BRAC University
Dept. of Computer Science and Engineering

Assessment: Assignment 1
Due: 12 PM 10 October 2023
Full Marks: **50**

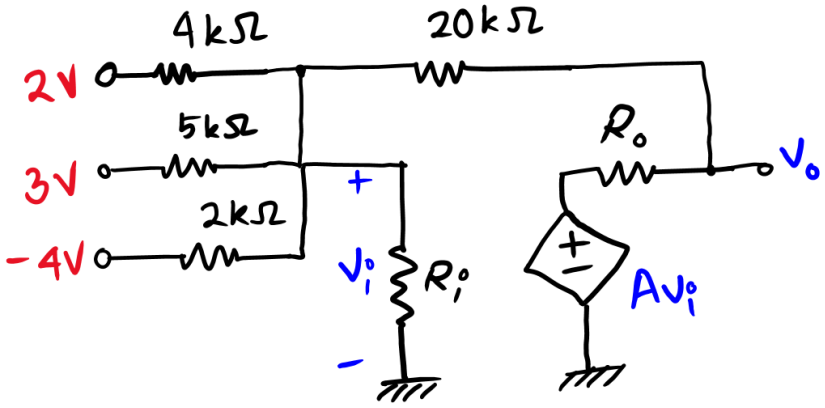
Semester: Fall 2023
Course Code: CSE251
Section: **15**
Course Name: Electronic Devices and Circuits

Name: _____

Student ID: _____

- ✓ 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/DUiHoK6iKJCWW2QB6

Question 1: 10 Marks



In the above circuit $A = 100$, $R_i = 100\ \text{k}\Omega$ and $R_o = 1\ \text{k}\Omega$. Answer the following questions

a) Write the node equations for the nodes indicated by v_i and v_o. [CO1] 4

b) Solve the node equations to find the values of v_i and v_o. [CO2] 3

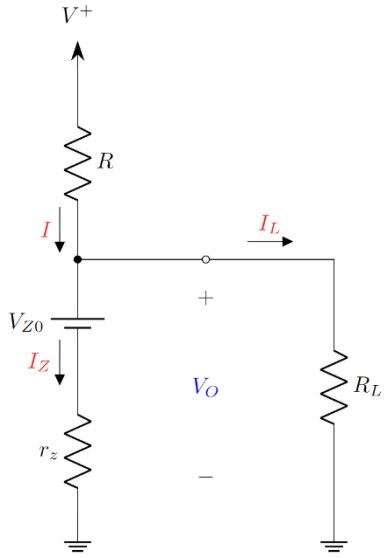
c) Can circuit theorems based on linearity principle (such as superposition principle) be applied to the above circuit? Explain in short why or why not. [CO1] 3

Question 2: 8 Marks

For $\boldsymbol{R} = 100\ \Omega$, $\boldsymbol{R_L} = 10\ \text{k}\Omega$, $\boldsymbol{r_z} = 20\ \Omega$, $\boldsymbol{V_{ZO}} = 3\ \text{V}$, and $\boldsymbol{I_Z} = 1\ \text{mA}$.

a) Find $\boldsymbol{V_O}$, $\boldsymbol{I_L}$ [CO2] 4

b) Find $\boldsymbol{I}$, $\boldsymbol{V^+}$. [CO2] 4



Question 3: 10 Marks

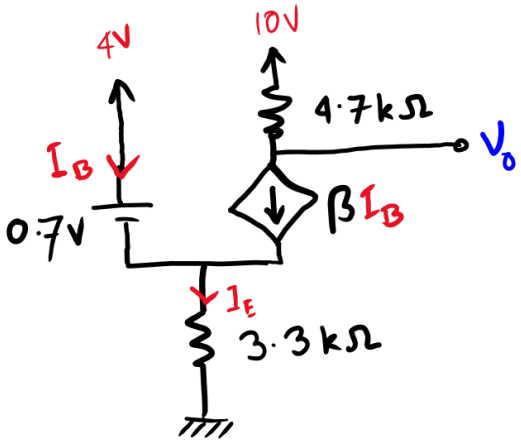
In the adjacent circuit $\boldsymbol{\beta = 100}$.

a) Derive an expression of $\boldsymbol{I_E}$ in terms of $\boldsymbol{I_B}$ and $\boldsymbol{\beta}$. [CO1] 2

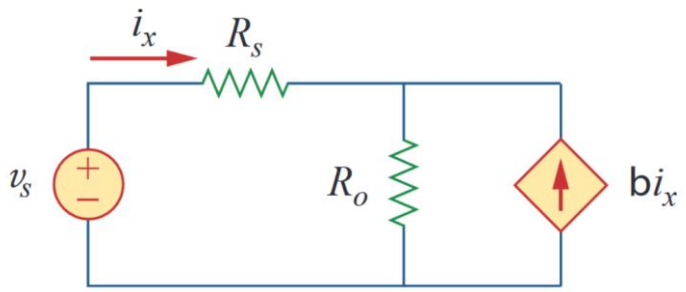
b) Find the value of the currents $\boldsymbol{I_E}$., and $\boldsymbol{I_B}$. [CO2] 3

c) Find the value of the voltage at the output node $\boldsymbol{v_o}$. [CO2] 2

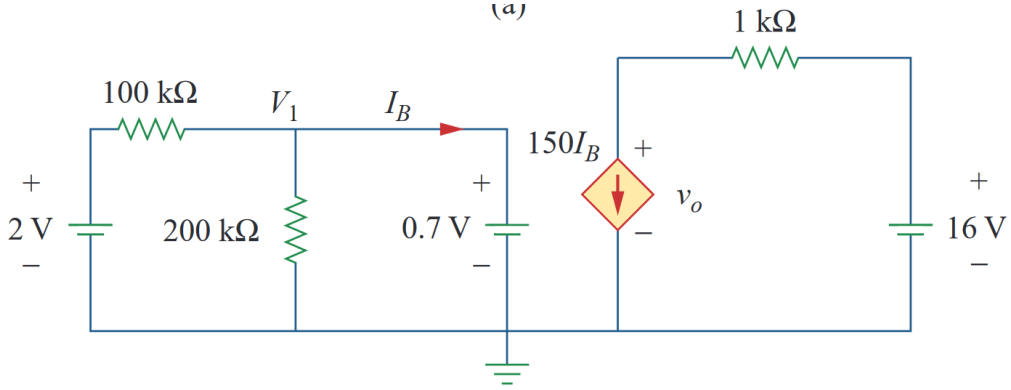
d) Express $\boldsymbol{v_o}$ in terms of $\boldsymbol{I_B}$ and $\boldsymbol{\beta}$. Thereafter, determine how $\boldsymbol{v_o}$ would change for changing the value of $\boldsymbol{\beta}$. Show the change in $\boldsymbol{v_o}$ for $\boldsymbol{\beta = 50}$ and $\boldsymbol{\beta = 20}$. [CO2] 3



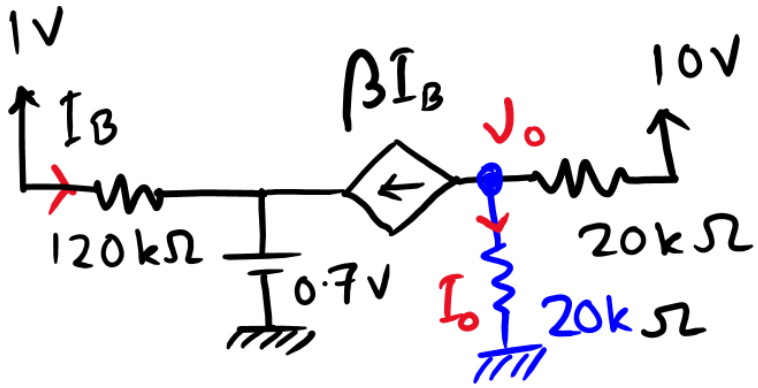
Question 4: 12 Marks



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

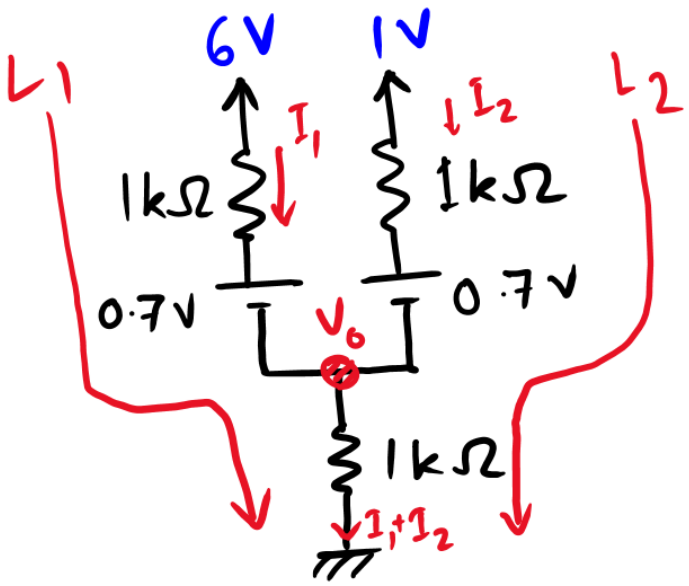


b) For the above circuit, find the value of v_o. [CO2] 4



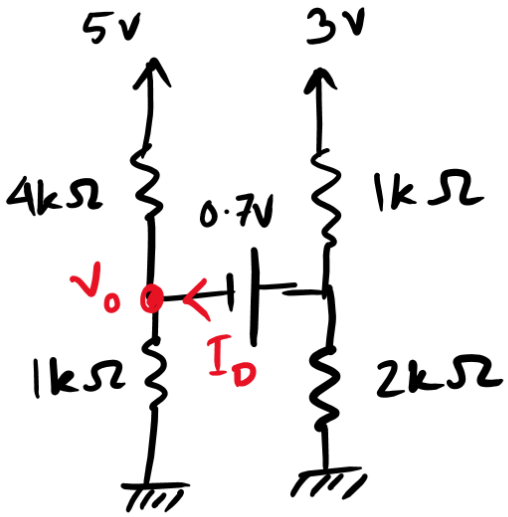
c) In the above circuit, $\beta = 80$. Find the current I_O and v_o from the given circuit. [CO2] 6

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. [CO1] 3

b) Solve the circuit to find v_o, I_1 and I_2. You may use either mesh analysis or nodal analysis. [CO2] 4



c) Analyze the circuit to find v_o and I_o. [Use any technique of your choice.] [CO2] 3