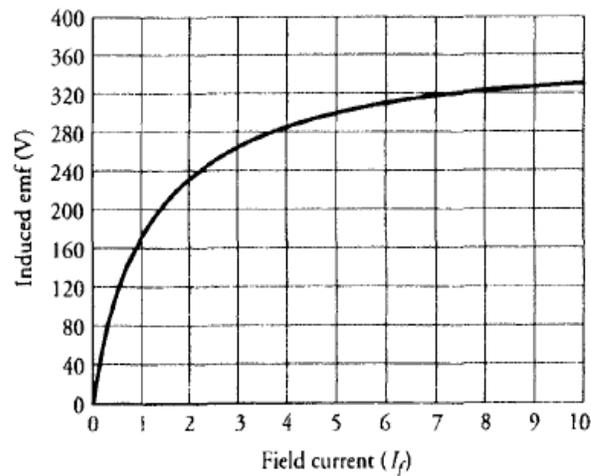


Sheet 6**DC Generators**

1. A 240-kW, 240-V, 6-pole, 600-rpm, separately excited generator is delivering the rated load at the rated voltage. The generator has $R_a = 0.01 \Omega$, $R_f = 30 \Omega$, $V_f = 120 \text{ V}$, $N = 500$ turns per pole, and $P_r = 10 \text{ kW}$. Its magnetization curve is given below. Determine:
- The induced emf at full load.
 - The power and the torque developed.
 - The applied torque and efficiency
 - The external resistance in the field winding.



2. A 50 kW, 250 V shunt generator has an armature and field winding resistances of 0.02Ω and 150Ω respectively. The friction, windage and core losses are 1500 W at full load. Calculate:
- Load current
 - Field current
 - Armature current
 - Voltage regulation
 - Shunt field copper loss
 - Armature copper loss
 - Efficiency

3. A 50 KW, 250 series generator has an armature resistance of 0.02Ω and a series field resistance of 0.045Ω . The friction, windage, and core losses are 2.5 KW. At rated load calculate:
- Armature current
 - Induced emf
 - Armature copper losses
 - Total copper losses
 - Generator efficiency
4. A 10 KW, 230V self-excited shunt generator, delivering rated load, has an armature circuit voltage drop that is 6 percent of the terminal voltage and a shunt field current equal to 4 percent of the rated load current. Calculate the resistance of the armature circuit and that of the field circuit.
5. The OCC of a DC shunt generator when driven at 400 rpm is as follows:

Field current (A)	2	3	4	5	6	7	8	9
E.M.F (V)	110	155	186	212	230	246	260	271

Find:

- The emf to which the machine will excite when the field resistance is 34Ω .
 - The critical value of the shunt field resistance.
 - The critical speed when the field circuit resistance is 34Ω .
 - The additional resistance required in the field circuit to reduce the emf to 220 V.
6. The following figures were obtained from an open circuit test on a shunt generator driven at 1000 rpm.

Field current (A)	1	1.5	2	2.5	3
E.M.F (V)	104	119	130	138	145

If the field resistance is 50Ω , find graphically:

- The terminal voltage on open circuit when the speed is 1000 rpm.
- The terminal voltage on open circuit when the speed is 750 rpm.
- The additional field resistance required so that the machine builds up 89 V when the speed is 750 rpm.