

BT6270-Assignment_1

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BS20B032

1.

I1=0.0223 microampere

I2=0.0624 microampere

I3=0.4748 microampere

Assumptions: Spikes with maxima greater than 9 mv were considered as an action potential.

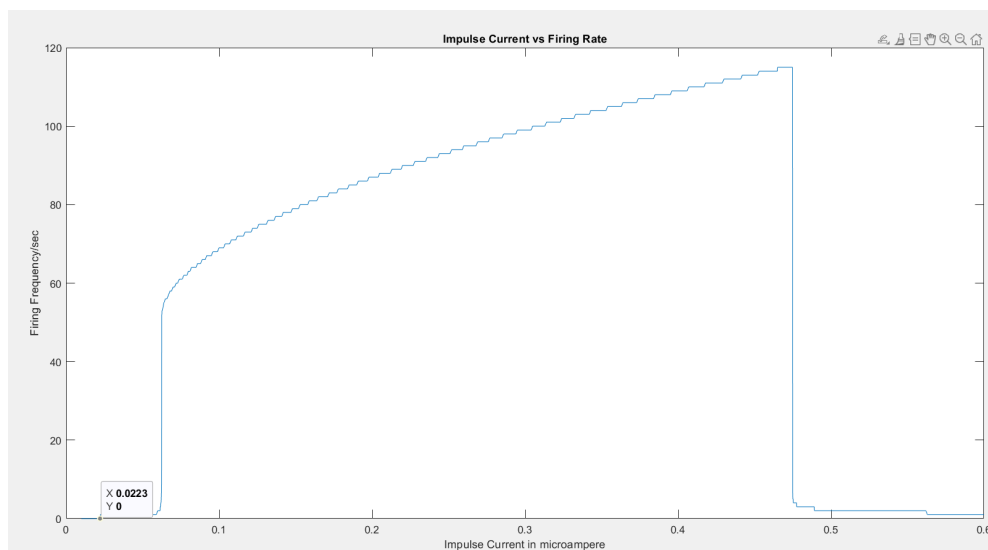
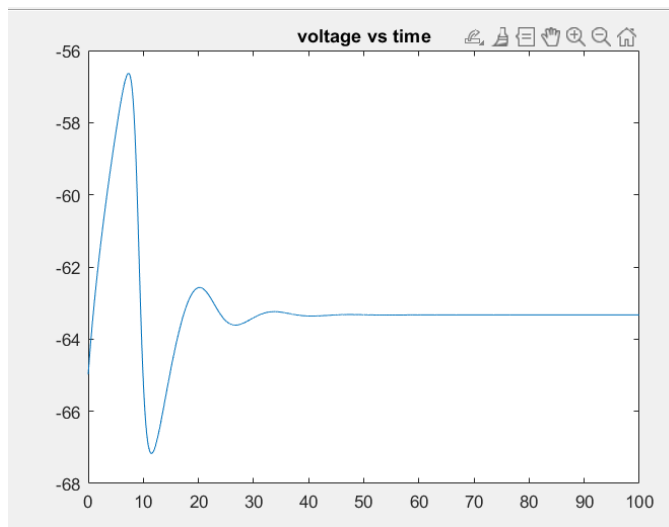
- The threshold voltage has been chosen such that the every corresponding peak in the conductance of Sodium and Potassium Channels for every firing is at least 1 millisecond apart giving sufficient time for the Sodium Channels to depolarise the membrane potential before the inactivation gates of K⁺ open
- When the threshold voltage was chosen to be 9mv ,the threshold current was found to be 0.4748 microampere post which there was a rapid decrease in no of APS observed.
- At this Input current, the corresponding peaks in gNa and gK were approximately a milli second apart.

Observations:

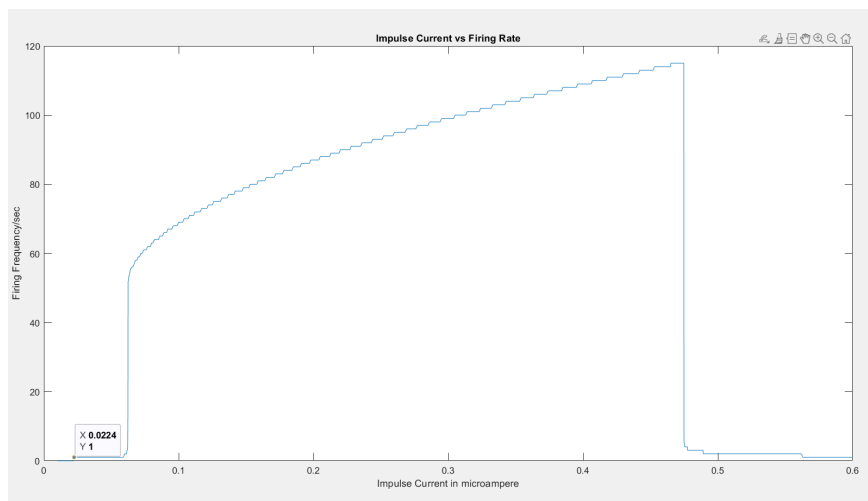
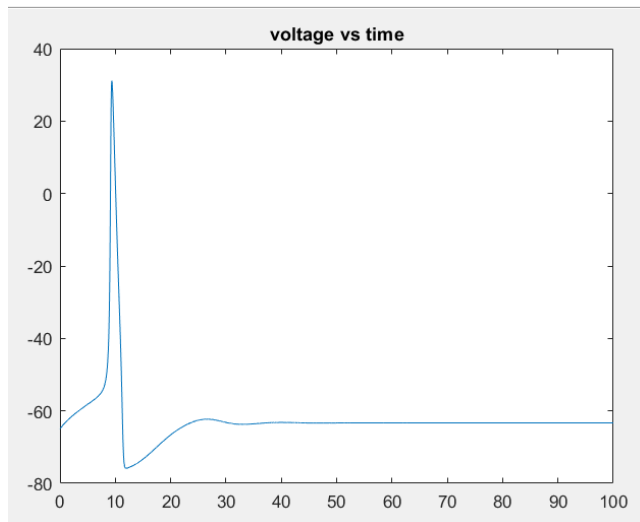
- No action potentials were observed until the Input Current was till 0.0223 microampere
- The first AP was observed at input current of 0.0224 microamperes.
- The second AP was observed at 0.05955 microamperes.
- Finite APs were observed till 0.624 microamperes.
- There was continuous firing from 0.0625 microamperes.
- As the current was increased to 0.4748 microamperes, the firing frequency was gradually increasing .The APS other than the first had the same amplitude , signifying limit cycle behavior.
- When current was increased beyond 0.4748 microamperes, a rapid decrease in the number of APs and amplitude was observed.

Supporting plots attached in the following pages.

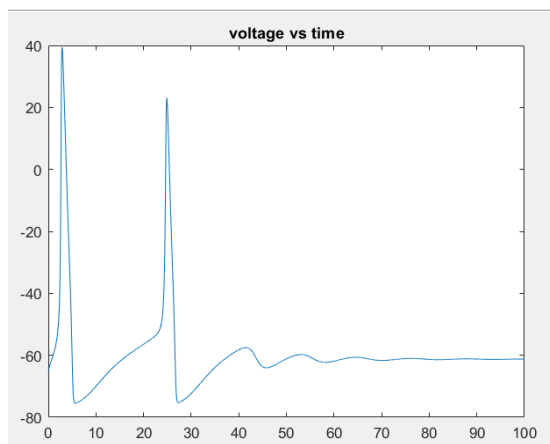
At $I=0.0223$ microamperes (No action potential Observed)



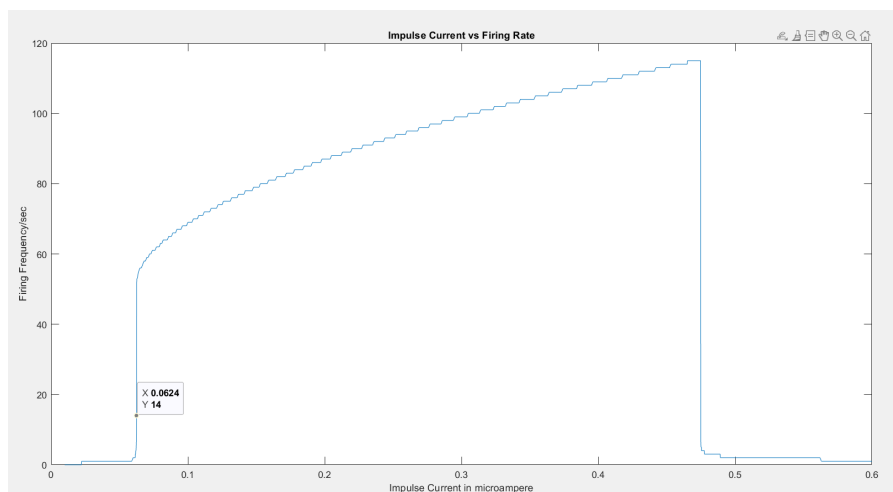
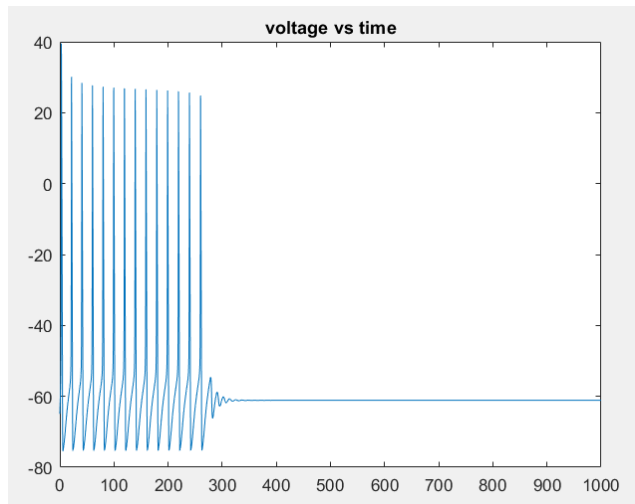
At $I=0.0224$ microamperes, First Action Potential Observed



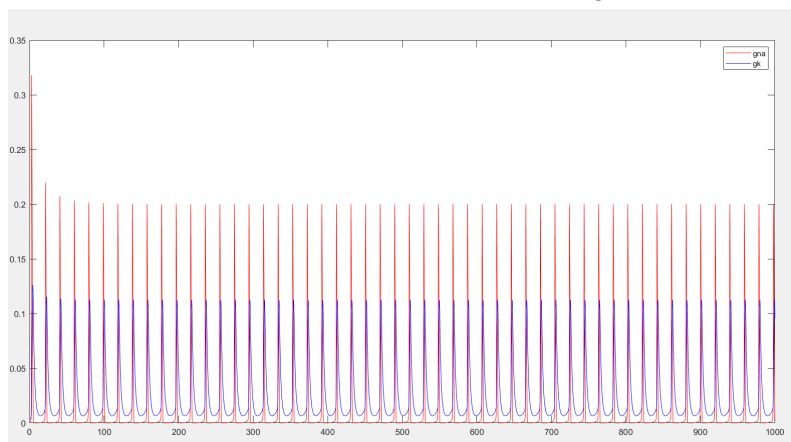
At $I=0.05955$ microamperes (2 Action potentials observed)

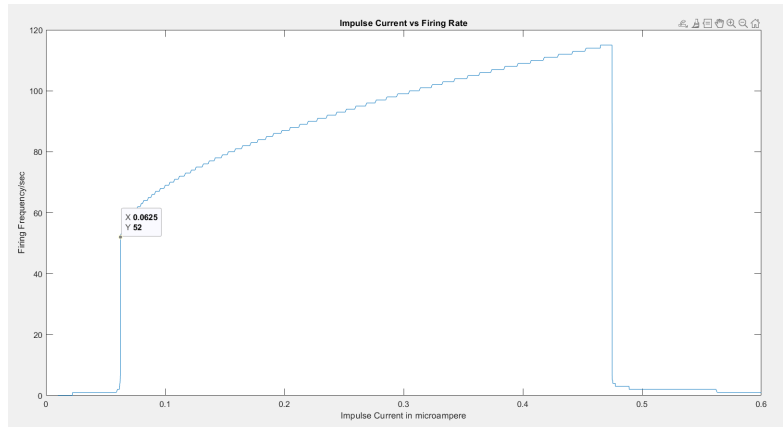


At $I=0.0624$ microamperes (Finite APs)

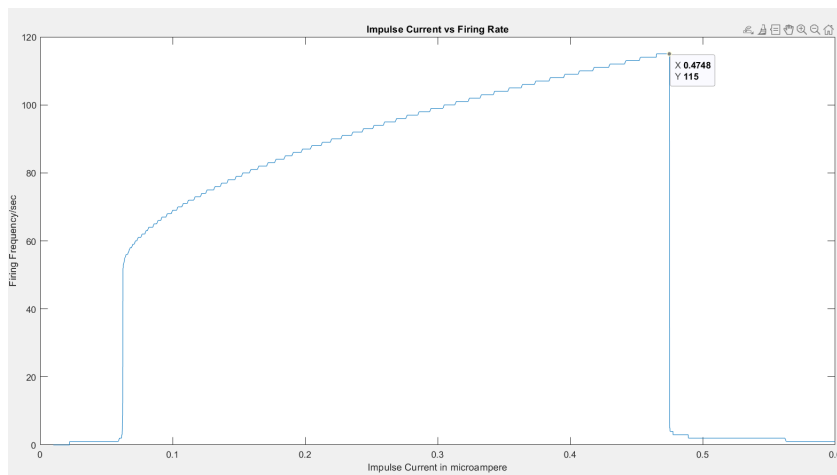
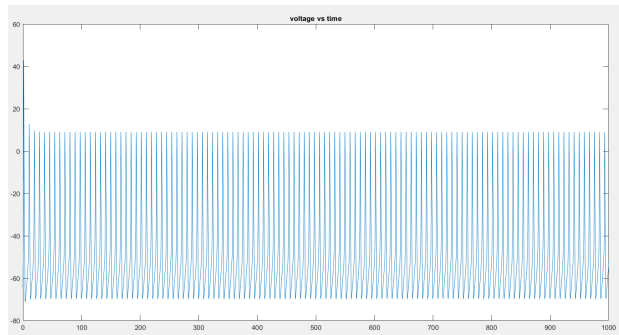


At $I=0.0625$ microamperes (Continuous Firing)

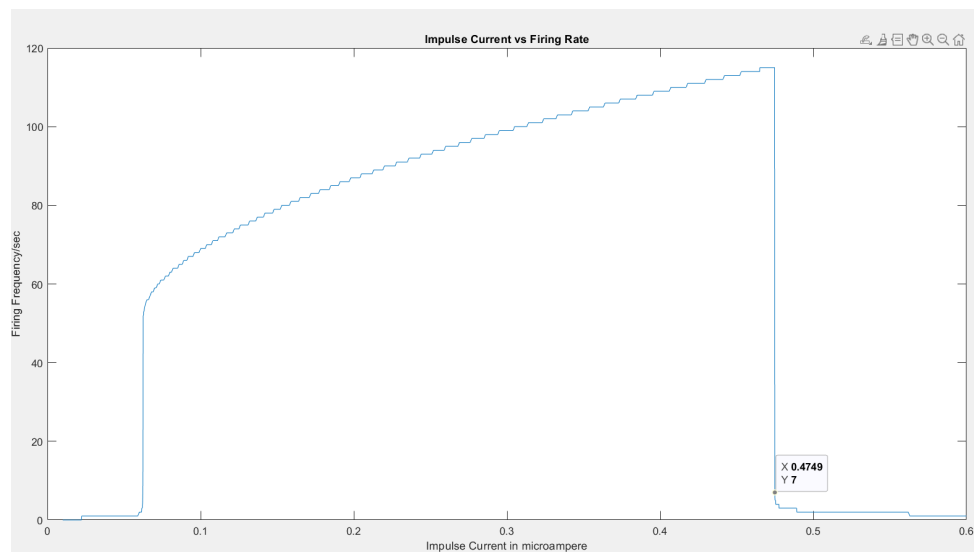
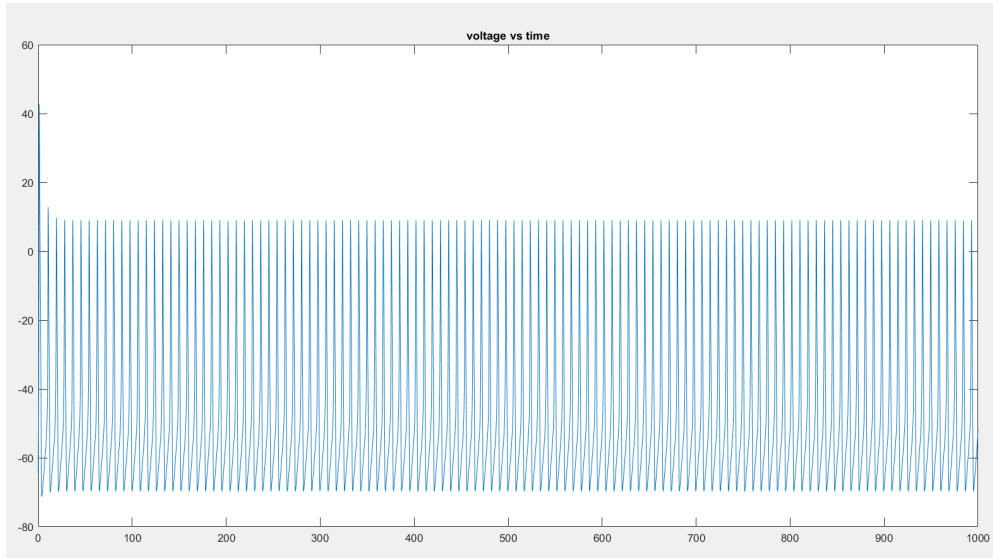




At $I=0.4748$ microamperes (Frequency rapidly decreases when increased beyond this current)



At $I=0.4749$ microamperes(There were many spikes but most of them were below 9mV)



Final Plot:

