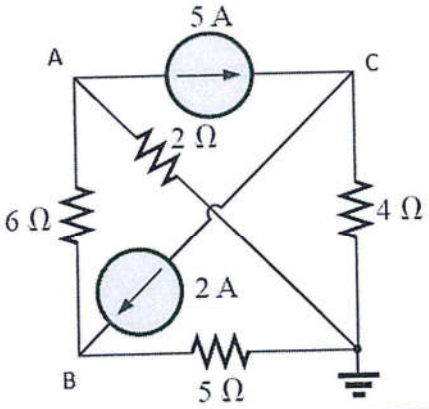
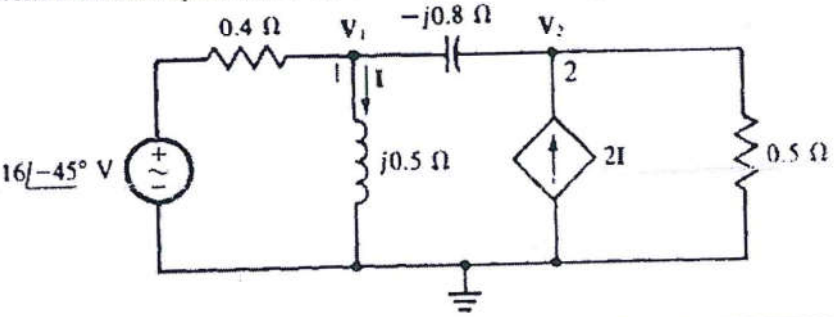
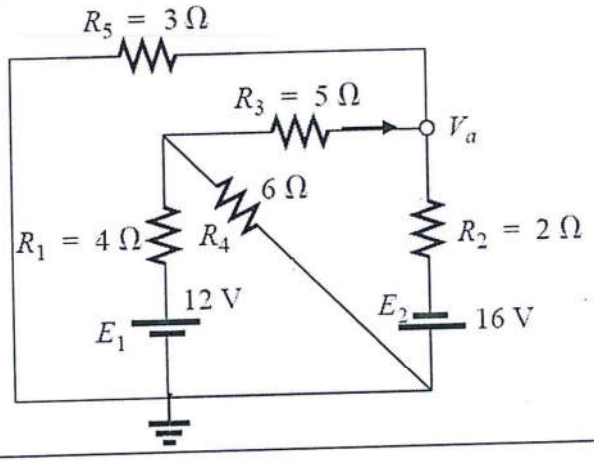
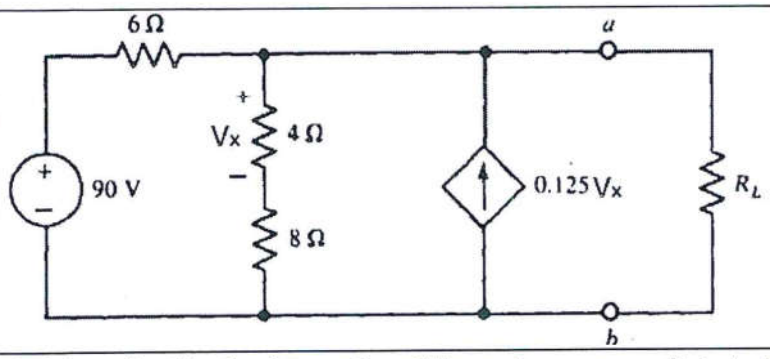
PES University, Bengaluru UE19EC202
(Established under Karnataka Act No. 16 of 2013)

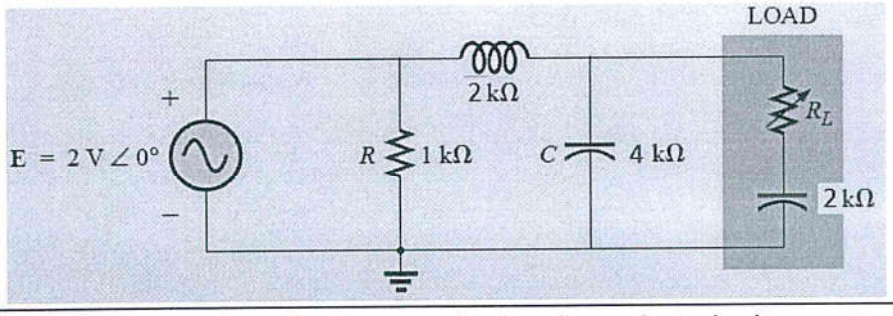
DECEMBER 2020: END SEMESTER ASSESSMENT B TECH
III SEMESTER
UE19EC202 (4 credit) – NETWORK ANALYSIS AND SYNTHESIS

Time: 3 Hrs	Answer All Questions	Max Marks: 100

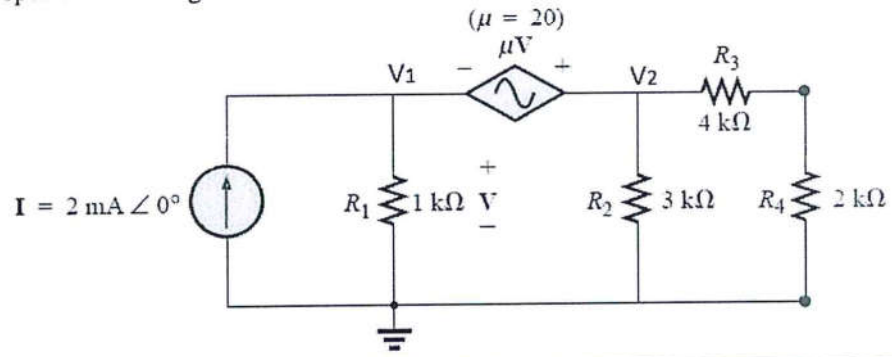
1.	a)	Find the voltage across the current sources using nodal analysis. 	5
	b)	Write the nodal equations for the circuit given below only in terms of the nodal voltages. 	5
	c)	Apply mesh analysis for to determine the currents in each mesh in the circuit given below. Then find the current flowing through R_3 and the voltage V_a. Explain the calculation with steps. 	10
2.	a)	Draw the Norton's equivalent circuit across the resistance R_L in the circuit given below.	5



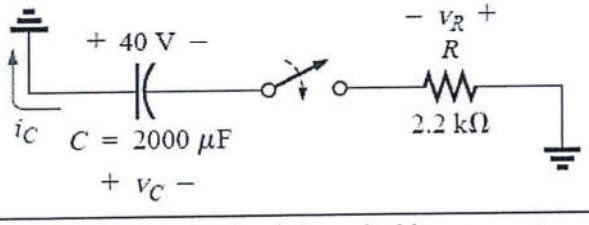
b) Find the optimal load resistance R_L and the maximum power dissipated by R_L in the circuit given below. 5



c) Derive the expressions for the open circuit voltage, short circuit current and Thevenin's resistance for the circuit given below. For a value of $\mu = 20$ find the numerical values of the open circuit voltage and Thevenin's resistance. 10



3. a) Suppose the switch closes at t = 0 and the initial voltage across the capacitor is 40 V. Write the expression for the capacitor voltage $v_c(t)$ for $t \geq 0$. What is the value of $v_c(t = \tau)$? 5



b) Suppose a series RL circuit is excited by a current source of 1A at t=0. Suppose if the value of R=10 Ohms. Find the value of L such that the transient voltage across the inductor reaches 3V at 3ms. Explain your calculation. 5

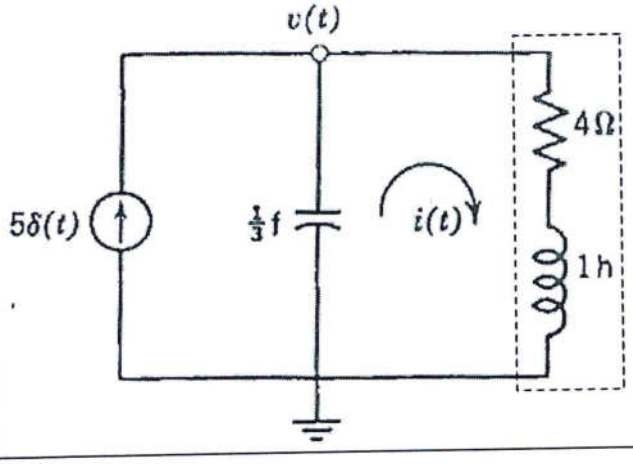
c) Assume all initial conditions to be zero in the circuit given below. Answer the following: 10

i. Draw the Thevenin's equivalent in s-domain across the boxed portion in the circuit (i.e., resistance and inductance is treated as load).

ii. Express the current $I(s)$

iii. Find the current $i(t)$ for $t \geq 0$ using s-domain analysis.

iv. Find the voltage across the inductor based on $i(t)$



4.	a)	Consider the two port networks given below. Draw the parallel interconnection model and state the necessary conditions for the interconnection. Draw the series interconnection model and state the necessary conditions for the interconnection. In the resultant models, use notations V_1 and V_2 for input and output voltages. Similarly use I_1 and I_2 for the input and output currents.	10
	b)	State the relation between currents and voltages of a two port network in terms of h parameters and transmission parameters separately. Derive the h parameters in terms of the transmission parameters.	10
5.	a)	Check whether the given polynomials are Hurwitz polynomials. Show full calculation and justification. i. $H_1(s) = s^5 + 4s^4 + 6s^3 + 8s^2 + 10s + 12$ ii. $H_2(s) = s^3 + s^2 + 2s + 2$	10
	b)	Synthesize the impedance function $Z(s)$ as Cauer II form realization. Express the impedance as a continued fraction expansion. $$Z(s) = \frac{(s^2+1)(s^2+4)}{s(s^2+2)}$$	10