Otto cycle

Q 21.11) a certain quantity of air at a pressure of 1 bar and temperature of 70° C is compressed adiabatically until the pressure is 7 bar in otto cycle engine. 465 Kj of heat per Kg of air is now added at constant volume. Determine: i) compression ratio of the engine, ii) temperature at the end of compression, iii) temperature at the end of heat addition. For air C_P = 1 Kj/Kg-k, C_v = 0.706 Kj/Kg-k

Q 21.13) an engine working on otto cycle has a volume of 0.45 m^3, pressure is 1 bar, and temperature 30° C at the beginning of compression stroke, the pressure is 11 bar. 210 Kj of heat is added at constant volume. Determine: i) percentage clearance ii) efficiency iii) mean effective pressure iv) pressure temperature at salient points in the cycle v) ideal power developed by the engine if the rpm is 210. Assume that the cycle is reversible

Q 1) initial state at the start of compression in otto cycle is 0.97 bar, 40° C and 27 liters. The energy transfer as heat after compression to 18 bar is 190 Kj/Kg. find i) compression ratio ii) pressure, volume, temperature at all points, iii) bore and stroke if L=1.5D, iv) thermal efficiency, v) work output per unit stroke volume, vi) power developed if speed is 210 rpm, vii) clearance as a percentage of stroke volume.

Q 2) in an air standard otto cycle efficiency is 56 %. Heat rejected is 550 Kj/Kg. pressure and temperature at start of compression are 0.1 MPa and 60° C. find i) compression ratio, ii) maximum pressure, iii) pressure and temperature at end of compression, iv)work done per Kg of air, v) clearance ratio.

Diesel cycle

Q 21.18) the stroke and cylinder diameter of a compression ignition engine are 250 mm and 150 mm respectively. If the clearance volume is 0.0004 m^3 and fuel ignition takes place at a constant pressure for 5 % of the stroke, determine the efficiency of the engine.

Q 21.19) calculate the percentage loss in ideal efficiency of a diesel cycle engine with compression ratio 14 if the fuel cut off is delayed from 5% to 8%

Q 21.21) assuming an engine with 200 mm bore and 300 mm stroke works on a diesel cycle, with initial pressure and temperature of air as 1 bar and 27° C. cutoff occurs at 8 % of stroke. V_1/V_2 is Compression ratio = 15 i.e V_1 = 15 and V_2 = 1. find i) pressure and temperature at all points, ii) heat supplied, heat rejected, and network, iii) efficiency, iv) mean effective pressure, v) power output if N = 1000 rpm and efficiency is 85 %.

Dual cycle

Q 4) an air standard dual cycle has a compression ratio of 16. Compression begins at 1 bar and 50° C. maximum pressure is 70 bar. Heat transferred to air at constant pressure is equal to that of volume, i) pressure temperature at all points, ii) efficiency, iii) mean effective pressure.

Q 5) the swept volume of an engine working on dual cycle is 0.0053 m^3, and clearance volume is 0.00035 m^3. The max pressure is 65 bar. Heat addition ends at 5 % of stroke. The temperature and pressure at the beginning of compression are 80° C and 0.9 bar respectively. Determine air standard efficiency.

Q 6) the compression and expansion ratio of an oil engine working on a dual cycle are 9 and 5 respectively. Initial pressure and temperature of air are 1 bar and 30° C. the heat supplied at constant pressure is twice the heat supplied at constant volume. The expansion and compression law follows $PV^{1.25}$ = constant. Find i) pressure and temperature at all points, ii) mean effective pressure, iii) efficiency, iv) power if rotation per second is 8 rps.

Brayton cycle

Q 7) a gas turbine unit works in a simple brayton cycle between 1 bar and 6 bar. Maximum temperature is 900° C and surrounding temperature is 27° C. find i) work output and efficiency, ii) optimum pressure ratio and maximum work done

Q 8) in a gas turbine plant working on brayton cycle the air inlet is at 100 KPa and 27° C with pressure ratio of 6.25 and maximum temperature is 800 ° C. the turbine and compressor efficiency are each 80 %. Find i) turbine work per Kg of air, ii) compressor work per Kg of air, iii) heat supplied per Kg of air, iv) efficiency