

AC LAB 19

AUDIT COURSE ELECTRONIC CIRCUITS 1: SIMULATION BASED STUDY

Kindly update your name and roll no, once this document is shared with you

Time slot to complete your work is **40 MINUTES**

Date: 12/10/2020

Kindly upload your schematic & waveform images here, every 10 minutes, indicating your progress and intention to completion of WORK within time slot allotted

Time slot allotted to you all for the completion of WEEK 10 DAY 1 is 40 MINUTES

Kindly upload your work (only circuit schematic & waveform in LTSpice) in the shared google doc between this time slot only.

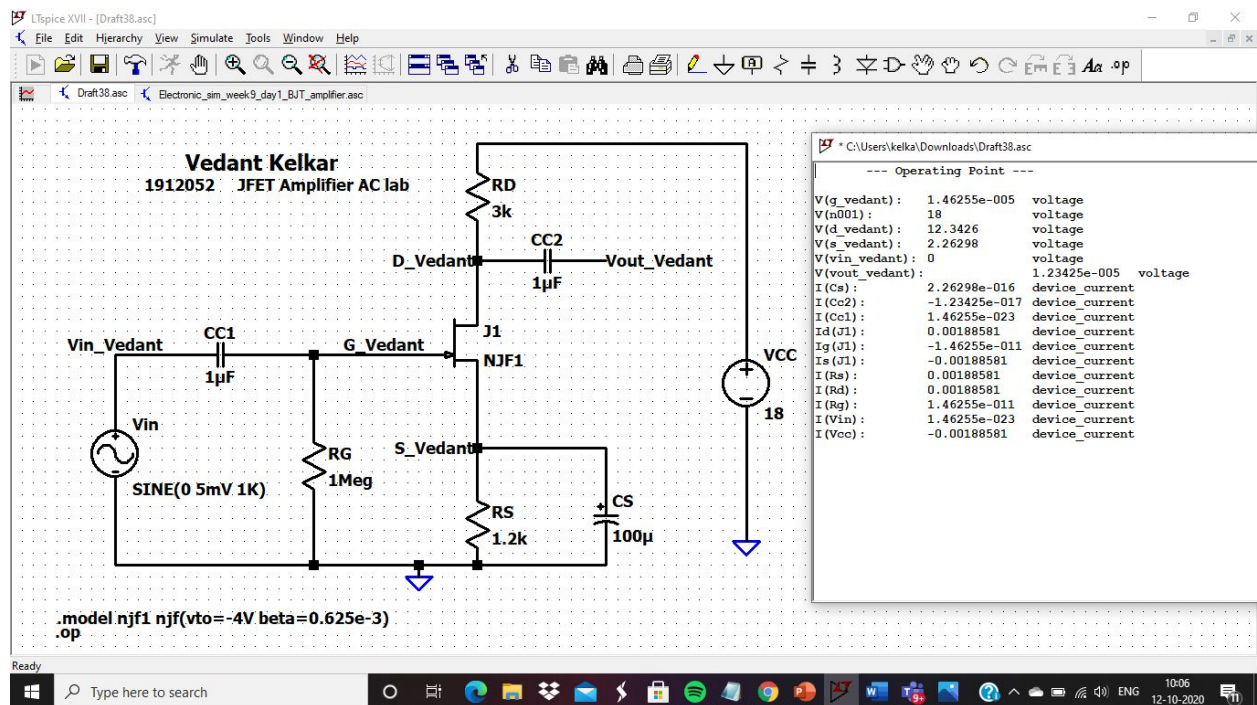
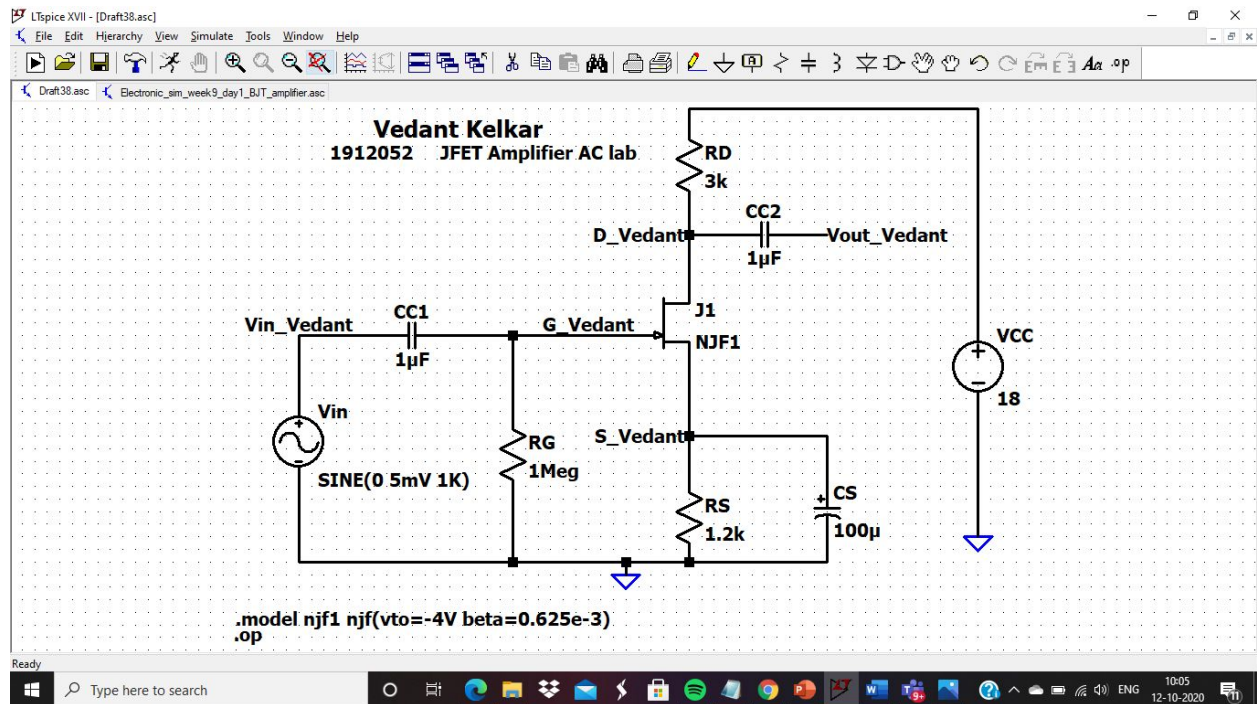
Follow these instruction strictly:

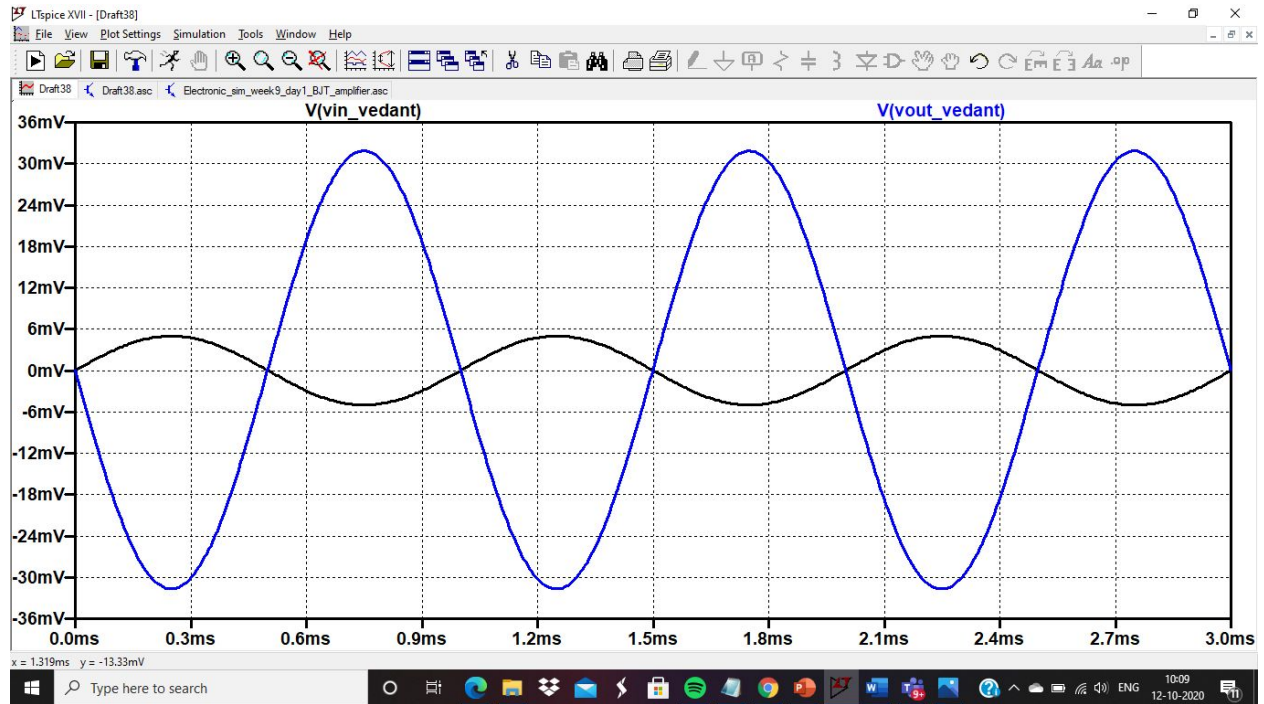
- 1, Start sharp ON TIME, by posting your name and roll no and **screenshot of your LT spice work screen (time and date MUST BE VISIBLE)**
2. Upload your work every 10 minutes, i.e LT spice work screen
3. This means you will upload LT spice work screen 4 times during this time slot.
4. Point 3 indicates your readiness and presences for completion of WEEK 10 DAY 1

You are entitled for 1 CREDIT per Lab only if you follow above instruction to the details

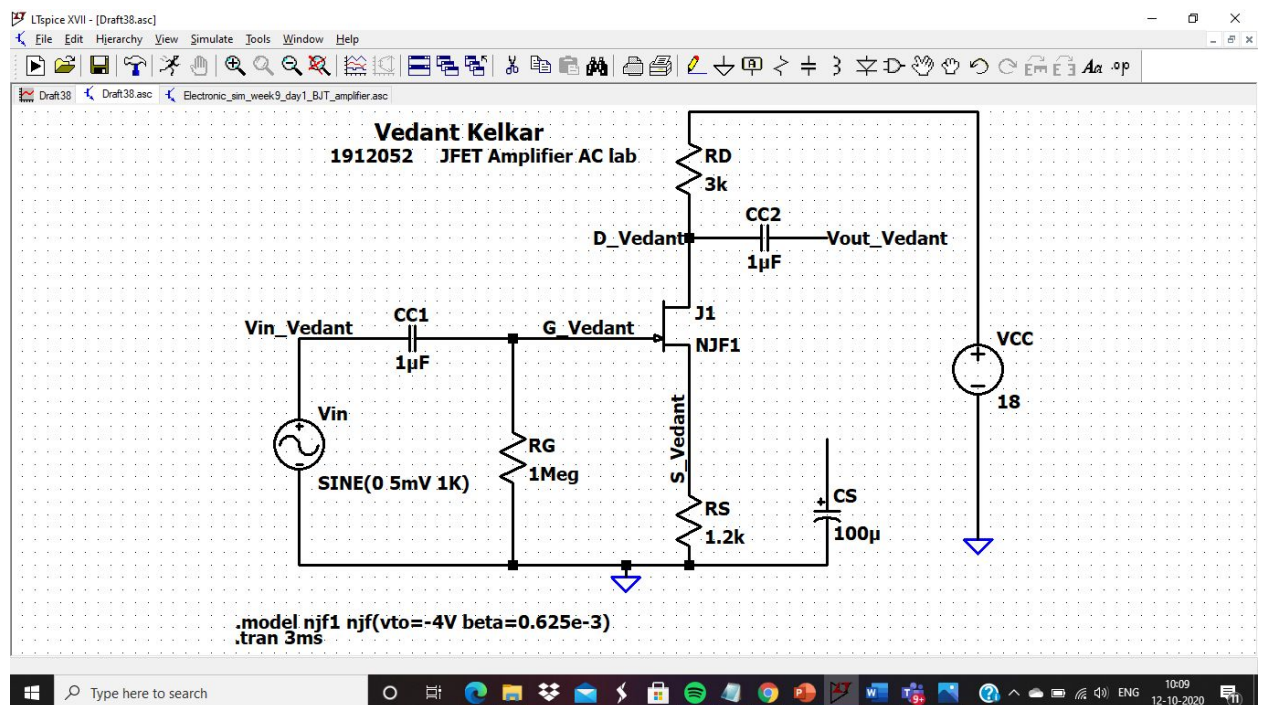
STUDENTS WORK AREA STARTS HERE

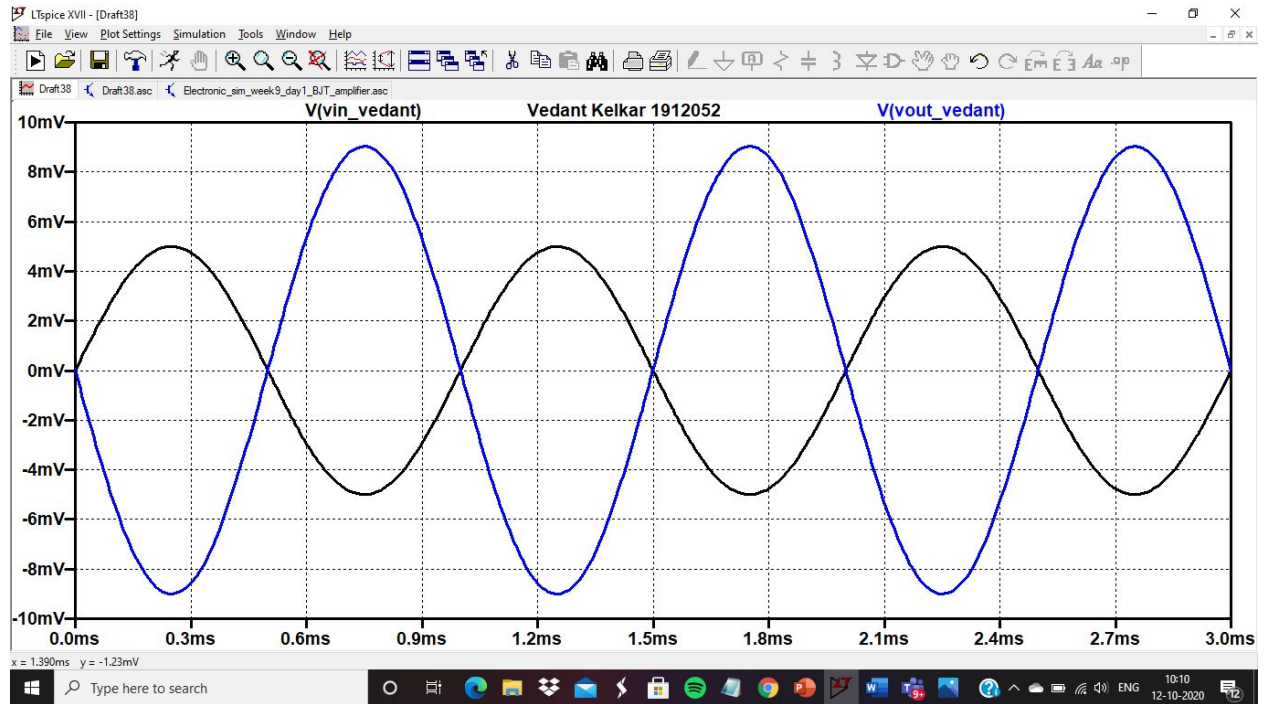
10 mV p to p BYPASSED





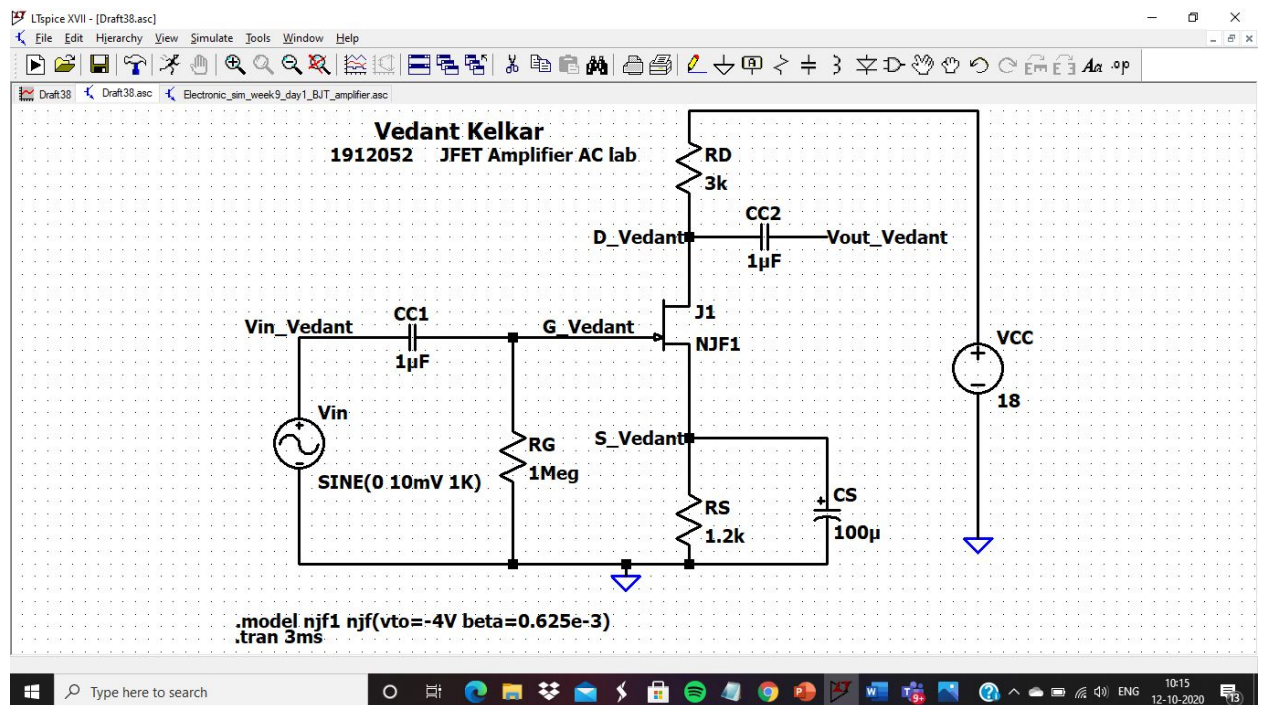
UNBYPASSED

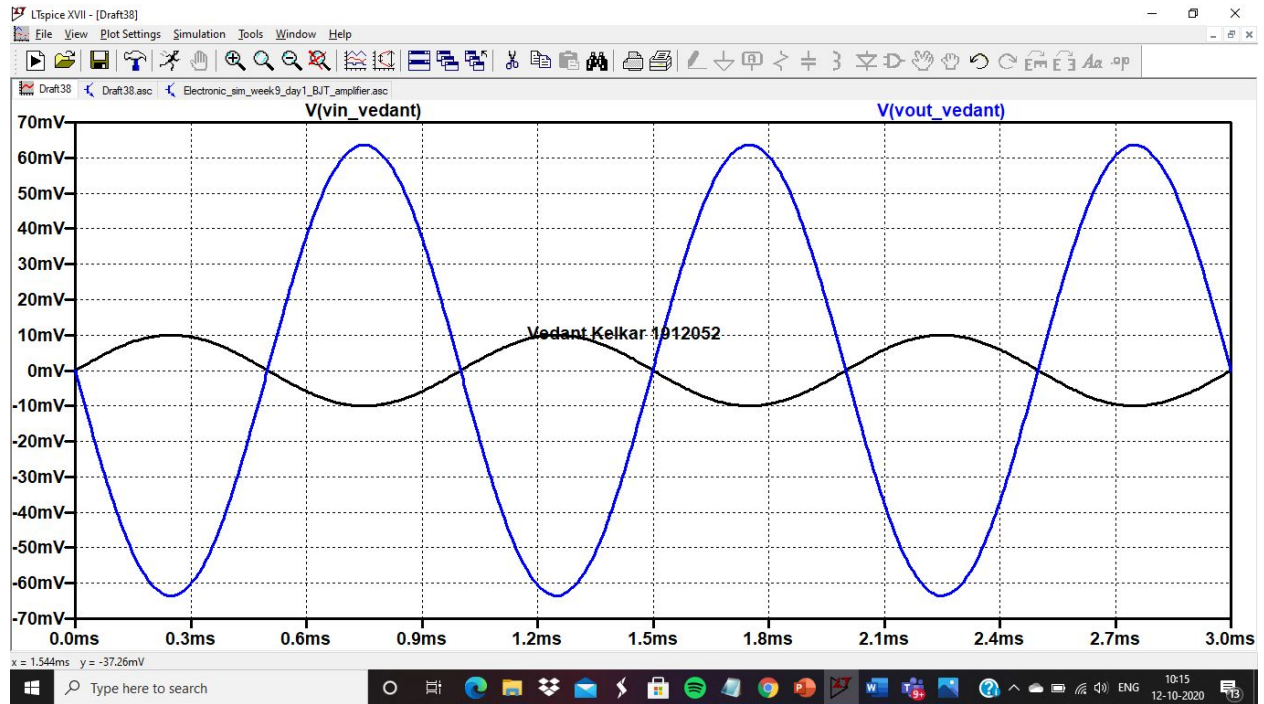




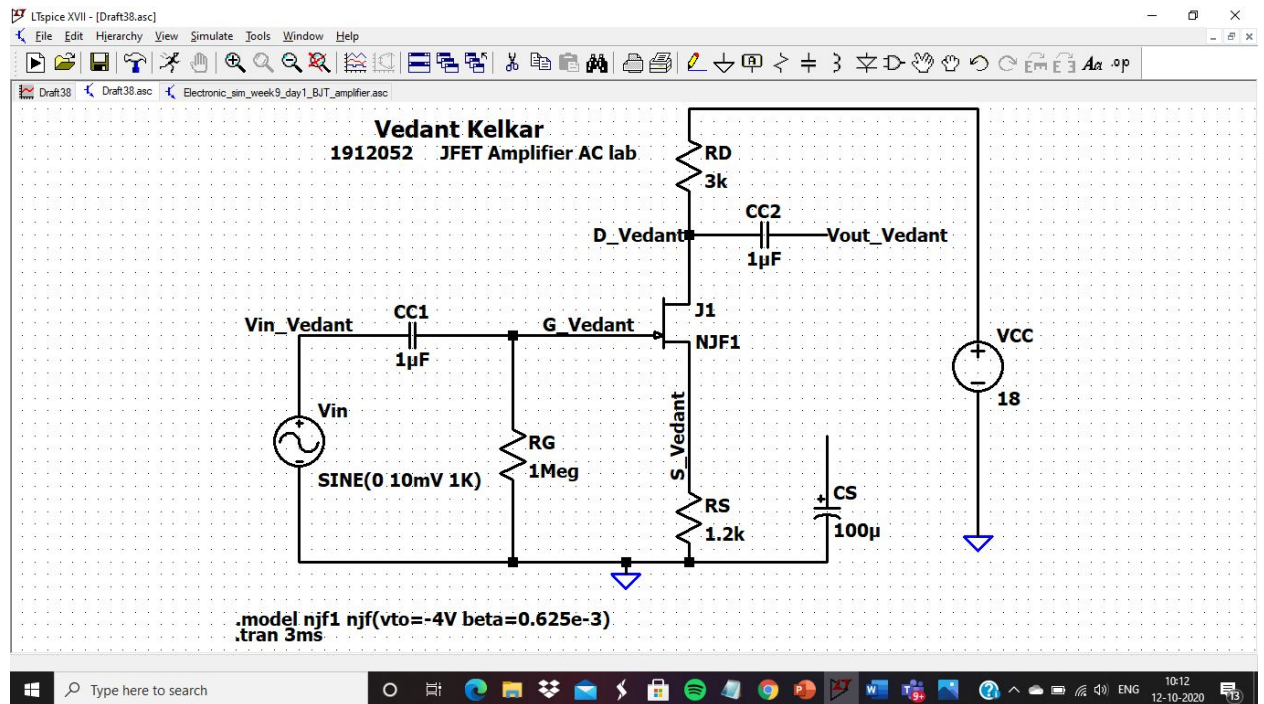
20 mV p to p

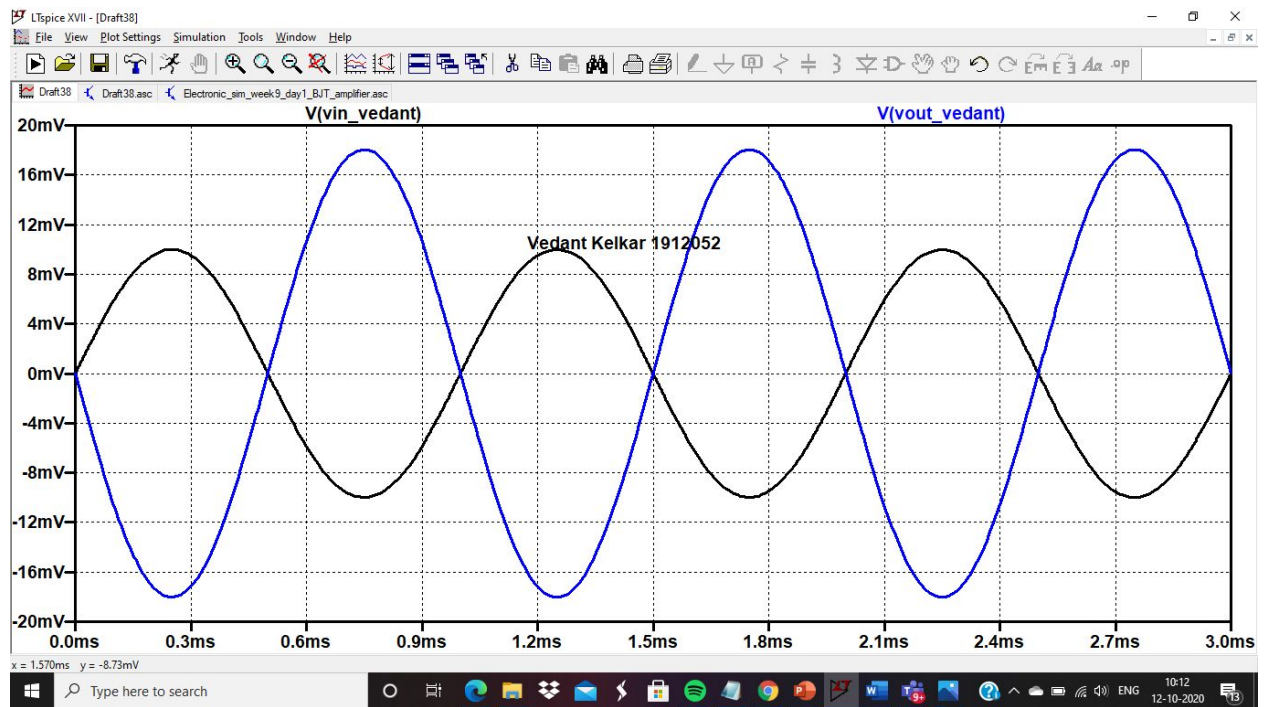
BYPASSED





UNBYPASSED





$$I_{DSS} = 10 \text{ mA}, V_p = -4 \text{ V}, V_G = I_G R_G = 0$$

1912052

$$V_S = I_D R_S = I_D (1.2 \times 10^3)$$

$$V_{GS} = -I_D (1200) \quad (1)$$

$$I_D = I_{DSS} \left(1 + \frac{V_{GS}}{V_p}\right)^2 = 10 \times 10^{-3} \left(1 + \frac{V_{GS}}{V_p}\right)^2 \quad (2)$$

from (1) & (2)

$$V_{GS} = -1200 \times 10 \times 10^{-3} \left[\frac{1 + \frac{V_{GS}}{V_p} + \frac{V_{GS}^2}{V_p^2}}{2} \right]$$

$$V_{GS} = -12 \left(1 + 0.5 V_{GS} + 0.0625 V_{GS}^2\right)$$

$$0.75 V_{GS}^2 + 7 V_{GS} + 12 = 0$$

$$V_{GS} = -2.2629 \text{ V (V)} \text{ or } V_{GS} = -7.07 \text{ V}$$

$$I_D = 1.8859 \text{ mA}$$

Small signal parameters

$$g_m = \frac{2 I_{DSS}}{|V_p|} \left[\frac{1 - V_{GS}}{V_p} \right] = \frac{2.1713 \text{ mA}}{\text{V}} \quad V_{out} = -(g_m V_{gs}) R_D$$

$$A_v = -g_m R_D = -2.1713 \times 3 = -6.5141 \quad (R_S \text{ bypassed})$$

$$A_v = \frac{V_{out}}{V_{in}} = \frac{-R_D}{\frac{1}{g_m} + R_S} = \frac{-3 \times 10^3}{(2.1715 \times 10^3)^{-1} + 1.2 \times 10^3} = -1.8066$$

Vin	Vout	Vout	Av(bypassed)	Av(bypassed)	Av(unbypassed)	Av(unbypassed)
	(bypassed)	(unbypassed)	Calculated	Observed	Calculated	Observed
10mV p-p	64.832mV	-18.324mV	-6.5141	-6.5077	-1.8066	-1.8034
20mV p-p	-131.567mV	-36.310mV	-6.5141	-6.5105	-1.8066	-1.8034

LAB 19 is incomplete. Kindly add observation table and calculations

AC LAB 19 is approved: Inderjit Singh Dhanjal