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Electrical engineering (Sec: A)

Aim of the experiment: To perform no load and short circuit test on a 3 phase alternator and to determine X_s .

Objective: To find the parameters of the synchronous machine and to determine their performance.

Apparatus Required:

Sl. No.	Name of Apparatus	Range	Quantity
1.	DC Ammeter	0-2 A	1
2.	DC Voltmeter	0-450 V	1
3.	AC Ammeter	0-300W	1
4.	AC Voltmeter	0-260V	1
5.	3- ϕ alternator coupled with DC motor	2 KVA, 415 V 1500 rpm	1
6.	Switch system	-	1

Circuit diagram:

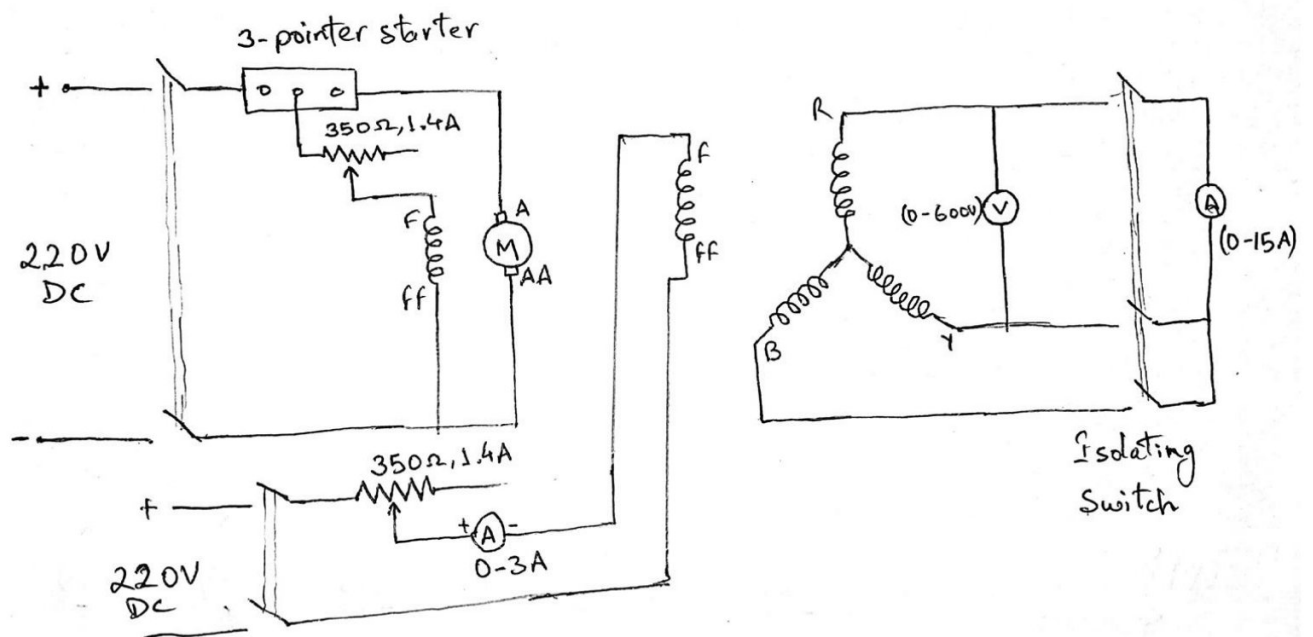


Fig. Circuit diagram for no load and short circuit test

Theory:

These characteristics are useful for finding out the parameters of the synchronous machine and for determining their performance. For obtaining the open circuit characteristics of the alternator it is driven at constant rated speed and the open circuit terminal voltage is noted as the field current is gradually increased from zero. Thus the OCC is a graph between field current (I_f) and generated emf (E_g). The OCC will not be a straight line because of saturation in iron part of magnetic circuit.

For obtaining short circuit characteristics the machine is driven at rated synchronous speed and the armature terminals are short circuited through an ammeter. Now the field current (I_f) is gradually increased from zero until short circuit current has reached its maximum safe value equal to 150 per cent of rated current. Then SCC is a plot between I_s and I_f . Drop is mainly due to

- i) armature resistance drop
- ii) drop due to X , (leakage reactance)
- iii) due to the effect of armature reaction.

Observation:

No load test

Sl. no	Field Current (I_o) (A)	Open circuit Voltage (V_o) (V)
1	0	0
2	0.06	100
3	0.08	160
4	0.12	200
5	0.16	230
6	0.19	260
7	0.22	280
8	0.26	325
9	0.3	360
10	0.34	380
11	0.38	395
12	0.42	410
13	0.43	415

Short circuit test

Sl. no	Field Current (I_o)	Short Circuit Current (I_{sc})
1	0	0
2	0.06	0.2
3	0.1	0.25
4	0.19	1

5	0.28	1.5
6	0.35	2.3
7	0.56	3.4
8	0.76	4

Discussion:

In the experiment, after doing the OC and SC test we found the parameters of the synchronous machine and the performance of the machine. For finding the voltage regulation we assume power factor to be 0.8 ohm and R_a to be 1.2 ohm considering R_{dc} as 1 multiplying by the skin factor to get the result. The voltage regulation obtained is 22.8 ohm and the value of X_s is 62 ohm.

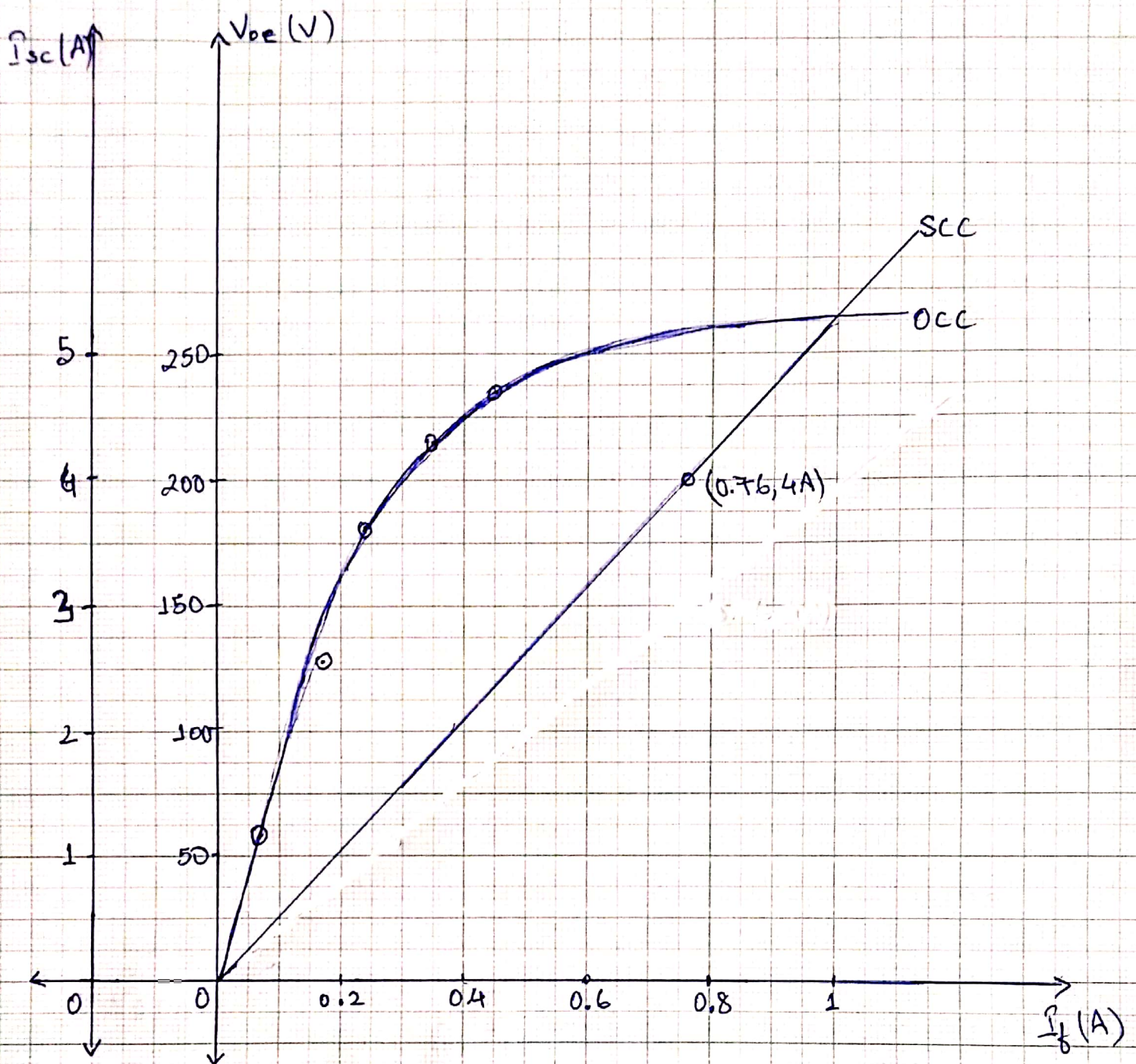
Conclusion:

Hence the experiment to perform OC and SC test has been successfully done. The parameters and performance related to synchronous machines were found out.

Precautions:

Make the connections as per the circuit diagram.

Before switching on the supply, verify the connection with the laboratory technician.



Scale, 10 small sq. = 1 unit on y and z axis

Plot of I_f Vs I_{sc} and I_f Vs V_{oc}