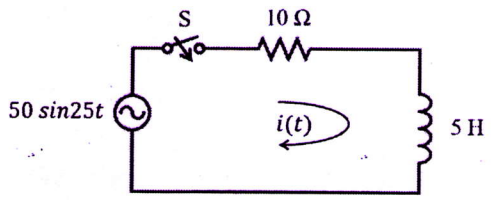


12 Obtain the Thevenin's and Norton's equivalent for the transistor amplifier circuit shown in the figure. (14)

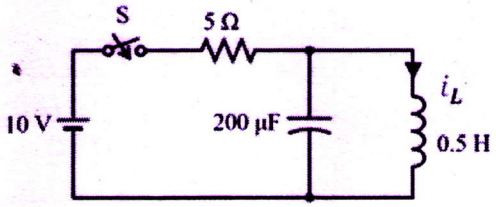


Module 2

13 a) Using Laplace transform technique, determine the current $I(s)$ in the network given below when the switch is closed at $t = 0$. Assume initially the inductor is relaxed. (4)



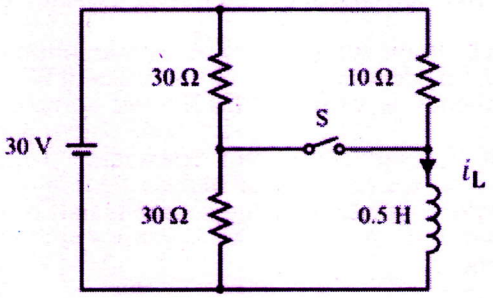
b) In the network shown in figure below, initially the switch S is closed and steady state is obtained. At $t = 0$, switch S is opened. Using Laplace transform technique, determine the current $i_L(t)$ through the inductor. (10)



14 In the circuit given below, obtain $i_L(t)$ when

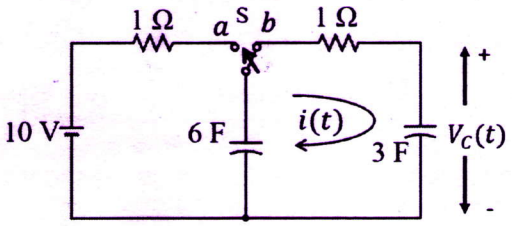
(a) Switch S is initially open and closed at $t = 0$. (8)

(b) Switch S is initially closed and opened at $t = 0$. (6)

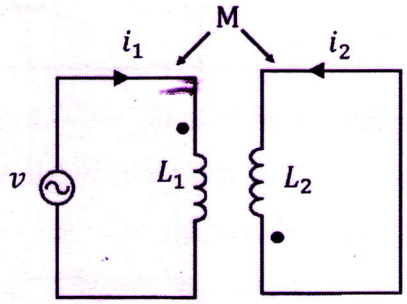


Module 3

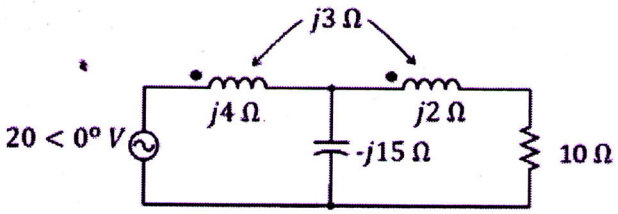
15 In the network, the switch S initially at position a for a long time, is changed to position b at time $t = 0$. Draw the transformed circuit and determine $i(t)$ and $V_c(t)$. (14)



16 a) Determine $i_1(t)$ and $i_2(t)$ in the circuit shown below if, $L_1 = 0.4$ H, $L_2 = 0.4$ H, $v(t) = 15\cos t$, and $M = 0.2$ H. (6)



b) For the network shown below, find the voltage across 10 Ω resistor. (8)



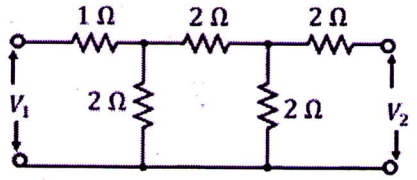
Module 4

17 A three-phase, 400 V *RYB* system, has a delta-connected load with $Z_{RY} = 10 < 90^0\ \Omega$, $Z_{YB} = 20 < 45^0\ \Omega$, *and* $Z_{BR} = 40 < -45^0\ \Omega$. Calculate the phase currents, line currents and total power. Assume positive phase sequence. (14)

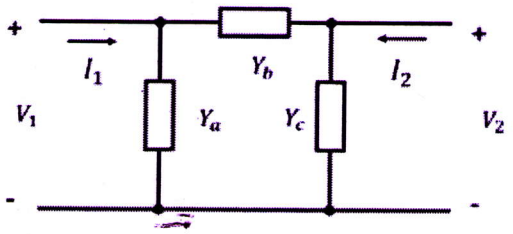
18 In an RLC series circuit supplied at 250 V, maximum current of 1 A flows when the supply frequency is varied to 60 Hz and corresponding voltage across the inductor is 500 V. Find the circuit constants, Q-factor, bandwidth, and the frequencies at which power from the source is half of the power delivered at the resonant frequency. (14)

Module 5

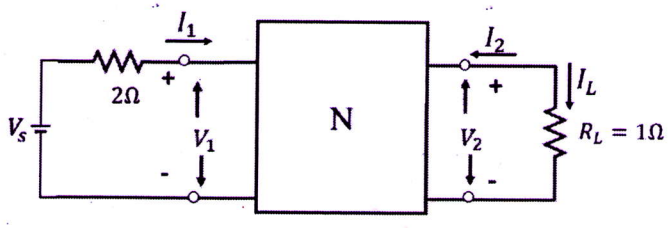
19 Obtain z-parameters for the circuit shown. Draw the z-parameter equivalent model and also find whether the network is reciprocal and symmetrical. (14)



20 a) For general π-network shown in the figure, obtain the y parameters. (6)



b) Find the value of source voltage V_S in the network shown. The power dissipated in the load resistance is 100 W and the network N is represented in terms of h parameters as $h_{11} = h_{22} = 1\ and\ h_{12} = 2,\ h_{21} = -2$. (8)



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