

IC Engine

Formual Sheet – Mid Term – Spring 2021

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

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

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

$$R = r/a$$

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

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

$$mep = \frac{W}{V} \quad 2\pi\tau = W_b = (\text{bmep}) V_d/n \quad \tau = (\text{bmep})V/2\pi\gamma \quad \dot{W} = (\text{mep})A_p\bar{U}_p/2\gamma$$

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

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

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

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

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

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

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

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

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

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

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

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

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

$$w_{1-2} = (P_2 v_2 - P_1 v_1)/(1 - k) = R(T_2 - T_1)/(1 - k)$$

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

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

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

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

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

$$R = \text{gas constant for air} = 0.287 \text{ kJ/kg-K} = 53.33 \text{ ft-lbf/lbm-}^\circ\text{R}$$

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

$$Q = mC_dT$$