1. The GE90-85B engine has an overall compression ratio for the core air-flow of 39.3 achieved with a total of 14 compression stages.

(a) Assuming that each stage has the same pressure ratio (this not the real situation) estimate the pressure ratio of each stage.

(b) If the stage pressure ratio could be increased by 4% what would be the compression ratio of a 14 stage compressor?

(c) How many stages would be needed if the stage compression ratio were to be increased 4% and the overall pressure ratio were kept fixed at 39.3.

2. The air entering the first stage of an axial flow compressor has a stagnation temperature of 260 *K* and is moving at *Mach* 0.42. The inlet flow is purely axial, the compressor has a mean radius of 0.52 *m*, and the rotor is rotating at 6000 *rpm*. The compressor is designed for constant axial velocity and $w_2 = 0.74\, w_1$. Assume a work factor $\lambda = 0.97$.

(a) Sketch the velocity triangles and calculate the Mach number of the flow relative to the blade at the mean radius.

(b) Calculate the air angles β_1, α_2, and β_2 at the mean radius.

(c) Calculate the stagnation temperature rise across the stage.

(d) Estimate the stage compression ratio assuming a stage efficiency of 0.93.