SRN | | | | | | | | | | | |

PES UNIVERSITY

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

UE18EC201

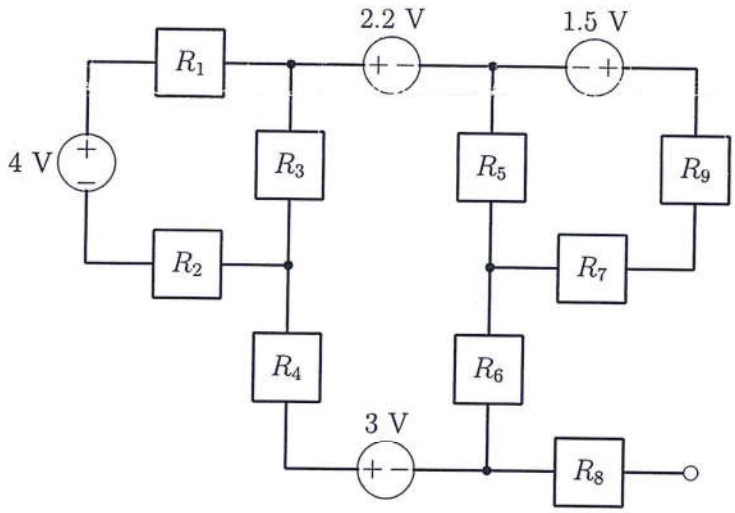
DEC 2019: END-SEMESTER ASSESSMENT — B. TECH. IIIrd SEM.

UE18EC201 — NETWORK ANALYSIS & SYNTHESIS

Time: 3 Hrs | Answer All Questions | Max. Marks: 100

1. (a) Suppose that for the circuit shown below $R_1 = 2.7$ kΩ, $R_2 = 5.0$ kΩ, $R_3 = 1.0$ kΩ, $R_4 = 1.0$ kΩ, $R_5 = 4.4$ kΩ, $R_6 = 3.0$ kΩ, $R_7 = 3.0$ kΩ, $R_8 = 1.0$ kΩ, and $R_9 = 4.0$ kΩ. Determine the power absorbed by the resistor R_3 and the power delivered by the 2.2 V and 1.5 V sources.

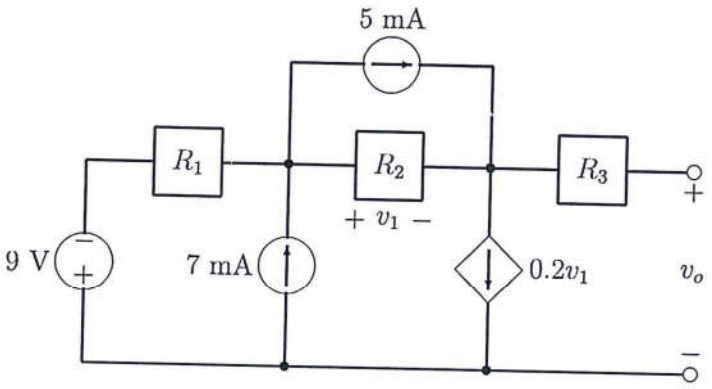
(6 Marks)



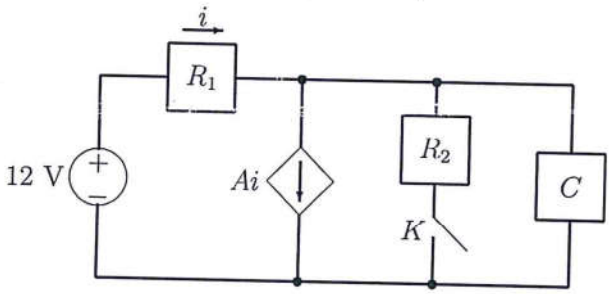
(b) A constant voltage is applied to n groups of resistors in series where each group has m identical resistors in parallel. One resistor burns out in one group. Find the percentage increase of current in each resistor of the faulty group, the percentage decrease of current in each resistor of the sound groups, and the percentage change in the total current.

(9 Marks)

(c) Determine the voltage v_o, and the power absorbed by the dependent and independent sources in the network given below. Assume $R_1 = 470\,\Omega$, $R_2 = 10.0\,\text{k}\Omega$ and $R_3 = 2.2\,\text{k}\Omega$. **(5 Marks)**

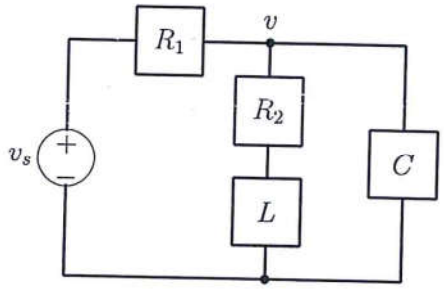


2. (a) The network shown below is at steady-state before the switch K closes at $t = 0$. Find the capacitor voltage $v(t)$ for $t > 0$. Determine the value of A, $A \neq 1$, so that the time constant is +10 ms. Let $R_1 = 5\,\text{k}\Omega$, $R_2 = 10\,\text{k}\Omega$, and $C = 2\,\mu\text{F}$. **(7 Marks)**



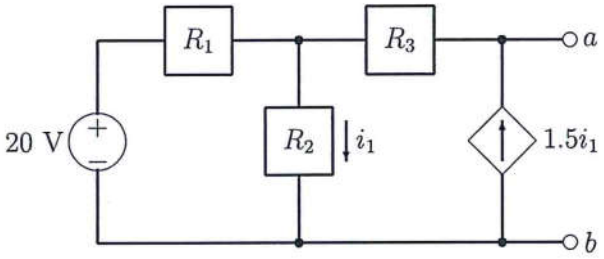
(b) A charged capacitor is connected to a discharged capacitor of n times the capacitance by a resistor. (i) What fraction of the original voltage is the final voltage across the first capacitor? (ii) What fraction of the originally stored energy in the first capacitor is lost? **(7 Marks)**

(c) Find the differential equation for the voltage v for the following circuit: **(6 Marks)**

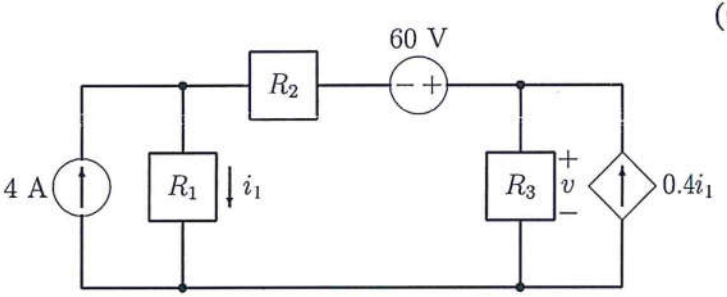


3. (a) A practical current source provides 10 W to a 250 Ω load and 20 W to a 80 Ω load. A resistance R with voltage V and current I is connected to it. Find the values of R, V and I if (i) VI is a maximum; (ii) V is a maximum; and, (iii) I is a maximum. **(8 Marks)**

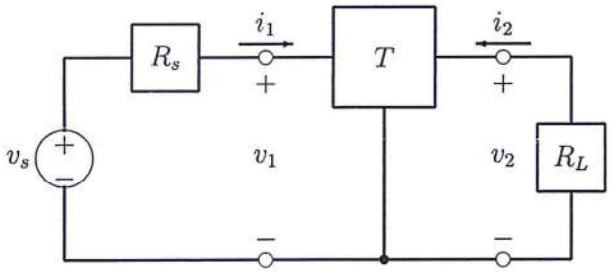
(b) What is the Thevenin equivalent of the following network as viewed from the terminals a and b. (i) What power would be delivered to a load of 100 Ω between these terminals? (ii) What is the maximum power that can be delivered between these terminals? Let $R_1 = 40\,\Omega$, $R_2 = 200\,\Omega$ and $R_3 = 100\,\Omega$. **(6 Marks)**



(c) Find the voltage v in the following circuit if $R_1 = 20\,\Omega$, $R_2 = 10\,\Omega$ and $R_3 = 30\,\Omega$. **(6 Marks)**

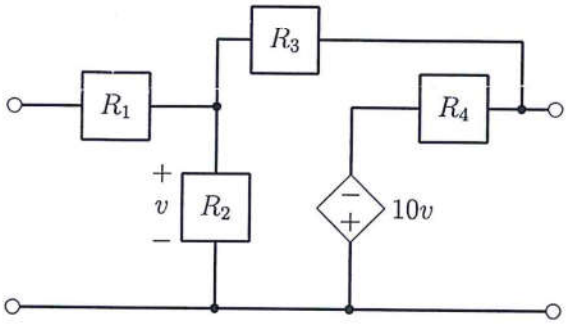


4. (a) The transistor T in the diagram, represented by a four-terminal described in terms of the z-parameters, is operating from a source of resistance R_s and connected to a load R_L. Express the following in terms of the z-parameters, R_s and R_L: (i) the current gain $\frac{i_2}{i_1}$, (ii) the input impedance $\frac{v_1}{i_1}$, (iii) the voltage gain $\frac{v_2}{v_s}$, and (iv) the output impedance $\frac{v_2}{i_2}$. **(10 Marks)**



(b) Find the g-parameters of the following two-port where $R_1 = 10\,\Omega$, $R_2 = 100\,\Omega$, $R_3 = 300\,\Omega$ and $R_4 = 50\,\Omega$. From these g-parameters determine the corresponding h-parameters.

(10 Marks)



5. (a) Verify whether or not the following polynomial has no roots in the right half of s-plane:

$$p(s) = s^4 + s^3 + 5s^2 + 3s + 8$$

(2 Marks)

(b) Synthesise both Foster forms for the following driving-point impedance function:

$$Z(s) = \frac{(s^2+1)(s^2+8)}{s(s^2+4)}$$

(9 Marks)

(c) Synthesise the following driving-point impedance function in both Foster and Cauer forms:

$$Z(s) = \frac{s^2+4s+3}{s^2+6s+8}$$

(9 Marks)