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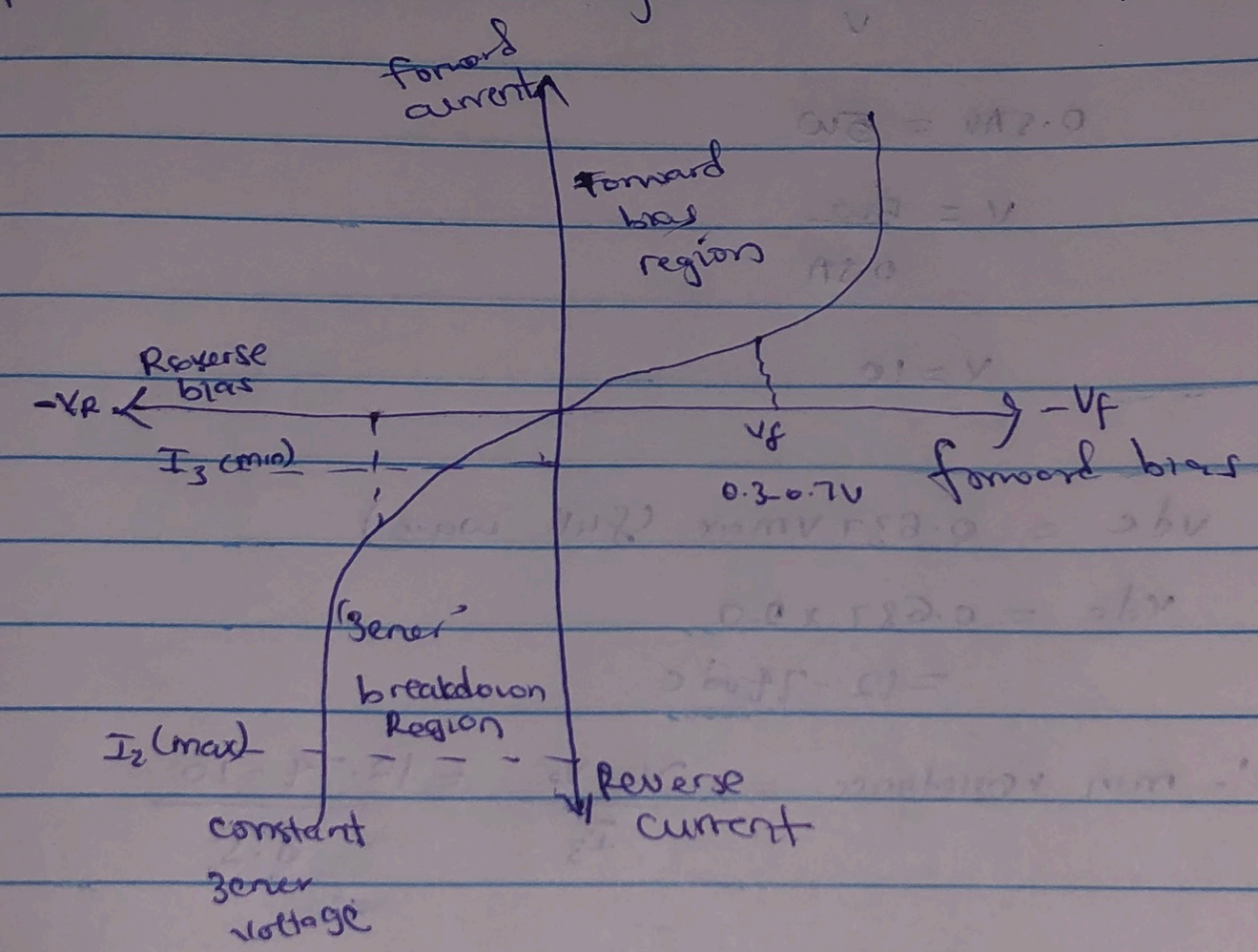
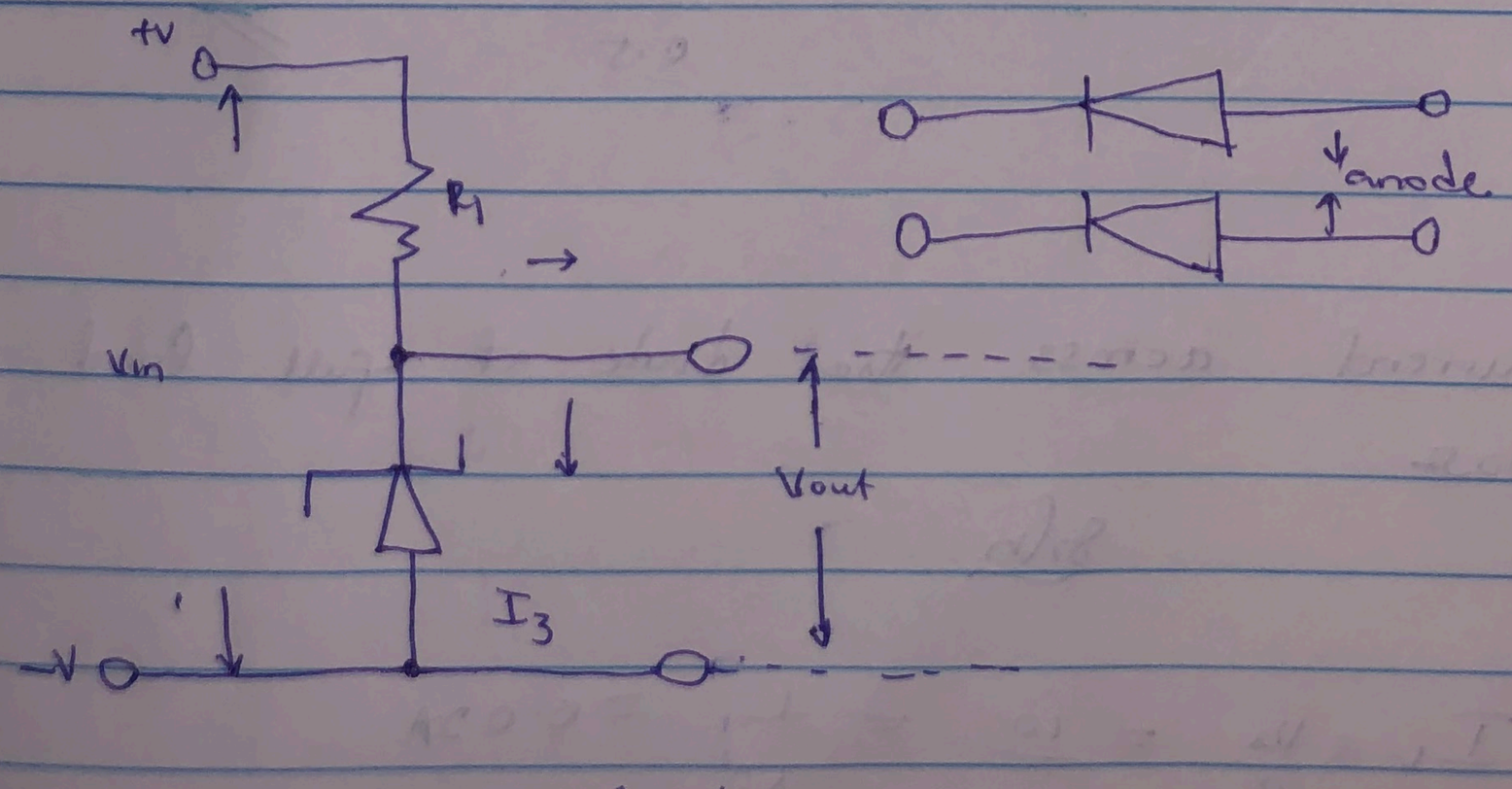
18/ENG08/025
BIOMEDICAL ENGINEERING
ENG222

1. A zener diode is always operated in its reverse biased condition. As such a simple voltage regulator circuit can be designed using a zener diode to maintain a constant DC output voltage across the load in spite of variations in the input voltage or changes in the load current

i



ii



circuit diagram

2. (i) $P_3 = 5W$

$I_3 = 500mA = 0.5A$

Max Current $= \frac{\text{Max Power}}{V}$

$0.5A = \frac{5W}{V}$

$0.5AV = 5W$

$V = \frac{5W}{0.5A}$

$V = 10$

But $v_{dc} = 0.637 V_{max}$ (full wave)

$v_{dc} = 0.637 \times 20$

$= 12.74 v_{dc}$

$\therefore$ min resistance $= \frac{V_2 - V_3}{I_3} = \frac{12.74 - 10}{0.5}$

$= \frac{2.74}{0.5} = 5.48\Omega$

(ii) The current across the diode at full load of 500Ω

Soln

$I_L = \frac{V_3}{R_L} = \frac{10}{500} = \frac{1}{50} = 0.02A$

Current across the diode at 500Ω

full load = 0.02A or 20mA

$I_3 = I_s - I_n$

$= 500 - 20 = 480mA$ or $0.48A$