THE HONG KONG POLYTECHNIC UNIVERSITY
HONG KONG COMMUNITY COLLEGE

Subject Title : Introduction to Electrical Systems **Subject Code** : CCN2270

Session : Semester One, 2017/18

Numerical Answers

Question A1

(a) $P_{in} = 40$ kW and $Q_{in} = 30$ kVAR
(b) $S_c = -j12.96$ kVA

Question A2

$\eta = 96.44\%$

Question A3

$R_1 = 0.116\ \Omega$, $R_2 = 0.083\ \Omega$, $X_1 = X_2 = j0.0735\ \Omega$, $X_M = j6.5325\ \Omega$

Question A5

(a) GMR = 0.0218 m
(b) $A = D = 1$, $C = 0$, $B = j15.058\ \Omega$

Question A6

Speed = 2947 rpm
Current = 27.8 A

Question B1

(a) $R_{C,pu} = 103.306$ pu, $X_{M,pu} = j21.087$ pu, $Z_{eq,pu} = 0.0413 + j0.2025$ pu

Question B2

$X_{s,G1} = j0.16$ pu, $X_{s,G2} = j0.125$ pu, $X_{s,T1} = j0.4$ pu, $X_{s,T2} = j0.3$ pu
$Z_{L1} = 0.265 + j0.661$ pu, $Z_{L2} = 0.529 + j0.926$ pu, $Z_{L1} = -j0.132$ pu
$Z_{load} = 4.444\angle 31.79°$ pu

Question B3

(a) $S_A = 65.619\text{M}\angle -35.29°$ VA, $S_B = 34.454\text{M}\angle -39.88°$ VA
(b)(i) $I_{rated,in} = 25$ A, $I_{rated,out} = 22.727$ A

(b)(ii) $S_w = 2.727$ kVA

Question B4

(a) $E_A = 7580.211\angle 12.8°$ V
(b) V. R. $= 19.36\%$, $\eta = 62.75\%$
(c) $V_T = 13.129$ kV
(d) $Q_{3\phi} = 1.233$ MVAR, $P_{3\phi} = 800$ kW