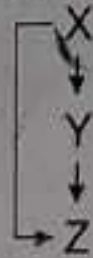1. If the regulator Y in coherent FFLs is positively auto-regulated. How does this affect the dynamics of the circuit, assuming that it has an OR input function at the Z promoter? Consider both an ON step and an OFF step. Draw and explain **[3 marks]**

Coherent type 1

$$\begin{array}{l} X \\ \downarrow \\ Y \\ \downarrow \\ Z \end{array}$$

2. What is the tempo al order of turn ON and turn OFF in a multi-output coherent FFL where all genes are regulated by AND gates? Which thresholds determine the ON and OFF orders? **[3 marks]**

3. What is the minimum pulse duration (time) of X that is required to activate Z in the cascade: **[3 marks]**

X-----| Y -----| Z

4. What are the different ways by which proteins are controlled inside the cell? Explain the difference in the response time **[3 marks]**