École Polytechnique de Montréal

ELE8401, Machines électriques et entraînements électriques, Hiver 2019
Devoir#3

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Problem 1:

A synchronous generator with Xs=0.8 p.u. is connected to the infinite bus with nominal voltage. When the emf of the field is set to 1.3 p.u. the generator provides an output power of 0.5 p.u. Calculate:

1- The load angle, the armature current Ia (p.u.) and the P.F.

2- The emf of field is changed to another value but the generator still provides the same output power and the same armature current Ia. For this situation find the emf of the field, the load angle and the P.F.

3- From the emfs obtained in parts 1 and 2, which one is more common in practice? Why?

Problem 2:

A synchronous generator is synchronized with the infinite bus at its nominal voltage. The input steam to the turbine system increases so that the synchronous generator starts working at its nominal KVA. If Zs=0.02+j0.8 p.u., then find the P.F. and the load angle of the generator.

Problem 3:

Drive the expression for electromagnetic torque in machine variables for the two-phase synchronous machine shown in Fig. 1.

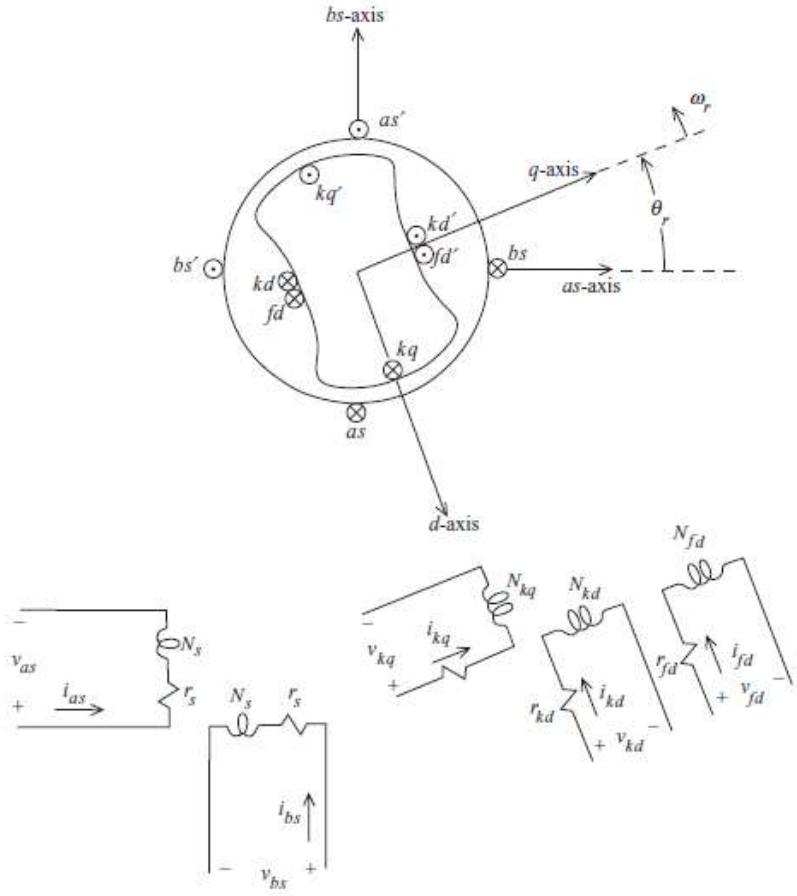

Fig. 1: Two-pole, two-phase salient pole synchronous machine.

Problem 4:

For a synchronous generator, show that the rotor angle at which maximum steady-state torque occurs is (all values in p.u.):

$$\cos\delta = -\frac{X_q E'^r_{xfd}}{4(X_d - X_q)V_s} \pm \sqrt{\left[\frac{X_q E'^r_{xfd}}{4(X_d - X_q)V_s}\right]^2 + \frac{1}{2}}$$