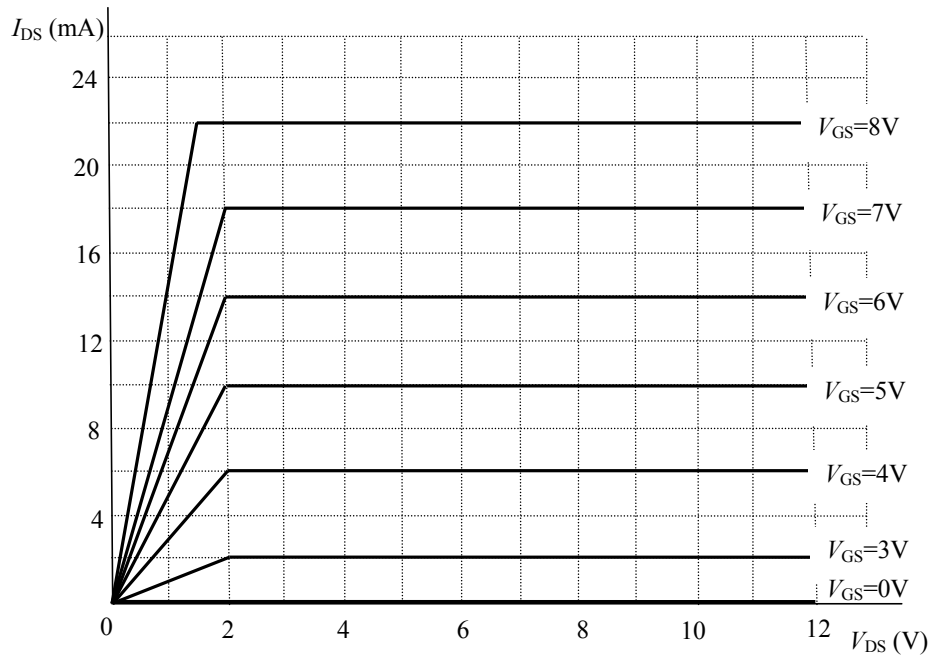


2 Digital Electronics (IJW)

- (a) Draw a diagram showing the structure of an n-channel MOSFET and describe how the Drain to Source current can be controlled. [4 marks]
- (b) Draw the circuit diagram of a NOT gate that comprises an n-channel MOSFET and a resistor R . [2 marks]
- (c) For the NOT gate in part (b), plot the relationship between the input voltage, V_{in} , and the output voltage, V_{out} . The power supply voltage, $V_{DD} = 10\text{ V}$, $R = 500\ \Omega$, and the MOSFET has the characteristics given in the following figure. [6 marks]



- (d) For the NOT gate in part (c), calculate the power dissipated by resistor R when $V_{in} = 8\text{ V}$. [3 marks]
- (e) (i) Describe how the power dissipated by resistor R can be reduced. State any potential problems with your proposed solution. [3 marks]
- (ii) Present a modified circuit for a NOT gate that eliminates the problem of static power dissipation in resistor R . [2 marks]