

Q1) **a)** What do you understand by the Swarm Drones.

The group of drones which work together to achieve a specific goal or to complete a specific task is known as swarm drones. They all can communicate between each other.

b) In Done if you want to use ESP8266 with the controller to communicate, how will you do it.

Since there are three drones and each have to communicate with every other, I will use many-to-many communication type between all esp8266 modules. This makes the system communicable with each other. This can be achieved by using ESP_NOW protocol. This protocol allows multiple ESP8266 boards to communicate with each other directly, without relying on a central hub or router (i.e. without an active internet connection)

By tuning the all the esp modules into the same channel each can receive and send message through the channel. We can add even more than three modules and it will still work.

c) If you are allowed to make changes in the design of regular drone, what will you change and justify your answer. Also attach the references for the suggested changes in the design.

Many drones are used for surveillance purpose nowadays, for those and in general drones too. I would suggest using Active Noise Cancellation technology / Active Noise Reduction (ANR) to reduce the sound produced by its motors. This is a major problem in surveillance drones because the surveillance drones are intended to remain undetected by the target or other observers. We could achieve this by:

- Placing a microphone near the propellers/motors and by recording the sound from it , we can generate a signal which has same frequency and amplitude but a inverted one (with a 180-degree shift).
- By the destructive interference concept these two waves would cancel each other. So, there will be no noise (practically very minimum).
- This technique is already being used in earphones/headphones. While there are other methods to i suggest this specific one since it is a dynamic method.
- In some circumstances the frequency/ sound of the motors may vary if we use a static / constant method it will not help at that time. This method uses the real-time data to reduce the noise so it wouldn't be a problem if the frequency of the motors changes too.

References:

[https://www.sciencedirect.com/science/article/pii/S2452414X18300086#:~:text=A%20swarm%20or%20fleet%20of,%2C%20and%20land%20\(VTOL\).](https://www.sciencedirect.com/science/article/pii/S2452414X18300086#:~:text=A%20swarm%20or%20fleet%20of,%2C%20and%20land%20(VTOL).)

(This is the reference for the swarm drones concept, as I only know that swarm drones mean a group of drones i reviewed this and got a main point that they basically work to complete a specified task)

<https://github.com/techiesms/ESPNOW-Many-to-Many-Communication/tree/main>

(This is the reference code for the many-to-many protocol, this speaks on connecting many esp modules and controlling lights through it)