

VTOL Aircraft Theory, Design, and Practice II Mid-Term Exam.

2023/04/26 09:30 – 10:45

1. In the DC brushless motor, an inverter is sometimes used for a certain purpose. What is that purpose? And, compared against the brushless motor, which disadvantages will a brushed motor have? Which component included in the brushed motor was lately replaced by an inverter used in a brushless motor? (15 Points)
2. When the value of "Oswald efficiency factor" is varied between 0.3 and 0.8, will such variation directly imply that the wing (or an airfoil) will change its cross-sectional shape, such as into a better performing airfoil? Or in which other ways will such possible change be possible in Oswald efficiency factor? (20 Points)
3. It is found that hydrogen fuel cell propulsion will be beneficial from the standpoint of the efficiency and pollution. However, which disadvantages (or limitations) still prohibits its world-wide use in an electrically driven ground vehicle or eVTOL? (15 Points)
4. Distributed electric propulsion (DEP) is one major feature that most of eVTOLs use as their propulsion. Which advantages and disadvantages will DEP bring in terms of the vehicle performance, safety, noise, and the other properties? (15 Points)
5. Battery management system (BMS) is used in most of the eVTOLs and ground EVs. How does it work and what is the advantage? (15 Points)
6. There exists comparison upon the efficiency among the conventional fossil fuel, all electric (battery), and hydrogen fuel cell. What is the result of the comparison and how do you expect future improvement for each individual candidate? (20 Points)