Questions

(3.1) Calculate average molar specific heat of products of complete combustion of $C_8H_{18}$with fuel air equivalence ratio, Φ =1.0 (typical of SI engine) and Φ = 0.7 (typical of CI engine atfull load). EGR is used to control NO formation in IC engines. Using this information explain why EGR is more effective in SI than in the CI engines? Show qualitatively on the same graph the trends in percent reduction in NO with EGR rate for typical SI and CI engine operation. Molar specific heat for the gases; N_2 = 33.75, O_2 = 35.59, CO_2 = 55.37, H_2O = 44.94 kJ/kmol.K.

(3.2) For a SI engine having the same swept volume its design is changed from square (bore= stroke) to over square (bore> stroke) configuration. Discus how will it affect the engine emissions of HC, CO and NO_x. An over square engine can be made to operate at a higher engine speed. Howl an increase in speed would influence emissions? In all the cases imep is kept nearly the same.

(3.3) Explain the trends in NO formation observed for DI and IDI engines shown on Fig. 3.4.

(3.4) Discuss why advancement of injection timing in a CI engine results in an increase in NO_x and HC emissions but in lower soot emissions.

(3.5) Following Table 3.3 show the trends on the effect of inlet air humidity, boost pressure, valve flow area, mean piston speed, EGR and oxygen enrichment of air in the cylinder