

- ✓ Write down your student ID on the **top right corner of each of the pages**.
- ✓ Clearly write the solutions, along with the questions, on white paper with black ink (no need to use color pen, don't use pencils).
- ✓ Use **CamScanner**, or **Adobe Scan**, or **Microsoft Office Lens**, or any other software to scan the pages and make a **single PDF file**.
- ✓ After creating the PDF, make sure that **(a)** there are no pages missing, **(b)** all of the pages are legible, **(c)** your student ID on each page are visible.
- ✓ Please note, **collaboration ≠ copying**. You are allowed to discuss the questions and clear confusion you might have, but you have to write your solutions independently and be able to explain your answers during a random viva.
- ✓ **[Very Important]** Rename the PDF in the following format: "**A1_StudentID_FullNameWithoutSpace.pdf**". For example, if my student ID is 12345678 and my name is Shadman Shahid, the filename should be "**A1_12345678_ShadmanShahid.pdf**".
- ✓ **Submission Link:** <https://forms.gle/UhtL5NgJ5sVW3MU56>

Question 1:

8 Marks

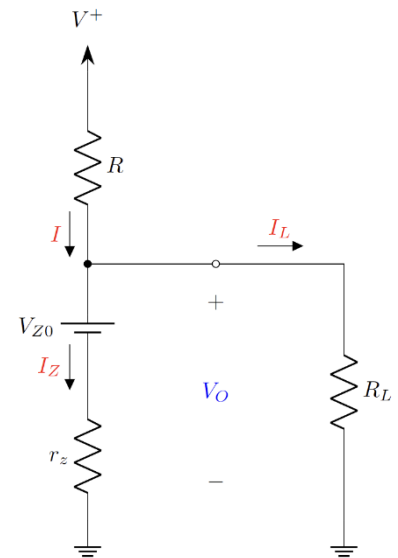
For $R = 80 \Omega$, $R_L = 15 \text{ k}\Omega$, $r_z = 30 \Omega$, $V_{Z0} = 4 \text{ V}$, and $I_Z = 1 \text{ mA}$.

a) Find V_O , I_L

[CO2] 4

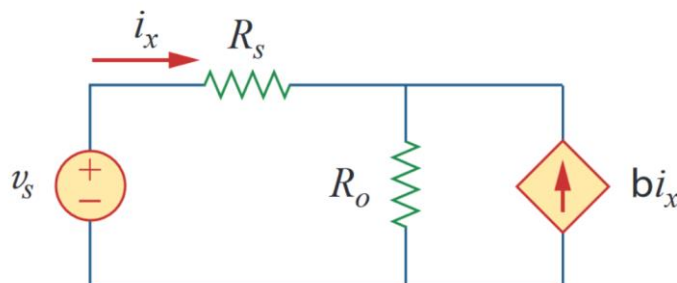
b) Find I , V^+ .

[CO2] 4



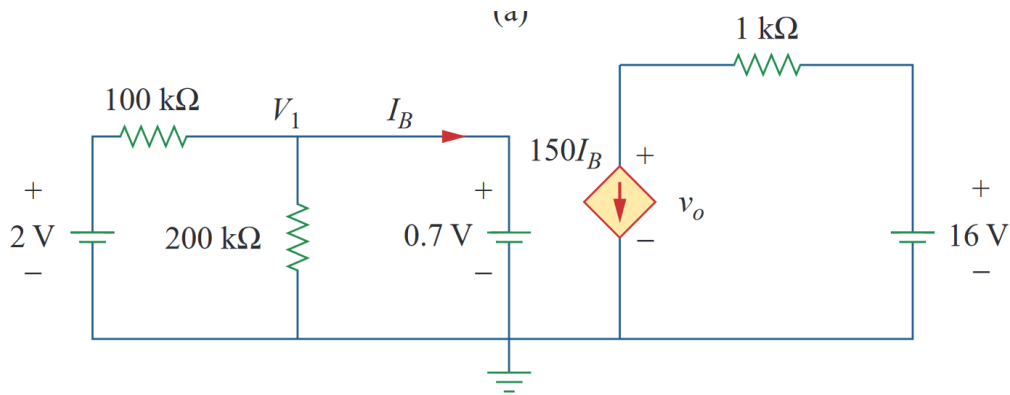
Question 2:

12 Marks



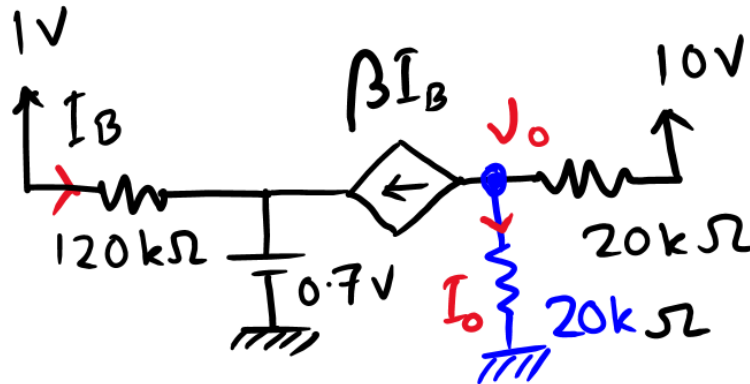
a) Analyze the circuit in the Figure above to find i_x in terms of v_s , R_s , R_o , and b .

[CO1] 2



b) For the above circuit, find the value of v_o .

[CO2] 4



c) In the above circuit, $\beta = 120$. Find the current I_o and v_o from the given circuit.

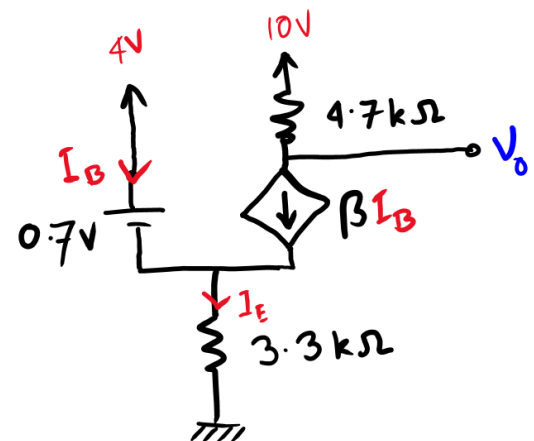
[CO2] 6

Question 3:

10 Marks

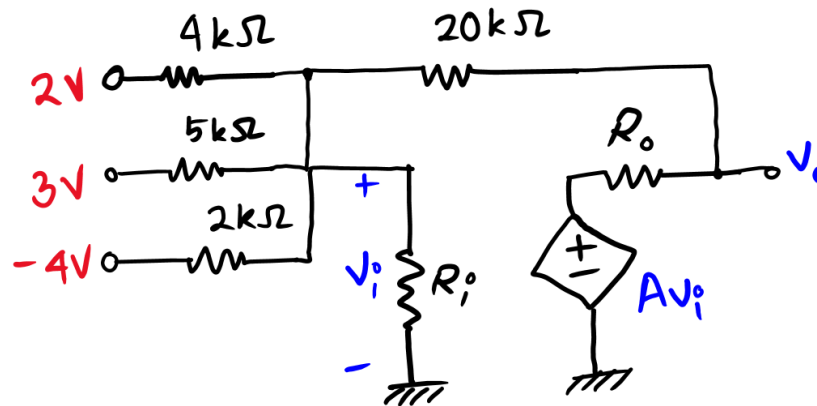
In the adjacent circuit $\beta = 80$.

- Derive an expression of I_E in terms of I_B and β . [CO1] 2
- Find the value of the currents I_E , and I_B . [CO2] 3
- Find the value of the voltage at the output node v_o . [CO2] 2
- Express v_o in terms of I_B and β . Thereafter, determine how v_o would change for changing the value of β . Show the change in v_o for $\beta = 50$ and $\beta = 20$. [CO2] 3



Question 4:

10 Marks

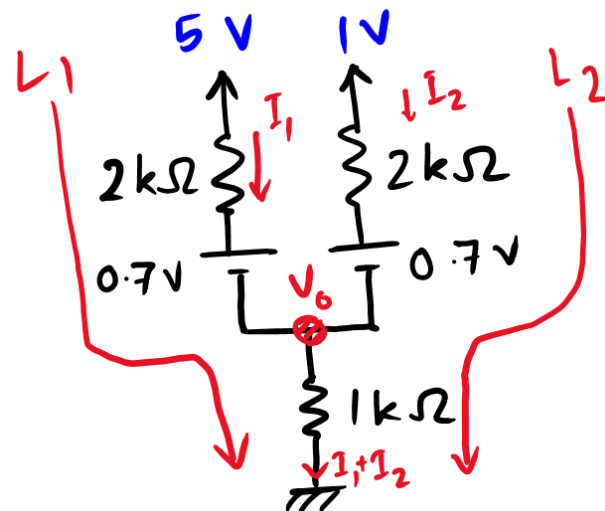


In the above circuit $A = 50$, $R_i = 80 \text{ k}\Omega$ and $R_o = 800 \Omega$. Answer the following questions

- Write the node equations for the nodes indicated by v_i and v_o . [CO1] 4
- Solve the node equations to find the values of v_i and v_o . [CO2] 3
- Can circuit theorems based on linearity principle (such as superposition principle) be applied to the above circuit? Explain in short why or why not. [CO1] 3

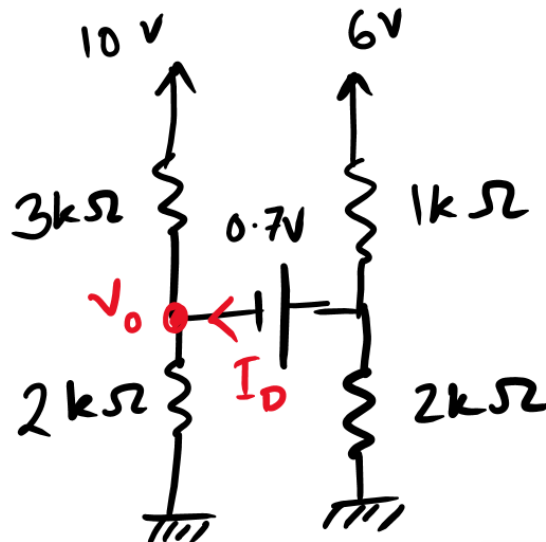
Question 5:

10 Marks



- a) Write down the two KVL equations for the lines (loops) indicated by the red lines L_1 and L_2 .
 b) Solve the circuit to find v_0 , I_1 and I_2 . You may use either mesh analysis or nodal analysis.

[CO1] 3
 [CO2] 4



- c) Analyze the circuit to find v_0 and I_0 . [Use any technique of your choice.]

[CO2] 3