1. A steel spherical shell with Young's modulus $E$ and Poisson's ratio $\nu$ is subjected to a uniform inner and outer pressure $p$.

Find the reduction $\delta$ of the inner diameter. (25%) 

![Diagram of a spherical shell]

2. A cantilever $AB$, loaded at the end $B$, is supported by a shorter cantilever $CD$ of the same cross section as cantilever $AB$.

Determine the pressure $X$ between the two beams at $C$. (25%) 

![Diagram of a cantilever]

3. A circular shaft $AB$ consists of a 250 mm long, 20 mm diameter steel cylinder, in which a 125 mm long, 16 mm diameter cavity has been drilled from end $B$. The shaft is attached to fixed supports at both ends, and a $120 \, N \cdot m$ torque is applied at its midsection.

Determine the torque exerted on the shaft by each of the supports. (25%) 

![Diagram of a shaft with torque applied]

4. A rectangular frame of uniform cross section is submitted to a uniformly distributed load of intensity $p$. Determine the bending moments $M$ at the corners. (25%) 

![Diagram of a rectangular frame]