8014

CBSGS - 2

sub - EMC-II

QP code: 24376

q. (2) b

$$Z_1 = (0.004 + j\,0.018)\ \Omega$$

$$Z_2 = (0.002 + j\,0.012)\ \Omega$$

$$S_L = 1500 \angle -36.86$$

$$\therefore S_1 = \frac{Z_2}{Z_1 + Z_2} \times S_L$$

$$= 596.46 \angle -35.02 \text{ KVA}$$

$$S_2 = \frac{Z_1}{Z_1 + Z_2} \times S_L$$

$$= 904.05 \angle -38.08^0 \text{ KVA}$$

$$P.f_1 = 0.81 \text{ lagging}$$

$$Pf_2 = 0.78 \text{ lagging}.$$

(3)(b)

$N_s = 120 f / p = 1000$ rpm

$S = 0.04 = \frac{N_s - N}{N_s}$

$P_{out} = 2\pi N \frac{T_{sh}}{60} = 20096$ W

$P_m = 20096 + 500 = 20596$ W

$\frac{\text{Rotor Cu loss}}{P_m} = \frac{S}{1-S}$

$\therefore$ Rotor Cu loss $= \frac{0.04}{1-0.04} \times 20596$

$= 858$ W

$\therefore$ Rotor i/p = stator o/p

$= 20596 + 858$

$= 21454$ W

stator i/p $= 21454 + 1500$

$= 22954$ W

$\therefore \eta = \frac{20096}{22954} \times 100$

$= 87.5\%$

R_1 (acf) Stator resistance $= 1.2 \times 0.6\ \Omega$

$= 0.72\ \Omega$

Rotational losses $= W_o - 3I_o^2 R_1$

$= 250 - 3 \times \left(\frac{8}{\sqrt{3}}\right)^2 \times 0.72$

$= 203.92\ W$

For delta connection $I_{o(ph)} = \frac{8}{\sqrt{3}}$

~~$Z_o = V_o / I_o = 86.60\ \Omega$~~

N.L. Test $\cos\phi_o = \frac{W_o}{\sqrt{3} V_o I_o} = 0.045$

$I_w = I_o \cos\phi_o = 0.208$

$I_m = I_o \sin\phi_o = 4.614$

$R_o = V_o / I_w = 1923\ \Omega$

$X_m = V_o / I_m = 86.76\ \Omega$

Blocked rotor test

$R_{O_1} = \frac{W_{sc}}{3 \times I_{sc}^2} = \frac{1350}{3 \times \left(\frac{35}{\sqrt{3}}\right)^2}$

$= 1.102\ \Omega$

$Z_{O_1} = V_{sc} / I_{sc} = 90 / 35/\sqrt{3}$

$= 4.4538\ \Omega$

$\therefore X_{O_1} = 4.315\ \Omega$

$\therefore X_1 = X_2' = 2.1576\ \Omega$

$R_2' = R_{O_1} - R_1 = 1.102 - 0.72$

$= 0.382\ \Omega$