

Exam II

Spring 1996

Closed book, closed notes, no sheet

Problem #1
25 Points

A 3 ϕ , 60 Hz, 6 pole synchronous generator has the following test data:

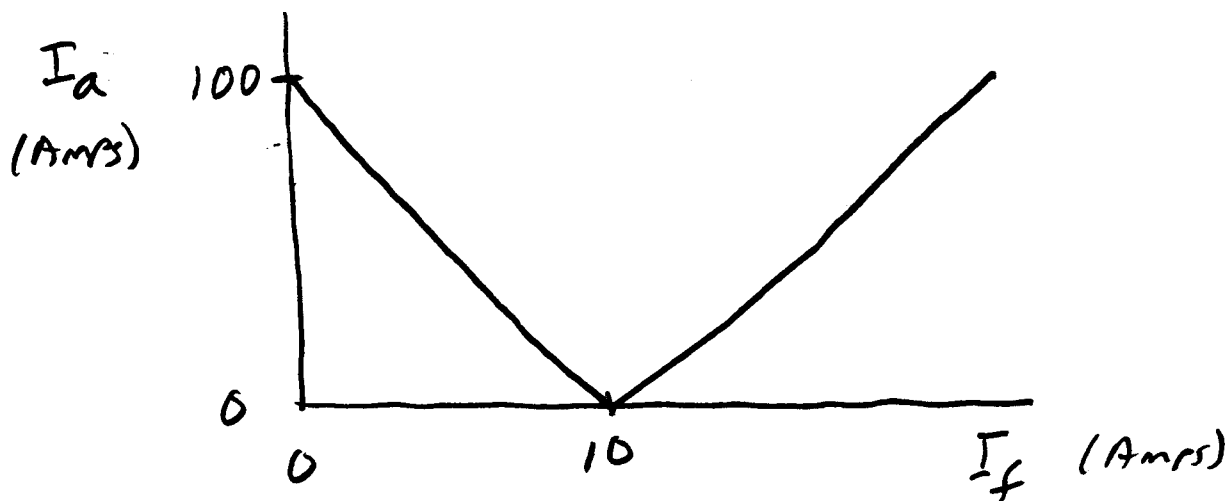
O.C. test: $V_t = 120\text{V (l-n)}$, $I_a = 0$, $I_f = 2\text{A}$

S.C. test: $V_t = 0$, $I_a = 6\text{A}$, $I_f = 1\text{A}$

How much field current must be applied to make $V_t = 120\text{V (l-n)}$ when the load is $I_a = 6\text{A}$ at unity power factor? (neglect r_a)

Problem #2
25 Points

A 4160 V (l-l), 60 Hz, 2 pole, 3 ϕ synchronous motor has the no-load V curve shown below. Find the field current needed to make the power factor 1.0 when it is loaded to 300 kW (3 ϕ) (neglect r_a)



Problem #3
25 Points

A self-excited shunt dc generator has a no-load terminal voltage of 240V at 1200 RPM. The field current in this condition is 2A. It has a residual voltage of 10 volts at 1200 RPM. What is the no-load terminal voltage at 1100 RPM? (neglect R_a) (constant R_f)

Problem #4
25 Points

- (a) Give a derivation which shows that the speed of a self-excited shunt dc motor is essentially independent of the armature voltage. Give the assumptions needed to show this.
- (b) Give a derivation which shows that the speed of a separately-excited shunt dc motor (fixed I_f) is directly proportional to armature voltage.