Sheet(4): MOSFET AC Analysis

1. For the circuits shown on Figure 1, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro . (μCox = 100 μA/V^2, λ = 0.01 V^{-1}, V_{th} = 1V, I_D = 0.4 mA)

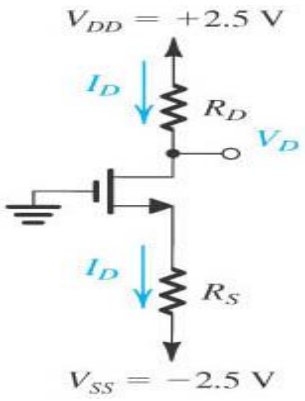

Fig 1

2. For the circuits shown on Figure 2, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro, (μCox = 100 μA/V^2, λ = 0.01 V^{-1}, V_{th} = 1V, I_D = 0.8 μA)

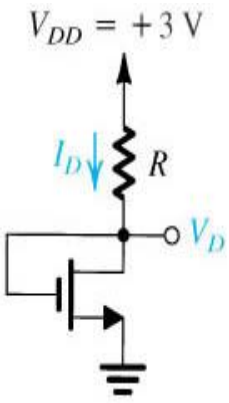

Fig 2

3. For the circuits shown on Figure 3, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro . (μCox = 100 μA/V^2 , λ = 0.01 V^{-1} , V_{th} = 1V, $K_n(w_n/L_n)$= 1mA/V^2)

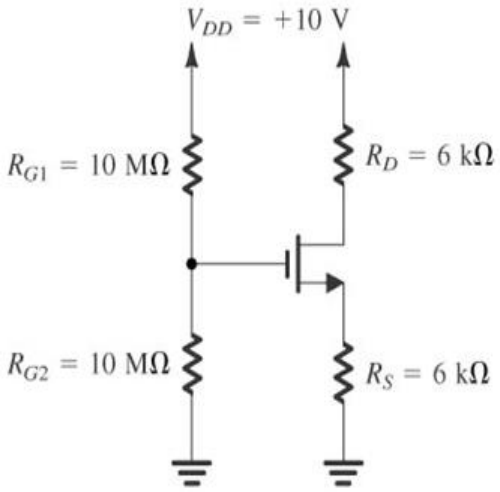

Fig 3

4. For the circuits shown on Figure 4, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro . (μCox = 100 μA/V^2 , λ = 0.01 V^{-1} , V_{th} = 1V)

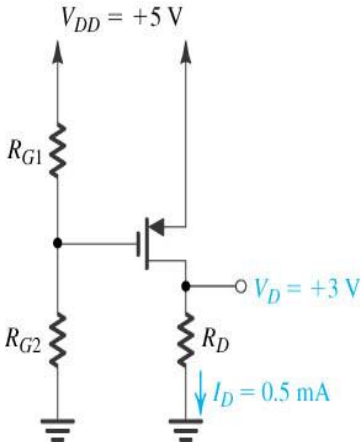

Fig 4

5. For the previous problem 4 determine:

a. The DC load line and its graphical solution.

b. The AC load line and compare it with the DC load line.

6. For the circuits shown on Figure 5, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro. (μCox = 100 μA/V^2, λ = 0.01 V^{-1}, V_{th} = 1V, $K_p(w_p/L_p)$ = 1mA/V^2)

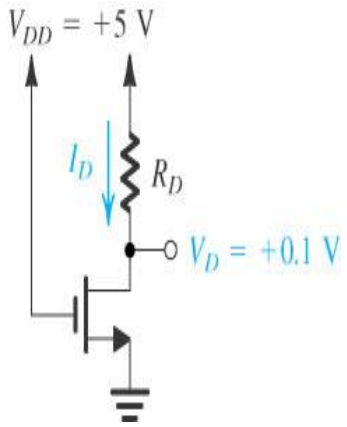

Fig 5

7. For the previous problem 6 determine:

c. The DC load line and its graphical solution.

d. The AC load line and compare it with the DC load line.

8. For the circuits shown on Figure 6, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro. (μCox = 100 μA/V^2, λ = 0.01 V^{-1}, V_{tn} =- V_{tp} =1v, $K_n(w_n/L_n)$ =$K_p(w_p/L_p)$= 1mA/V^2)

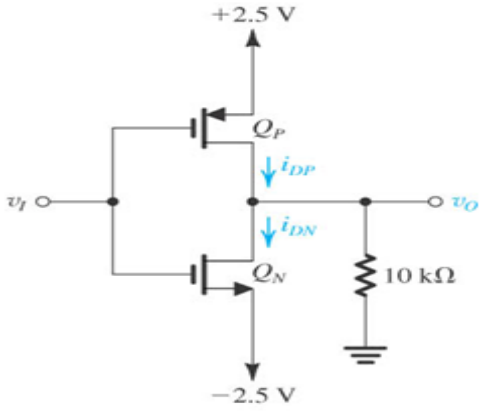

Fig 6

9. For the circuits shown on Figure 7, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro. (μCox = 100 μA/V^2, λ = 0.01 V^{-1}, V_{th} = 1V)

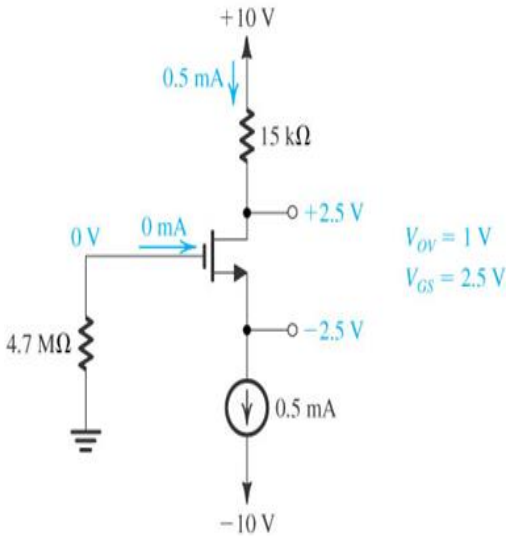

Fig 7

10. For the previous problem 9 determine:

e. The DC load line and its graphical solution.

f. The AC load line and compare it with the DC load line.

11. For the circuits shown on Figure 8, draw the equivalent AC circuit model. Denote on your schematic the values of g_m and ro. (μCox = 100 μA/V^2, λ = 0.01 V^{-1}, V_{th} = 1V)

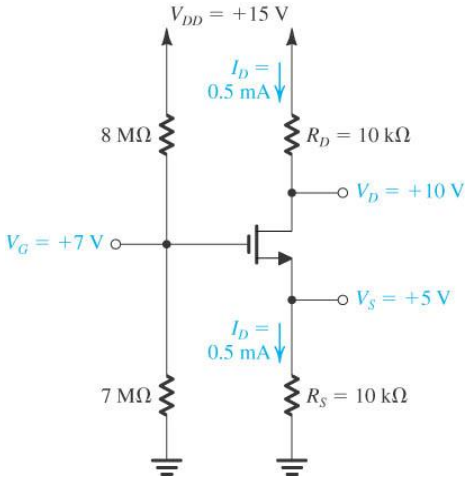

Fig 8

12. For the circuit shown in figure 9:

    a. Find the DC solution and calculate g_m and r_o (μC_{ox} = 100 $\mu A/V^2$, λ = 0.01 V^{-1}, V_{th} = 1V)

    b. Find voltage gain V_1/V_{in}

    d. Find R_{in} and R_{out}

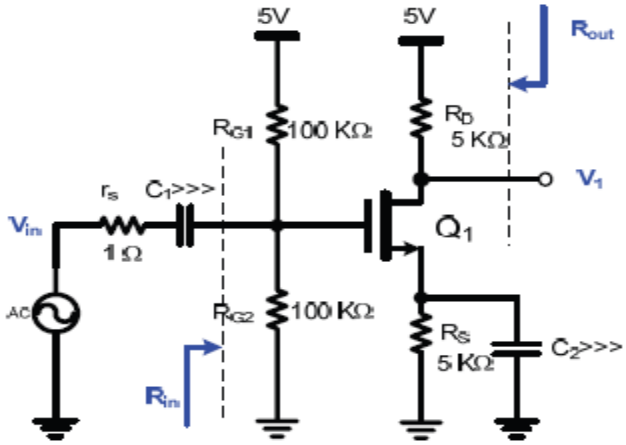

Fig 9

13. For the previous problem 12 determine:

g. The DC load line and its graphical solution.

h. The AC load line and compare it with the DC load line.

14. For the circuit shown in figure 10:

    a. Find the DC solution and calculate g_m and r_o (μC_{ox} = 100 $\mu A/V^2$, λ = 0.01 V^{-1}, V_{th} = 1V)

    b. Find voltage gain V_1/V_{in}

    d. Find R_{in} and R_{out}

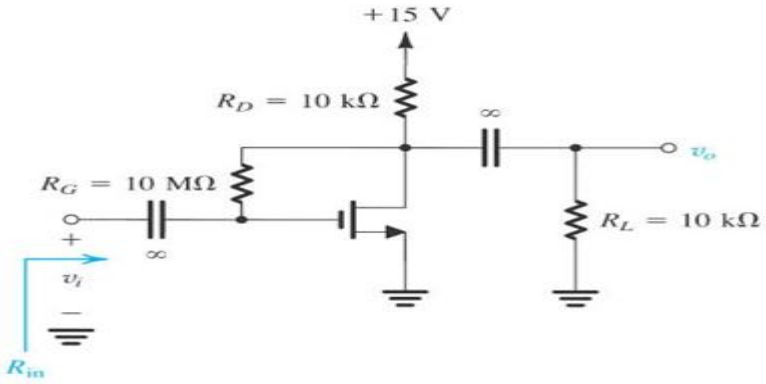

Fig 10

15. For the previous problem 14 determine:

i. The DC load line and its graphical solution.

j. The AC load line and compare it with the DC load line.

16. For the circuit shown in figure 11:

a. Find the DC solution and calculate g_m and r_o (μC_{ox} = 100 $\mu A/V^2$, λ = 0.01 V^{-1}, V_{th} = 1V, V_D = 2 v)

b. Find voltage gain V_1/V_{in}

d. Find R_{in} and R_{out}

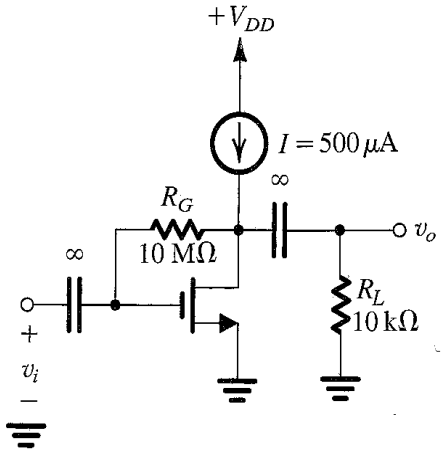

Fig 11

17. For the previous problem 16 determine:

k. The DC load line and its graphical solution.

l. The AC load line and compare it with the DC load line.