IC Engine

Formual Sheet – Mid Term – Spring 2021

$$\eta_v = m_a/\rho_a V_d$$

$$\eta_v = n\dot{m}_a/\rho_a V_d N$$

$$U_p/\overline{U}_p = (\pi/2)\sin\theta[1 + (\cos\theta/\sqrt{R^2 - \sin^2\theta})]$$

$$R = r/a$$

$$s = a\cos\theta + \sqrt{r^2 - a^2\sin^2\theta} \qquad \overline{U}_p = 2SN \qquad V_d = N_c(\pi/4)B^2S$$

$$r_c = V_{BDC}/V_{TDC} = (V_c + V_d)/V_c = v_{BDC}/v_{TDC} \qquad A_p = (\pi/4)B^2$$

$$mep = \frac{W}{V} \qquad 2\pi\tau = W_b = (\text{bmep})\,V_d/n \qquad \tau = (\text{bmep})V_d/2\pi\eta \qquad \dot{W} = (\text{mep})A_p\overline{U}_p/2\eta$$

$$\dot{W} = WN/n$$

$$\dot{W} = 2\pi N\tau$$

$$\dot{W} = (1/2n)(\text{mep})A_p\overline{U}_p$$

$$\text{SP} = \dot{W}_b/A_p$$

$$\text{OPD} = \dot{W}_b/V_d$$

$$\text{SV} = V_d/\dot{W}_b$$

$$\text{SW} = (\text{engine weight})/\dot{W}_b$$

$$\text{bsfc} = \dot{m}_f/\dot{W}_b$$

$$Q_{in} = m_f Q_{HV}\eta_c$$

$$w = (\text{mep})\Delta v$$

$$T_2 = T_1(v_1/v_2)^{k-1} = T_1(V_1/V_2)^{k-1} = T_1(r_c)^{k-1}$$

$$P_2 = P_1(v_1/v_2)^{k} = P_1(V_1/V_2)^{k} = P_1(r_c)^{k}$$

$$\text{mep} = w/\Delta v = W/V_d$$

$$w_{1-2} = (P_2v_2 - P_1v_1)/(1 - k) = R(T_2 - T_1)/(1 - k)$$

$$Q = m_f Q_{HV}\eta_c = m_m c_{\cdot}(T_3 - T_2)$$

$$\beta = V_3/V_2 = v_3/v_2 = T_3/T_2$$

$$(\eta_t)_{DIESEL} = 1 - (1/r_c)^{k-1}[(\beta^k - 1)/\{k(\beta - 1)\}]$$

$$\alpha = P_x/P_2 = P_3/P_2 = T_x/T_2 = (1/r_c)^k(P_3/P_1)$$

$$(\eta_t)_{DUAL} = 1 - (1/r_c)^{k-1}[\{\alpha\beta^k - 1\}/\{k\alpha(\beta - 1) + \alpha - 1\}]$$

R = gas constant for air = 0.287 kJ/kg-K = 53.33 ft-lbf/lbm-°R

$$V = V_c + (\pi B^2/4)(r + a - s)$$

$$Q = mCdT$$