EECE 370 formula sheet for final exam

$H_c = \frac{N.i}{l_c}$

$B = \mu H = \mu_0 \mu_r H$ where $\mu_0 = 4\pi * 10^{-7}$

$\varphi = B.A = \mu.H.A = \mu \frac{Ni}{l} A$

$R = \frac{l}{\mu.A}$ ;; $F(mmf) = \varphi.R = N.i$

$e = B.l.v.sin\theta = B.l.v$

$F = i.l.B.sin\theta = i.l.B$

**Y:** $V_l = \sqrt{3} V_\varphi$ ;; $P = \sqrt{3} V_l I_l cos\theta = 3 V_\varphi I_\varphi cos\theta$

**Δ:** $V_l = V_\varphi$ ;; $P = \sqrt{3} V_l I_l cos\theta = 3 V_\varphi I_\varphi cos\theta$

$\alpha = \frac{N_p}{N_s}$ ;; $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ ;; $\frac{i_p}{i_s} = \frac{N_s}{N_p}$ ;; $\frac{Z_p}{Z_s} = \left(\frac{N_p}{N_s}\right)^2$

$E_{rms} = \sqrt{2}\pi.\varphi_{max}.N_c.f$

$E_p = V_p - I_p(R_p + jX_{lp})$

**OC test:**

$S_{oc} = V_{oc}.I_{oc}$

$R_c = \frac{V_{oc}^2}{P_{oc}}$

$Q_{oc} = \sqrt{S_{oc}^2 - P_{oc}^2}$

$X_m = \frac{V_{oc}^2}{Q_{oc}}$

**SC test:**

$R_{eq} = \frac{P_{sc}}{I_{sc}^2}$

$Z_{eq} = \frac{V_{sc}}{I_{sc}}$

$X_{eq} = \sqrt{Z_{eq}^2 - R_{eq}^2}$

$V_{regulation} = \frac{V_{no-load} - V_{full-load}}{V_{full-load}} \times 100$

$Efficiency = \frac{P_{out}}{P_{in}} = \frac{P_{in} - P_{loss}}{P_{in}} = \frac{P_{out}}{P_{out} + P_{loss}}$ $(all \times 100)$

$Speed\ Regulation = \frac{n_{no-load} - n_{full-load}}{n_{full-load}} \times 100$

$\frac{V_c}{V_{sc}} = \frac{N_c}{N_{sc}} = \frac{I_{sc}}{I_c}$

$V_H = V_p + V_s$

$\frac{V_L}{V_H} = \frac{N_c}{N_{sc} + N_c}$

$\frac{I_L}{I_H} = \frac{N_{sc} + N_c}{N_c}$

$\frac{S_{I_0}}{S_w} = \frac{N_{sc} + N_c}{N_{sc}}$

$T = 2.r.B.i.l.sin\theta = \emptyset.i.sin\omega t$

$El.angle^\circ = \frac{p}{2} \times Mech.angle^\circ$

$n = \frac{120 \times f}{p}$ ;;; $\omega = \frac{2\pi.n}{60}$

$mmf: F_p = \frac{3}{2} F_m \cos(\theta - \omega t)$

$V_\varphi = E_a - I_a(R_a + jX_s)$

$P_{conv.} = 3 E_a I_a cos\gamma$

$P_{out} = \frac{3 V_\varphi E_a sin\delta}{X_s}$ ;; $T_{ind = \frac{P_{out}}{\omega m}}$

$R_a = \frac{V_{dc}}{2I}$ ;; $Z_s = \frac{V_{oc}}{I_a}$ ;; $X_s = \sqrt{Z_s^2 - R_a^2}$

$s = \frac{n_s - n_m}{n_s} \times 100$ => $n_m = n_s(1 - s)$ ;; $f_r = s.f_s$

$P_g = 3 I_2^2 \frac{R_2}{s}$

$P_{conv} = P_g(1 - s)$ ;; $T_{ind} = \frac{P_g}{\omega_s}$

$V_{Th} = V_\varphi \frac{X_m}{X_1 + X_m}$ ;; $R_{Th} = R_1 \left(\frac{X_m}{X_1 + X_m}\right)^2$ ;; $X_{Th} = X_1$

$T_{ind.} = \frac{1}{\omega_s} \cdot \frac{3 V_{Th}^2 (R_2/s)}{[(R_{Th} + R_2/s)^2 + (X_{Th} + X_2)^2]}$

$T_{start} = \frac{1}{\omega_s} \cdot \frac{3 V_{Th}^2 R_2}{[(R_{Th} + R_2)^2 + (X_{Th} + X_2)^2]}$

$T_{max} = \frac{3 V_{Th}^2}{2\omega_s [R_{Th} + (X_{Th} + X_2)^2]}$

**I.M Testing:**

$R_1 = \frac{V_{dc}}{2 I_{dc}}$ ;; $R_{LR} = |Z_{LR}| cos\theta$ ;; $X_{LR} = |Z_{LR}| sin\theta$

$R_2 = R_{LR} - R_1$ ;; $X_{LR} = \sqrt{Z_{LR}^2 - R_{LR}^2} = X_1 + X_2$

$P_{rot} = P_{nl} - 3 I_{nl}^2 . R_1$

$Z_{nl} = \frac{V_{nl}}{\sqrt{3} I_{nl}} = X_1 + X_m$ => $X_m = Z_{nl} - X_1$

$e_{dc\ machines} = 2.B.L.r.\omega$ ;; $A = 2\pi r l$

$A_{pole} = \frac{A}{2}$ => $e_{dc\ machines} = \frac{2}{\pi} \varphi \omega$

$T_{dc\ machines} = \frac{2}{\pi} \varphi i$