American International University- Bangladesh (AIUB)
Faculty of Engineering

Course Name :	Electronic Devices	**Course Code:**	EEE 2103
Semester :	Spring 2020-21	**Section:**	J
Faculty :	Dr. Md. Rifat Hazari		

Assignment No :	1
Assignment Name :	CO2 (POI: P.a.3.C3)

Student Name:	**NAFINUR LEO**	**Student ID:**	**20-42195-1**

Submission Date:	**08/04/2021**	**Due Date :**	**08/04/2021**

Marking Rubrics (to be filled by Faculty):

Problems	Excellent [5]	Proficient [4]	Good [3]	Acceptable [2]	Unacceptable [1]	No Response [0]	Secured Marks
Problem 01	Detailed unique response explaining the concept properly and answer is correct with all works clearly shown.	Response with no apparent errors and the answer is correct, but explanation is not adequate/unique.	Response shows understanding of the problem, but the final answer may not be correct.	Partial problem is solved; response indicates part of the problem was not understood clearly.	Unable to clarify the understanding of the problem and method of the problem solving was not correct.	No Response	
Problem 02	Detailed unique response explaining the concept properly and answer is correct with all works clearly shown.	Response with no apparent errors and the answer is correct, but explanation is not adequate/unique.	Response shows understanding of the problem, but the final answer may not be correct	Partial problem is solved; response indicates part of the problem was not understood clearly.	Unable to clarify the understanding of the problem and method of the problem solving was not correct	No Response	
Comments						Total marks (10)	

INSTRUCTIONS: ***When a question mentions "ID" as a value, you have to use the last two digits of your ID before the hyphen. For example, for 12-34567-8 it would be 67. If the last 2 digits of your ID form a number less than 10, then add 10 with the number before using it to solve the problems. If the last 2 digits of your ID form a number greater than or equal to 10, you can use it as it is.***

Note: Copied/identical submissions will be graded as 0 for all parties concerned.

Problem 1

Apply the knowledge gained from the ac analysis of BJT to construct the AC equivalent model of the circuit shown in Fig. 1 and calculate $\boldsymbol{Z_o}$ and $\boldsymbol{A_v}$. Given, β = (**ID** × 10) and r_o = **ID** kΩ. **[5]**

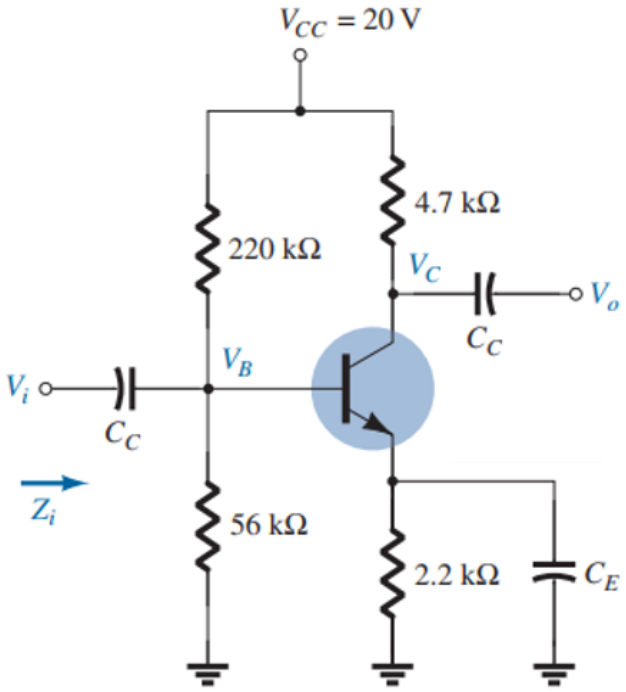


Fig. 1

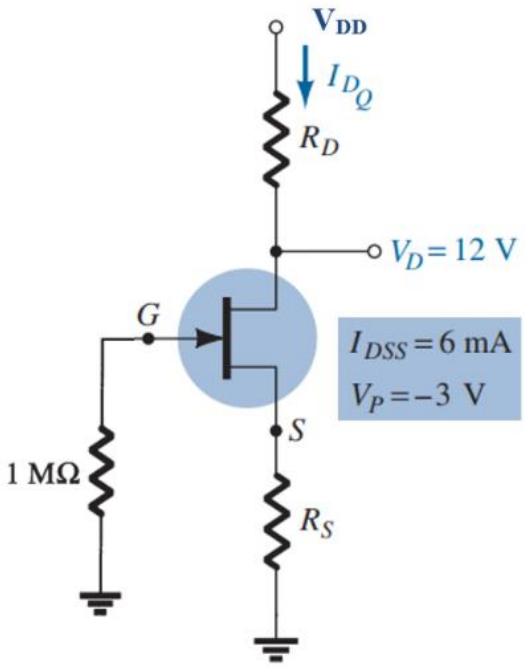


Fig. 2

Problem 2

Apply the knowledge gained from the DC biasing of JFET to select appropriate values of $\boldsymbol{R_D}$ and $\boldsymbol{R_S}$ of the circuit shown in Fig. 2, assuming V_{DD} = (**ID** ÷ 5) +15 V, I_{DQ} = (**ID** ÷ 20) mA. **[5]**

Name: Nasinur 2e0

Id: 20-42195-1

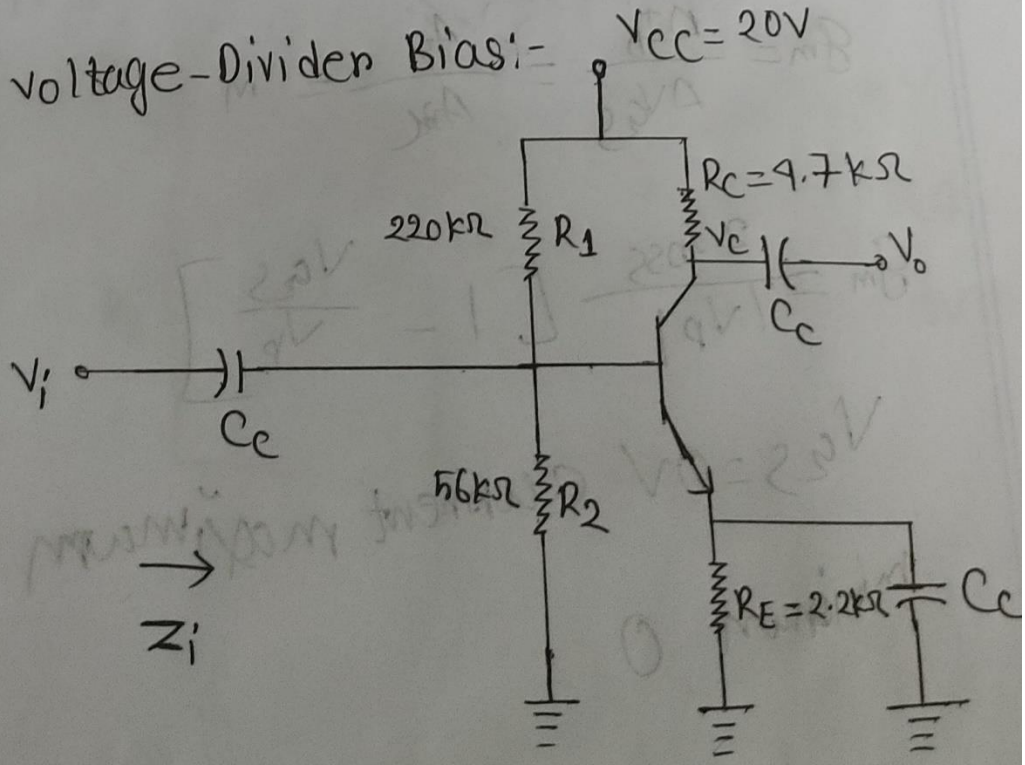
Answer to the Question No(1):

Given that.

$$\beta = (95 \times 10)$$
$$= 950$$

$$R_o = 95k\Omega$$

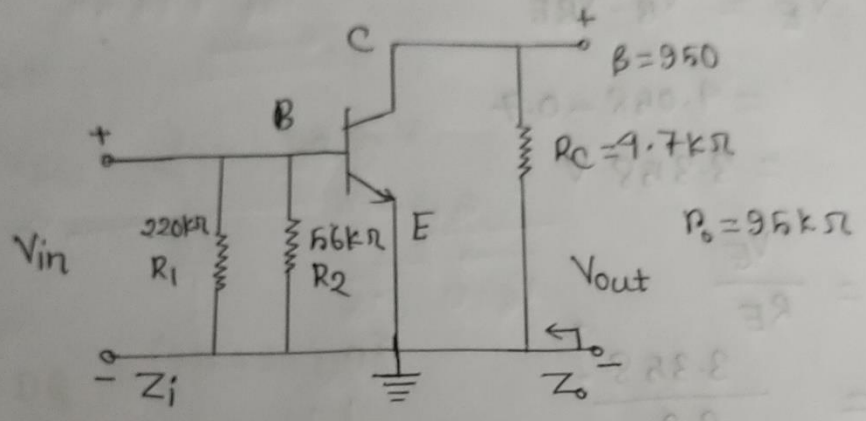
Figure of voltage-Divider Bias:-



Sub :

Day
Time : Date : / /

Figure of AC Equivalent Model:



Here,

$Z_o = R_C \parallel P_o$

$= 4.7 \parallel 95$

$= 4.478 k\Omega$

$$V_B = \frac{R_2}{R_1 + R_2} \times V_{CC}$$

$$= \frac{56}{220 + 56} \times 20$$

$= 4.058 V$

$V_{BE} = V_B - V_E$

$\Rightarrow V_E = V_B - V_{BE}$

$= 4.058 - 0.7$

$= 3.358\ V$

$I_E = \frac{V_E}{R_E}$

$= \frac{3.358}{2.2}$

$= 1.526\ mA$

$r_e = \frac{26mA}{I_E}$

$= \frac{26mA}{1.526mA}$

$= 17.038\ \Omega$

$= 17.038 \times 10^{-3}\ k\Omega$

$A_V = -\frac{R_C \| r_o}{r_e}$

$= -\frac{4.7495}{17.038 \times 10^{-3}}$

$= -262.85$ (Answer)

Day
Time : Date : / /

Sub :

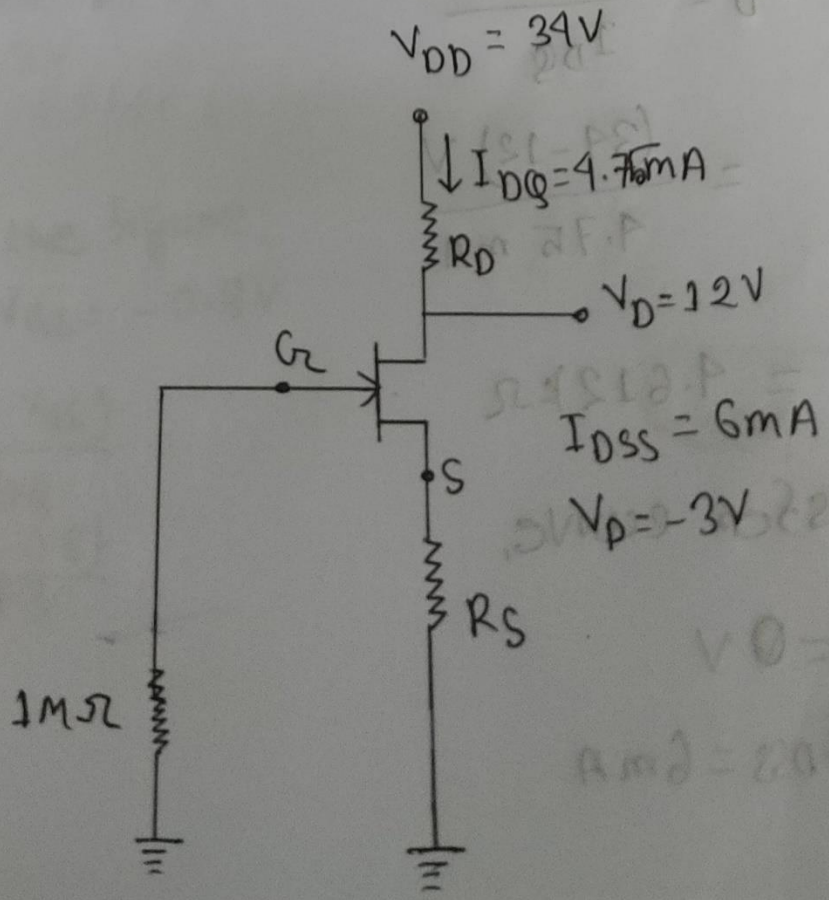
Answer to the Question No. (2):

Given that,

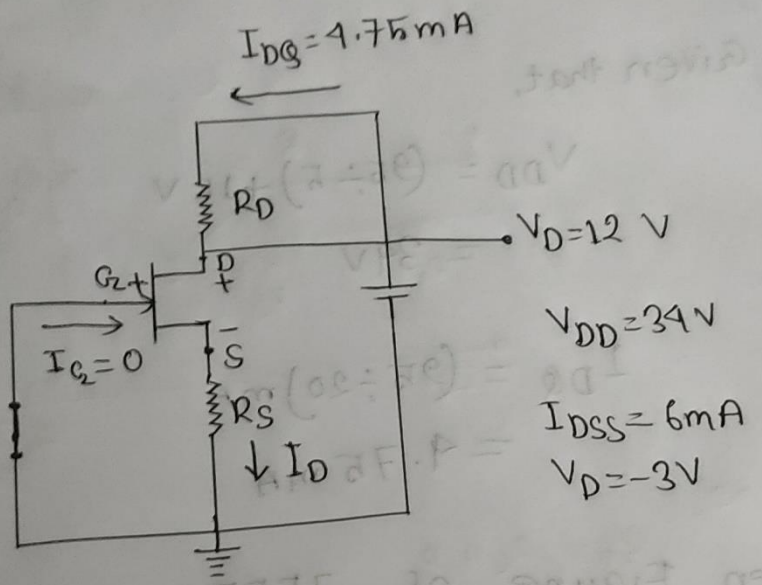
$$V_{DD} = (95 \div 5) + 15\ V$$
$$= 34\ V$$

$$I_{DQ} = (95 \div 20)\ mA$$
$$= 4.75\ mA$$

Given Figure of JFET :-



Equivalent Figure:



Here, $R_D = \dfrac{V_{DD} - V_D}{I_{DQ}}$

$= \dfrac{(34-12)\ V}{4.75\ mA}$

$= 4.612 k\Omega$

For transfer curve,

① $V_{GS} = 0\ V$

$I_D = I_{DSS} = 6mA$

(ii) $V_{GS} = 0.3 V_p$

$= 0.3 \times (-3)$

$= -0.9 V$

$I_D = \frac{I_{DSS}}{2} = \frac{6}{2} = 3mA$

(iii) $V_{GS} = 0.5 V_p$

$= 0.5 \times (-3)$

$= -1.5 V$

$I_D = \frac{I_{DSS}}{4} = \frac{6}{4} = 1.5mA$

(iv) $V_{GS} = V_p$

$= -3V$

$I_D = 0$

Here, from the figure,

$V_{GS} = -0.5 V$

$R_S = \frac{-(-V_{GS})}{I_{DQ}}$

$= \frac{0.5}{4.75}$

$= 0.105 k\Omega$

(Answer)