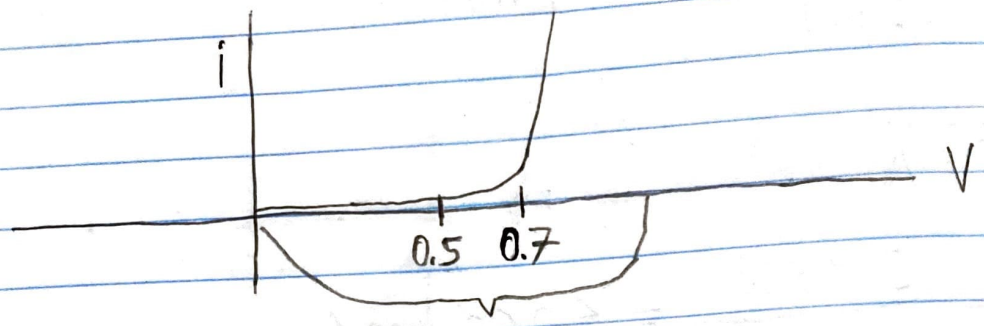
1. a. $i = I_S(e^{V/\eta} - 1)$

b.




forward region

2. a. Diode IN4148

b. i. Forward voltage : 1 V

ii. Forward current :
- Average Rectified : $I_o$ = 200 mA
- DC : $I_F$ = 300 mA
- Recurrent Peak : $I_f$ = 400 mA
- Non-repetitive Peak Forward Surge Current :
  Pulse Width = 1.0 S ⟶ $I_{FSM}$ = 1.0 A
  Pulse Width = 1.0 NS ⟶ $I_{FSM}$ = 4.0 A

iii. Reverse DC blocking Voltage
= Maximum Repetitive Reverse Voltage
= $V_{RRM}$
= 100 V

iv. Power Dissipation : $P_D$ = 500 mW

3. a. LED NSPW500BS

b. Forward on-voltage for the LED:
Current of 1 mA @ 2.8 V

4. Assume:
- $D_1$ : Forward Biased
- $D_2$ : Reverse Biased

Voltage at Point X
= Forward Voltage Drop of $D_1$
= 0.7 V

If $V_{input} > V_{DD} + 0.7$ V:
$D_2 \longrightarrow$ Forward biased, conducting:
Clamping $V_{point\ x} = V_{DD} + 0.7$ V

If $V_{input} < -0.7$ V:
$D_1 \longrightarrow$ Reverse biased, conducting:
Clamping $V_{point\ x} = -0.7$ V

Diodes:
Can function like clamps
→ When: forward-biased state

$D_1$: clamps $V_{point\ x}$ = max of 0.7 V above ground

$D_2$: clamps $V_{point\ x}$ = max of 0.7 V below $V_{DD}$