HW#8 Internal Combustion Engines

1) A base automotive engine produces 65kW with a BSFC of 290gm/kWh. Frictional losses are nominally 15% of the break power. When a turbo is added the intake pressure is boosted from 0.9 bar to 1.3 bar with a corresponding rise in indicated power. Frictional power increases by 20%. What is the resulting break power and BSFC?

2) For an automobile with a 10:1 compression ratio and nominal tuning running at WOT and a mid-range speed, what % of the overall mixture (before combustion) would you expect to be Recirculated Exhaust Gasses (EGR)? State your assumptions for EVC pressure and temperature. Calculate the mass of the EGR compared to the intake air/fuel for a 400cc displacement.

3) In the simplest automotive gasoline Variable Valve Timing mechanism (VVT) only one cam (of a DOHC configuration) is advanced or retarded. State which cam is manipulated, and how much it is shifted by. Is it advanced or retarded at high speeds?