ME 308 MACHINE ELEMENTS II FIRST PROJECT (SPRING DESIGN)

Name / Surname: Due Date:

Deep drawing machine and schematic representation of a nested spring for forming operation are shown in ***Figure 1*** with ***Section A-A***. It is assumed that weight of upper plate is carried by four nested springs (compression & extension) equally. Springs are preloaded by the weight of the upper plate. The forming force acting on the springs may increase due to thickness variation of sheet metal in proportion of load ratio (Fmax/Fmin).

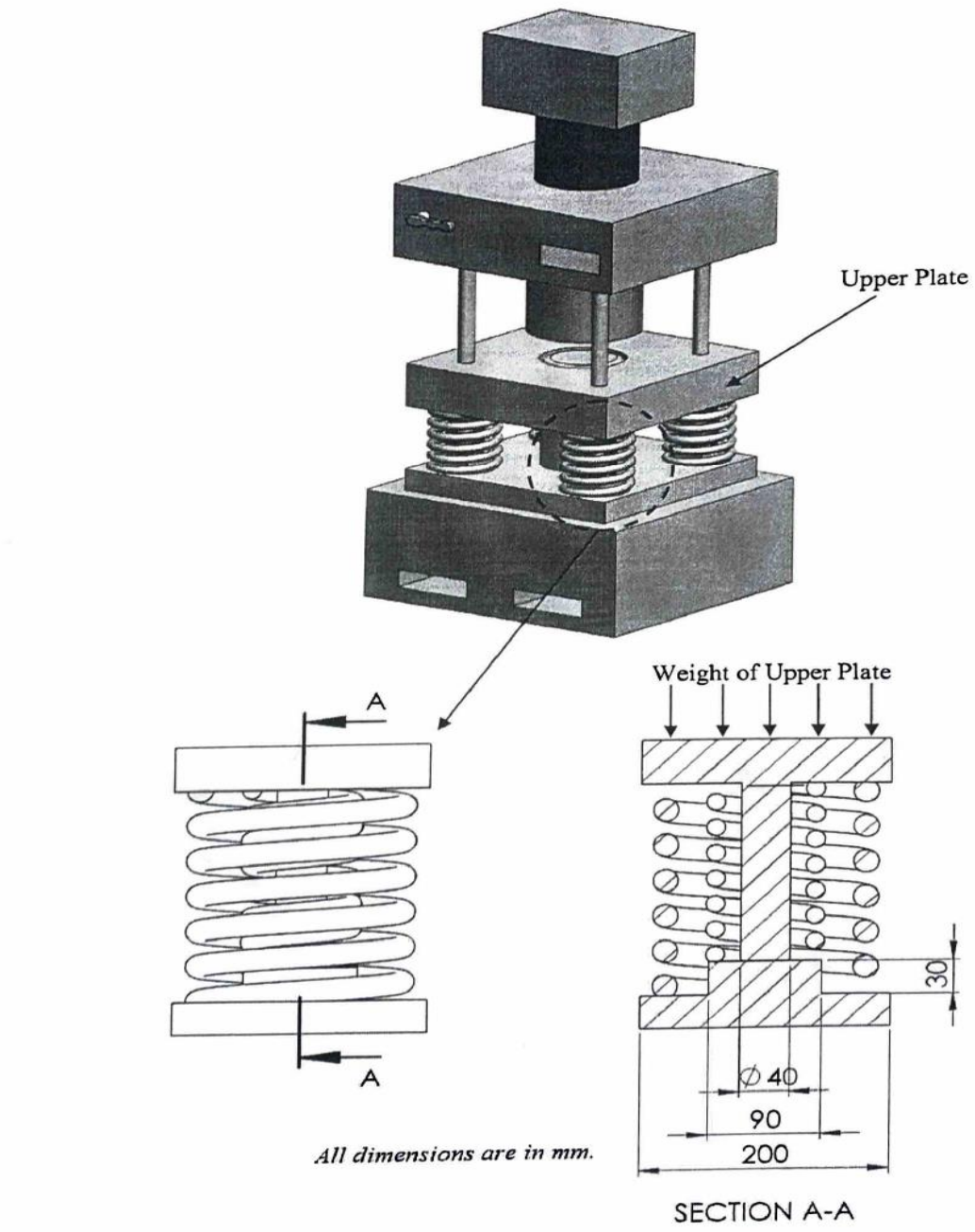

Figure 1. Deep Drawing Machine with Nested Springs.

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Design the inner and outer springs (coil diameters, wire diameters, total number of coils) fort he expected life by satisfying both strength and geometrical requirements and limitations (such as outer spring diameter must not exceed 200mm). Check the results for all failure types (static and fatigue). If surge and/or buckling is a problem, redesing the spring dimensions. Determine whether permanent set occurs if a load is applied to springs to be solid.

You can make necessary and reasonable assumptions.

LIST of PARAMETERS

1. **The Springs:**

Unpeened / Peened

2. **Weight of Upper Plate:**

500kg / 600kg / 800kg

3. **Load Ratio (Fmax/Fmin):**

2.0 / 2.5 / 3.0

4. **Initial compression Due to plate Weight:**

10mm / 12mm / 14mm

5. **Spring Rate for Inner Spring:**

60x10^3N/m - 70x10^3N/m - 80x10^3N/m

6. **Deflection of the Inner Spring for Solid Length:**

70mm / 80mm / 90mm

7. **End Conditions:**

Plain / Squared&Ground / Plain&Ground

8. **Spring Material:**

Hard Drawn / Oil Tempered / Chrome Vanadium

9. **Reliability:**

%90 / %95 / %99

10. **Frequency of Load:**

1 cyc/s – 1.5 cyc/s – 2 cyc/s

11. **Factor of Safety:**

2 / 2.5 / 3

12. **Minimum Expected Life:**

2x10^5 / 4x10^5 / 6x10^5

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