MECHANICAL ENGINEERING DEPARTMENT
MEL816: ANALYSIS OF I.C. ENGINE PROCESSES

MAJOR PART 2 **9-5-2007**

TOTAL TIME: 2 HOURS **MAXIMUM MARKS FOR THIS PART 20**

PLEASE BE VERY BRIEF AND TO THE POINT!
USE OF BOOKS AND NOTES ALLOWED
ASSUME SUITABLE DATA WHERE NECESSARY WITH JUSTIFICATION
THIS IS PART B
TO BE TAKEN AFTER SUBMITTING PART A

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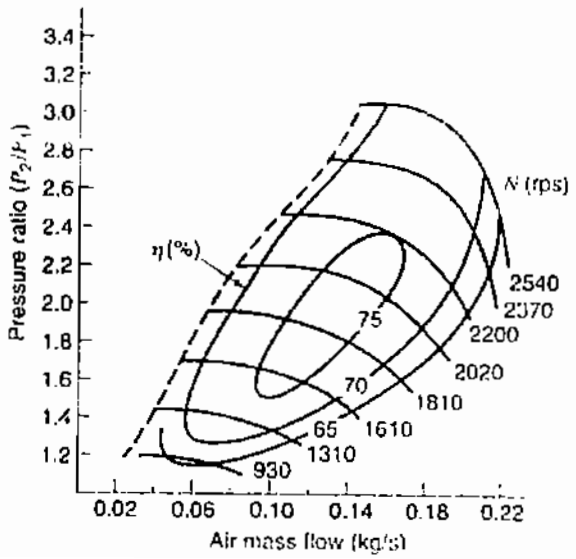
1. A naturally aspirated four-cylinder, four stroke gasoline engine has a swept volume of 2316 cm^3, a bore of 96 mm and a stroke of 80 mm. The compression ratio is 9.5. Assume inlet manifold conditions of 310 K and 1 bar and equivalence ratio 1.0. Take volumetric efficiency as 0.84 and mechanical efficiency of 0.9. **Determine the brake power the engine is expected to produce at a speed of 90 rev/s.**

   The same engine is now to be fitted with a turbocharger with a compressor pressure ratio of 1.5. The after-cooled gas temperature is 340 K. The volumetric efficiency is 0.91 and the mechanical efficiency is 0.88. To avoid knock the compression ratio is reduced to 8.7. **Using the compressor map given below determine the compressor isentropic efficiency and compressor speed. Also determine the brake power of the turbocharged engine.**

   15 marks

2. A diesel engine of bore 10.3 cm and stroke 8.6 cm and compression ratio 22.5:1 has a connecting rod length of 14.95 cm. Fuel is injected at an angle of 15 degrees btdc. Take conditions at start of compression as 350 K and 1 bar and assume the working medium has a specific heat ratio, γ, of 1.3. Engine speed is 1500 rev/min. **Using one of the correlations, estimate the ignition delay.**

   5 marks



Compressor Map for a turbocharged engine showing isentropic efficiency as function of pressure ratio, mass flow rate and compressor speed