

Helicopter Dynamics HW#1

1. **What are the advantages and the disadvantages of the tractor and pusher type tail rotors?**
2. **Which one of the following rotors need tail rotors for hovering?**
 - **A) coaxial rotor (ABC – Sikorsky)**
 - B) circulation controlled rotor (X-wing – NSRDC)**
 - C) tilt rotor (XV-15 – Bell)**
 - D) tandem rotor (Chinook – Boeing Vertol)**
 - E) tip jet rotor**
3. **Justify the following**
 - a) **The helicopters with conventional rotors are limited to a forward speed of about 170 knots**
 - b) **In hovering flight, the rotor disk follows the shaft (in about 3revs)**
 - c) **A rotation of the tail boom in the opposite direction of blades rotation can be troublesome.**
 - d) **For a rotor with hinge offset, the phase lag of the flapping motion, with respect to the pitch motion is not 90° .**
 - e) **For a fixed wing, control surfaces such as flaps and ailerons are used to control the lift, but that is not the case with rotor blades**
 - f) **It is quite common that a small precone of 2 to 3 degrees is given to hingeless blades**
 - g) **For a flapping rotor with no cyclic pitch (tail rotor), the hub and control planes are equivalent.**
 - h) **For a feathering rotor with non-flapping (propeller with cyclic pitch) the hub plane and TPP are identical.**
 - i) **The rotor behaves as a gyro, maintaining its orientation relative to the inertial space in vacuum.**
 - j) **A teetering rotor perhaps is not practical for large helicopters.**
 - k) **An optimal rotor is a hypothetical rotor that is efficient in hover for one thrust level.**
 - l) **The induced rotor power is the largest in hover.**