

THE HONG KONG POLYTECHNIC UNIVERSITY
HONG KONG COMMUNITY COLLEGE

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

Session : Semester One, 2016/17

Numerical Answers

Question A1

- (a) $600 + j325.897$ kVA
- (b) 0.8787, lagging

Question A2

$$R_1 = 0.5 \Omega, R_2 = 0.0185 \Omega, X_1 = X_2 = 1.9972 \Omega, X_M = 39.62 \Omega$$

Question A3

- (a) 2 poles
- (b) $P = 7.5024$ MW, $Q = 5.6268$ MVAR
- (c) $E_A = 4502.438 \angle 23.63^\circ$ V

Question A4

$$n = 1068 \text{ rpm}$$

Question A5

$$VR = 97.63\%$$

Question A6

- (b) $P = 164.67$ kW, $Q = 210.026$ kVAR

Question B1

- (a) $X_s = j0.1$ pu, $X_1 = j0.4$ pu, $X_2 = j0.3$ pu, $Z_{load} = 4.444 \angle -41.41^\circ$ pu, $Z_{line} = 0.4132 + j1.0331$ pu
- (b) $I_{line} = 232.727 \angle 16.45^\circ$ A

Question B2

- (a) $n_m = 1500$ rpm
- (b) $E_{A, generator} = 439.075 \angle 29.55^\circ$ V, $E_{A, motor} = 236.19$ V

(c) $P = 72 \text{ kW}$, $Q = -33.99 \text{ kVAR}$

Question B3

(a) $R_{eq,pu} = 0.0612 \text{ p.u.}$, $X_{eq,pu} = 0.0123 \text{ p.u.}$, $R_{C,pu} = 67.568 \text{ p.u.}$, $X_{M,pu} = 11.68 \text{ p.u.}$

Question B4

(a) $L = 912.349 \times 10^{-9} \text{ H/m}$, $C = 12.533 \times 10^{-12} \text{ F/m}$

(b) $A = D = 0.9919$, $B = j34.395 \text{ } \Omega$, $C = j470.563 \times 10^{-6} \text{ S}$