Module 16 - 5098 : Mechanical Technology 2. Design Analysis Assignment.

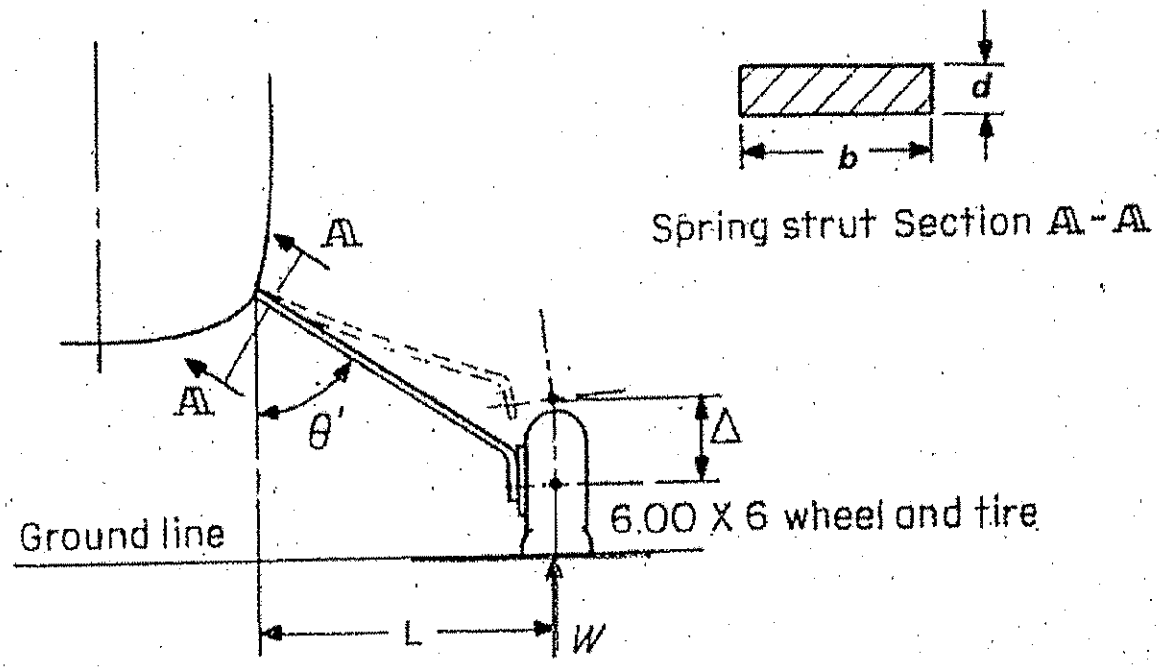
Date set.....26/11/2012.....Last Date required...20/12/2012.....

Your last Name.....First Name.....

[Completed assignment must be submitted on or before the last date required. Late submission will not be assessed without documented medical reasons. Students are strongly advised to retain some proof of submission and a duplicate copy of the completed work]

PRELIMINARY DESIGN ANALYSIS OF LANDING STRUTS FOR A LIGHT AIRCRAFT.

Given:
Total landing load on each wheel, W = 9786N.
Friction force on each tyre at touch down, F = 550N
Wheel radius, R = 152.4mm.
Track, L = 571.5mm.
Young's modulus of strut material, $E = 2 \times 10^5\ Nmm^{-2}$.
Uni-axial Yield stress of strut material, $\sigma_y = 1200 Nmm^{-2}$.
Angle, $\Theta = 58^0$.
Required maximum end deflection at touch down, $\Delta = (156 \pm 0.5)$ mm.



You are required to carryout an engineering design analysis to obtain preliminary sizing of the landing gear struts and submit a written report containing details of your work. The report should include the following:

(a)

(i) Resolution of forces operating on the struts.

(ii) Deflection analysis and selection of suitable cross sectional dimensions.

(iii) Buckling stability analysis.

(iv) Material yielding analysis.

[80% marks]

(b) Comments (with appropriate engineering explanations) on the suitability of your design in light of the safety factors inherent in the above listed aspects of analyses.

[10% marks]

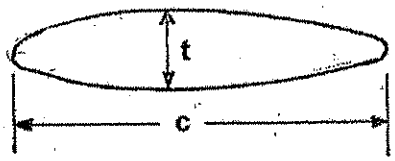
(c) Suggest, with concise explanations, a systematic procedure which can be used to make your design more efficient in service. Continue with this part of the work as far as you are able.

[10% marks]

Total [100% marks]

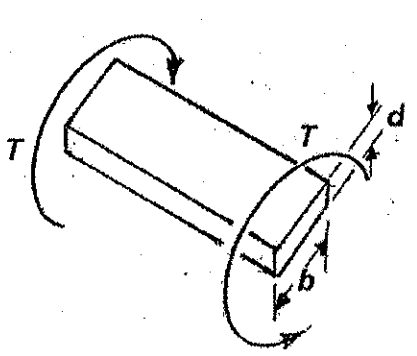
Information and formulas, in addition to those given in the lecture notes, you may wish to use in your analysis:

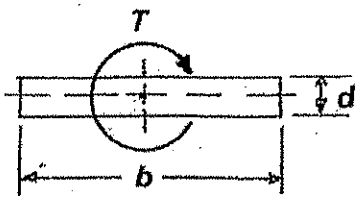
1. To reduce air 'drag', you may like to consider a 'stream line' cross-section for which:



(t/c) = (1/3) to (1/8)

2. Maximum shear stress, $(\tau_{xy})_{max}$, developed in a rectangular cross-section due to an applied torque, T :





$$(\tau_{xy})_{max} = \left[\frac{3b + 1.8d}{(bd)^2}\right] \times T$$