EE333

Second Hour Exam Spring 1990

Closed book, closed notes, answer problems in work books

Problem #1
25 PTS

In the chapter on synchronous machines, our text book introduces three quantities called $\bar{R}$, $\bar{F}$ and $\bar{A}$. Begin with an equivalent circuit of a synchronous machine in steady-state (round rotor) and define these three quantities and <u>derive</u> their relationship. (Do not assume $R_s = 0$) (Neglect Saturation)

Problem #2
25 PTS

A round rotor synchronous machine produces the following open circuit and short circuit data;

<u>O.C. Test</u>

$|\bar{V}_{as}| = 120v \qquad I_f = 0.8A \qquad |\bar{I}_{as}| = 0$

<u>S.C. Test</u>

$|\bar{V}_{as}| = 0v \qquad I_f = 0.3A \qquad |\bar{I}_{as}| = 10A$

Assume $R_s = 0$

Find: <u>If</u> necessary to make $|\bar{V}_{as}| = 120v$ when the machine is operating as a generator supplying 1200 watts per phase at unity power factor. (Neglect Saturation)

Problem #3
25 PTS

A round rotor 3ϕ synchronous machine has $X_s = 20\Omega$, $R_s = 0\Omega$. If $I_f = 1.0\,A$ produces $|\bar{I}_{as}| = 0$ when synchronized to an infinite bus of voltage $|\bar{V}_{as}| = 120V$, what is the maximum real power load (3ϕ) the machine can deliver with $I_f = 1.0\,A$ and $|\bar{V}_{as}| = 120V$? (neglect saturation)

Problem #4
25 PTS

A dynamic system is described by:

$$\frac{dx}{dt} = -3x^2 + 12 \qquad x(0) = 1$$

Find $x(.01)$ using eulers forward method with a step size of .01 sec