Question 1 [3 marks]:
   a) A field-effect transistor (FET) is an electronic switch. Typically, the current that flows through the source and drain electrodes is used to drive some device (e.g. a light emitting diode). State the purpose of gate electrode in an FET.[1 mark]
   b) Give a reason why can we not use single crystal silicon wafers for transistor backplanes in televisions / monitors.[1 mark]
   c) Give a reason why crystalline silicon wafers are not generally being explored for ubiquitous flexible electronics.[1 mark]

Question 2 [7 marks]:

\[
I_D = \frac{W}{L} \mu C_{ox} \left( (V_G - V_T)V_D - \frac{V_D^2}{2} \right)
\]

Where:
- \(I_D\) is the source-drain current.
- \(W\) is the channel width.
- \(L\) is the channel length.
- \(\mu\) is the charge carrier mobility.
- \(C_{ox}\) is the capacitance per unit area of the gate dielectric.
- \(V_G\) is the applied gate voltage.
- \(V_T\) is the threshold voltage.
- \(V_D\) is the applied drain voltage.

a) Are thin film transistors generally depletion mode devices or accumulation mode devices? [1 mark]

b) Figure 1 shows the transfer characteristics of a thin-film transistor. State whether this transistor is n-type or p-type. [1 mark]

c) State what is meant by an ambipolar (sometimes called bipolar) thin film transistor.[1 mark]
d) The speed at which information can be transmitted and processed, depends on the time taken for electrons or holes to traverse certain devices. Briefly explain why we generally characterize thin film transistors in terms of charge carrier mobility, rather than charge carrier velocity.[2 marks]

c) The main result from the gradual channel approximation is given by Equation 1. Using this equation, explain briefly one of the reasons why a high mobility is generally desirable in portable thin-film electronics.[2 marks]