AE 670 Aerospace Structural Analysis-I

Assignment No. 1

1.1 A 600 lb satellite is mounted in the upper stage of a launch vehicle. During the boosted vertical-flight phase, a peak acceleration of 9g is reached. The satellite is mated to the booster by four bolts loaded in shear, each of which has an ultimate shear strength of 2126 lb. The specified factor of safety is 1.25. Determine (a) the limit load per bolt (b) the ultimate load per bolt and (c) the ultimate margin of safety.

1.2 The fuel tank of a vertically launched rocket contains kerosene (specific gravity 0.8) and is pressurized to 100 psig at a sea level pressure of 14.7 psia. The peak boost acceleration of 9g occurs at an altitude where the ambient pressure is 5 psia and at a time when the depth of the unexpended fuel is 100 in. Determine the ultimate bursting pressure at the bottom of the tank at this time assuming an ultimate factor of safety of 1.25.

1.3 A 96600 lb transport airplane has a mass moment of inertia of 48300000 lb-in-sec^2 about a pitch axis passing through its centre of gravity. During landing, when the aerodynamic lift is 0.9 times the weight, it is subjected to the ground loads shown in figure 2.1. Determine (a) the limit load factor in the vertical direction at the centre of gravity and (b) the limit pitching acceleration in radians per second per second.

1.4 An electronics package weighing 100 lb is located 400 in aft of the centre of gravity in the airplane of problem 2.3. Determine the ultimate vertical load that the package support brackets are subjected to during landing. Use a load factor of 1.5 for ultimate load.