

ME 308 Machine Elements II

First Project

Name/ Surname:

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Design of Helical Compression and Extension Springs

A container is carried by a Jib Crane with the assistance of Spring A and Spring B members. This container is spilling sand over the ground. One spring balance is intended for tensile forces, while the other is intended for compressive forces. The spring balances built into the two arms are able to hold compressive and tensile forces.

During the discharge operation, the maximum and minimum weight carried by the Jib Crane varies and illustrated in Figure 1.

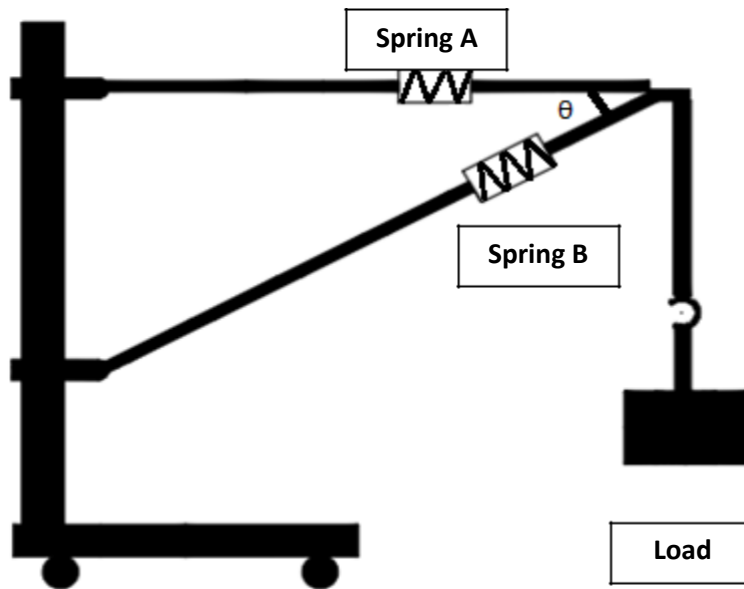


Figure 1. JIB CRANE

You are asked to design both Spring A and Spring B with decided the type of spring and being aware of dimensional constraints and all design criteria (static design (including hook design for extension spring), fatigue design (infinite life), buckling, resonance, permanent set etc). In both compression and tension springs, a rod is employed within the assembly. Washers are utilized at each end of the springs to facilitate proper distribution of forces. To comprehend the loading circumstances and spring kinds, you must also construct a free body diagram. You must provide any design details such as wire diameter, coil diameters, total number of coils, spring rates, spring lengths, hook radius and so on.

DATA LIST

Springs' Production Type	:	Unpeened / Peened
Minimum Load	:	5kg / 7kg / 9kg / 11kg
Maximum Load	:	60kg / 65 kg / 70kg / 75kg / 80 Kg
Angle Between The Arms "θ"	:	30° / 40° / 45°
Deflection Of Extension Spring For Full-Loading	:	15mm / 18mm / 21mm
Spring Materials	:	Oil Tempered / Hard Drawn / Chrome Vanadium
End Condition Of Compression Spring	:	Plain & Ground End / Squared & Ground End
Reliability	:	90% / 95% / 99% / 99.9% / 99.99%
Factor Of Safety (Both Static and Fatigue Conditions)	:	2/2.25/2.5/ 2.75 / 3
Diameter Of Rod For Compression Spring	:	8mm / 10mm/ 12mm /14mm / 16mm
Outside Diameter Of Washers	:	45mm / 50mm / 55mm / 60mm / 70mm
Minimum Active Coil Numbers Compression Spring	:	4 / 5/6/ 7

Note: Data values can be found on Table 1. You may make any reasonable assumptions at any stage of your design study. If any information missing, use your engineering sense and make a logical selection.