Subject: Request for the Award of a Moshe Shnabel Scholarship for Outstanding and Creative Students

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Sixth semester; Course of study: Building structures

Cumulative average: 90.3

I will describe briefly the work I have done for which I see myself as a worthy candidate for the prize:

The work submitted is a problem that I solved creatively as part of the course in Principles of Structural Design. In addition, I constructed two models to assure myself that the creative designs will in fact stand.

Principles of Structural Design is actually the first course in which we call on all of the knowledge we have acquired to date in the field of structural engineering, applying it to the design of buildings whose dimensions and geometric parameters (specified by the architect) are provided by the instructor.

Actually, this is the first time I discovered that creative thinking can make the difference between clumsy and expensive design and sophisticated, efficient and elegant design.

For the exercises in question we were requested to design a 5-story building whose ground floor area is smaller than that of the floors above it, The columns at ground level may be built only within the central area of the building, a condition that results in the construction of cantilevered beams around the entire perimeter of the building. (A schematic structural framing drawing is shown in the attached exercise).

The loads acting on the building were specified by the instructor. Calculations showed that the depth of the beams required in the area of the cantilever would be greater than the depth acceptable to the architect.

This problem can be resolved by several standard methods:

The beams on the top floor, which are not similarly limited in depth and could be particularly massive, could be used to suspend the cantilevers on all other floors by means of columns in tension. (This solution is shown in the exercise as Option 2).

- The beams of the lower floor, which are deeper than those of the typical floors, would be deep and massive. The cantilevered beams of all other floors would be supported by them by means of axially-loaded columns.
- The problem can also be solved by more creative, elegant means: The cantilevers on all floors can be connected by columns even though the columns do not reach the ground floor. Because these columns cannot carry the load, as stated above, their only function is to act as a guide for the ends of the cantilevers, thus turning them from freely deflecting cantilevers to guided cantilevers and in so doing reduce significantly the required cross-sectional area of the beams (This solution is shown in the exercise as Option 1).

I propose a creative solution that would be even more elegant than the elegant solution above (Option 3)

We can build the cantilevers of each floor separately with a peripheral beam that is sufficiently rigid to resist torsion and bending. In this solution we can do away entirely with columns that tie the floors to one another. The peripheral beams themselves will reduce the movements of the cantilever ends (the torque of one beam will be canceled by the bending of the beams to which it is connected.)

As stated, in order to satisfy myself completely that solutions 3 and 4 will work, I built a small model that demonstrates the efficiency and elegance of these solutions.

In summary:

I feel it important to say that I was greatly encouraged after discovering this semester that there is room for creative thinking in the design of structures (even standard structures), to discover that design is not just routine work and the blind application of standards.

I will be very happy if I can show the models I made to students who may take this course in the future, demonstrating to them how small additions can influence the solution to a building design problem so significantly.

I believe that solution 4 is the simplest, most creative and most original of the four options. It is a solution that demonstrates in a controlled way that it is possible to apply components commonly used in the building structure for well-known purposes (such as, for example, a column with axial loading, a beam in bending, etc) in ways that will best serve us.

Thanks in advance for your patient attention,
Erez Job