D. J. SANGHVI COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS ENGINEERING
ELX302: ELECTRONIC DEVICES AND CIRCUITS I SEM III
DESIGN 01: NMOS-E type Voltage divider biasing
15^{nd} **September, 2017** **[Maximum Marks: 05]**

1. **Follow similar approach for Self biasing design**

1. Design an N-channel Enhancement type MOSFET using voltage-divider biasing for the following specifications:

   $I_{DQ} = 5mA$, $V_{DSQ} = 5V$

   MOSFET parameters given are: $K_n = 25mA/V^2$, $V_{TN} = 1V$

   Solution:

   1. Since we want the operating point on the center of DC load line. We select the supply voltage $\underline{V_{DD} = 2 \times V_{DSQ} = 10V}$

   Assume $V_G = 0.25 \times V_{DD} = 0.25 \times 10 = 2.5V$

   Also, assume $R_2 = 100K\Omega, \frac{1}{4}W$

   i.e $V_G = 2.5 = \dfrac{R_2 \times V_{DD}}{R_1 + R_2} = \dfrac{100K \times 10}{100K + R_1}$

   i.e $R_1 = 300K\Omega, \frac{1}{4}W$

   Selecting nearest standard value of resistor $\underline{R_1 = 300K\Omega, \frac{1}{4}W,\ R_2 = 100K\Omega, \frac{1}{4}W}$

   3. Drain Current $I_D = K_n(V_{GS} - V_{TN})^2$

   i.e $5 \times 10^{-3} = 25 \times 10^{-3}(V_{GS} - 1)^2$

   i.e $V_{GS} = 1.447V$

   Now, $V_{GS} = V_G - I_D \times R_S$

   $R_S = \dfrac{V_G - V_{GS}}{I_D} = \dfrac{2.5 - 1.447}{5 \times 10^{-3}} = 210.6\Omega$

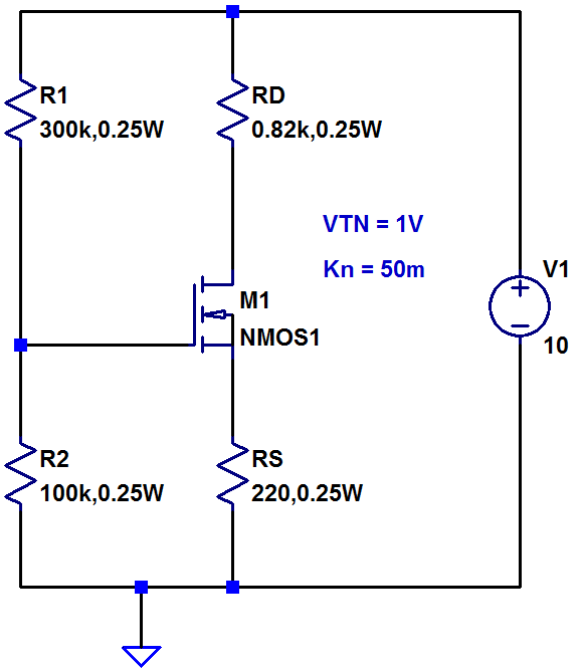
   Selecting nearest standard value of resistor $\underline{R_S = 220\Omega, \frac{1}{4}W}$

   4. Drain to source voltage $V_{DS} = V_{DD} - I_D \times R_D - I_D \times R_S$

   i.e $R_D = \dfrac{V_{DD} - V_{DS} - I_D \times R_S}{I_D} = \dfrac{10 - 5 \times 10^{-3} \times 220}{5 \times 10^{-3}} = 780\Omega$

   Selecting nearest standard value of resistor $\underline{R_D = 820\Omega, \frac{1}{4}W}$

Hence, the Designed Voltage divider circuit using NMOS E-type is



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