EC4.402: Introduction to UAV Design: Assignment I (Spring 2022)

- *Total 10 marks (7+3).*
- *Answer all the questions.*
- *Due date: Feb 20, 2022.*
- *Assume any data if found missing and mention your assumption in the answer.*
- *MATLAB, PYTHON programming can be used (no need to submit the codes). But need to show equations and results for 1 iteration of design.*

Q.1) Design a multi-rotor UAV used for spraying fertilizer in agriculture meeting the following specifications.

a) Endurance =40 min.
b) Range = 5 Km.
c) Payload weight = 10 Kg.
d) Flying altitude = 20 m from ground.
e) Climb and descent rates = 1 m/s and 2 m/s.
f) Cruise speed = 5 m/s

The following aspects of conceptual design phase must be elaborated:
i) CONOPS
ii) Requirement specifications
iii) Market survey (minimum of 2 UAVs)
iv) Sizing and layout (draw a brief sketch showing the parts and dimensions)
v) Component identification
vi) Performance analysis
vii) Optimize the design for maximizing the range while meeting the rest of the specifications.

Q.2) Obtain the dynamic thrust for the 3 given propellers from UIUC propeller database for 4000 RPM, 5000 RPM and 6000 RPM at a flight speed of 10 m/s?
a) APC 8 $\times$ 6
b) APC 9 $\times$ 6
c) APC 10 $\times$ 7

`https://m-selig.ae.illinois.edu/props/volume-1/propDB-volume-1.html#APC`