

- We value your input! Please provide specific suggestions for enhancing both the learning experience and the lecture materials. Think about areas like lecture pacing, clarity of explanations, use of visual aids, class engagement, or any specific topics you feel could be expanded or improved. I apologize for any shortcomings on my part. [5 marks]

### ■ Question 1 of 1

[CO2] [10 marks]

analyze the Circuit and calculate  $I_{DS}$  and  $V_{out}$  using the method of assumed states. You must validate your assumptions. Here,  $V_T = 1V$  and  $K = 2mA/V^2$

$$V_G = 5V$$

let saturation mode,

$$I_{DS} = \frac{1}{2} K (V_{GS} - V_T)^2$$

$$\Rightarrow I_{DS} = \frac{1}{2} \times 2 (5 - V_S - 1)^2$$

$$\Rightarrow I_{DS} = (4 - V_S)^2$$

$$\text{Again, } I_{DS} = \frac{V_S - 0}{3}$$

$$\Rightarrow \frac{V_S}{3} = (4 - V_S)^2$$

$$V_S = 3, 5.33$$

Take this value

Rubric

$$1. V_G = 5 \rightarrow 1$$

$$2. \text{Any assumption} \rightarrow 1$$

$$3. \text{formula} \rightarrow 1$$

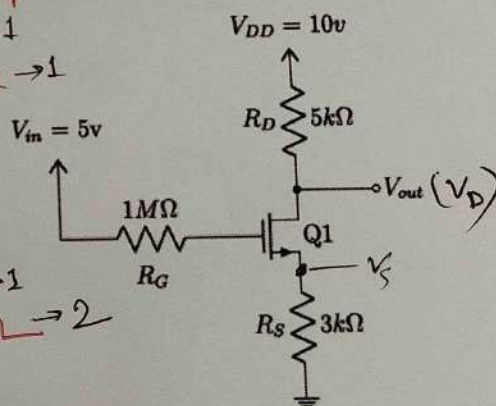
$$4. K \text{ eq/V} = IR \rightarrow 1$$

$$5. 2 \text{ eqs} \rightarrow 2$$

$$6. \text{Solve} \rightarrow 1$$

$$7. V_{out} \rightarrow 1$$

$$8. \text{Validation} \rightarrow 2$$



$$I_D = \frac{3}{3} = 1mA$$

$$V_{GS} = 5 - 3 = 2V$$

$$I_{DS} = \frac{10 - V_D}{5} \Rightarrow 1 = \frac{10 - V_D}{5} \Rightarrow V_D = 5V$$

$$V_{DS} = 5 - 3 = 2V$$

$$V_{ov} = V_{GS} - V_T = 2 - 1 = 1V$$

$V_{DS} > V_{ov}$  ∴ Assumption Correct