UNIVERSITY OF GAZIANTEP
ELECTRICAL AND ELECTRONIC ENGINEERING DEPARTMANT
EEE 322
EXPERIMENT 3
LOAD TEST ON AN ALTERNATOR

1.OBJECT OF THE EXPERIMENT

The object of the experiment is to perform load test on an alternator and from the results of this text to determine the regulation and efficiency of the alternator.

2.THEORY

2.1 Load Characteristics of an alternator

A.C. voltage generated at alternator terminals can be adjusted by varying the excitation current flowing through the field winding. the higher the excitation current will higher the generated voltage in armature. when a residual flux is established, open-circuit characteristic of the alternator does not commence from the origin as can be seen from Fig.1. That is, as the excitation current is zero, the terminal voltage will be equal to the alternator rated voltage. When reduced. However, a voltage rise may be observed. If the load is capacitive load characteristic of an alternator are illustrated in Fig.2.

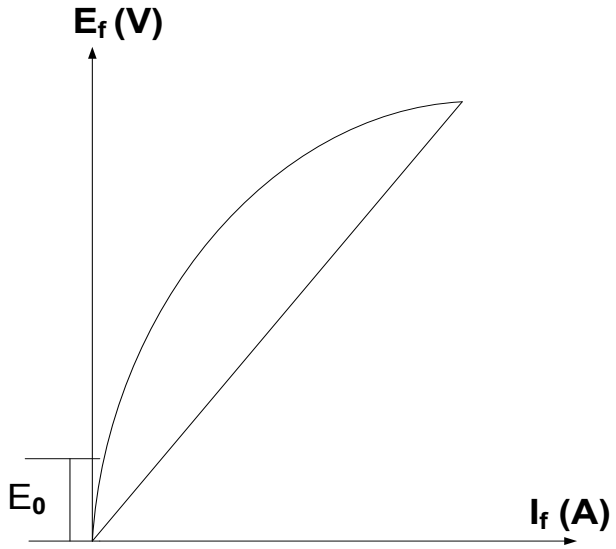


Fig.1. Open-circuit Characteristic of an alternator

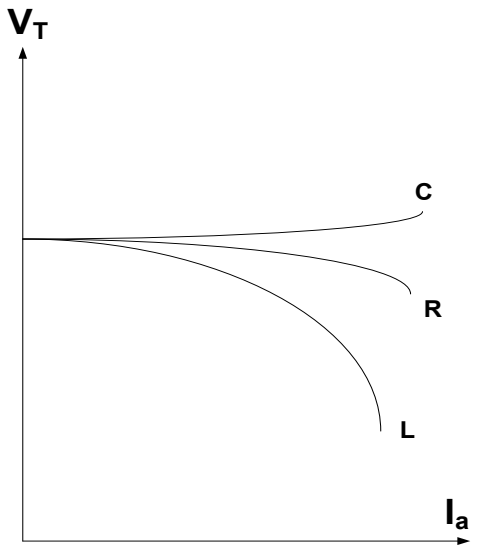


Fig.2. Load Characteristics of an alternator

2.2 Efficiency:

Alternator efficiency is determined from input (mechanical power) and output (electrical power) powers as,

$$\eta = \frac{P_{out}}{P_{in}} * 100 = \left(1 - \frac{loses}{P_{in}}\right) \times 100\%$$

where
$P_{IN}=V_{dc}*I_{dc}-P_{loss}$ (d.c driving motor)
$P_{loss}=P_{msc}+P_{elect}$; $(P_{elect}=R_aI_a^2+R_f^2)$

(Assume that mechanical loss is constant at no and full load) Where V_{dc} I_{dc} are input voltage and current of d.c. driving motor

3. PROCEDURE

1. Connect shunt-dc motor, adjust the speed to rated value of alternator (1500rpm with the help of rheostat. (see Fig.3)
2. Connect the alternator field terminals (5,6) to the variable dc voltage source.
3. Connect the alternator stator terminals (U1,V1,W1) to the terminals (S1,S2,S3) of the variable Y-connect resistive load with (A1,A2,A3) terminals short circuited. Set the load so that it draws minimum current. (See Fig.4)
4. Increase field current of the alternator by single-phase variac so that terminal voltage of alternator reaches to rated value (380V).
5. Increase load in step, at each step record the value of load voltage (line-to-line), load current (line), dc voltage and dc current of dc motor by keeping speed (1500 rpm) constant. Fill in Table1

Table 1. Table for Load Test of Alternator

Iload(A)	Vload(V)	Vdc(V) Dc motor	Idc(A) Dc motor
0.5			
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

4. RESULTS and CONCLUSION

1. Draw the variation of terminal voltage of load current.
2. Calculate the voltage regulation of the alternator at each load current value.
3. Calculate the efficiency of the alternator for all data points.
4. Plot the variation of efficiency against the armature current.

5. APPENDIX

A. Synchronous Generator (Alternator) Data

Pole number=4
S=3.5 kVA
Vrated (line-to-line)=380V, 50Hz

B. Variable rheosta (1-ph or 3-ph) Data

P=6 kW
Vrated (line-to-line)=380 V

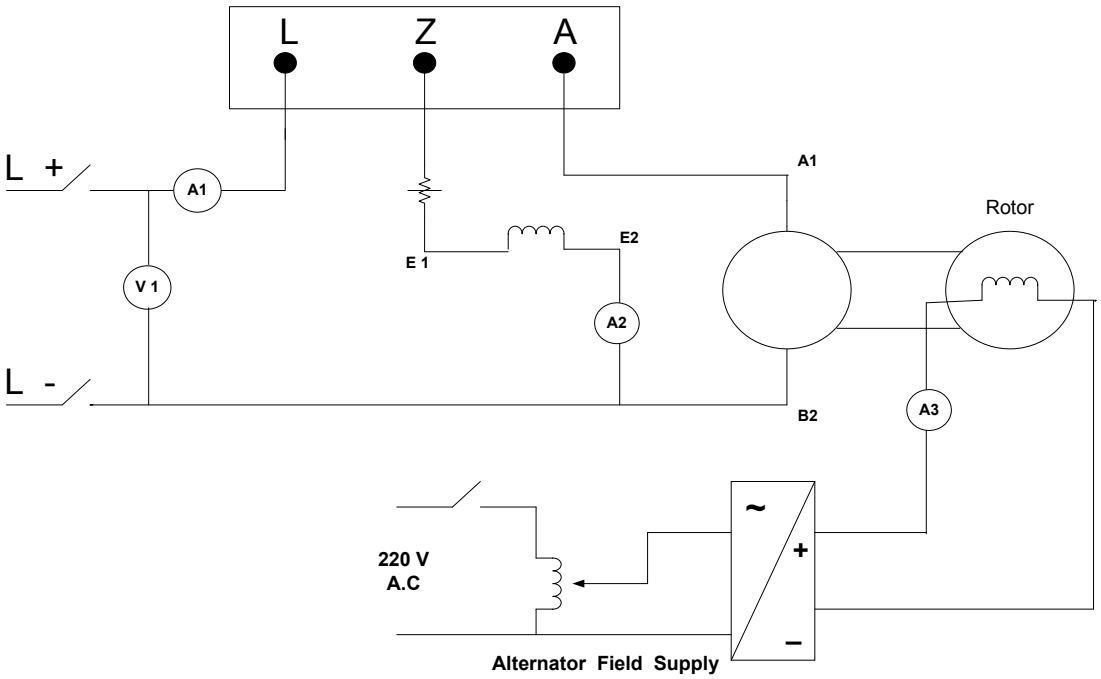
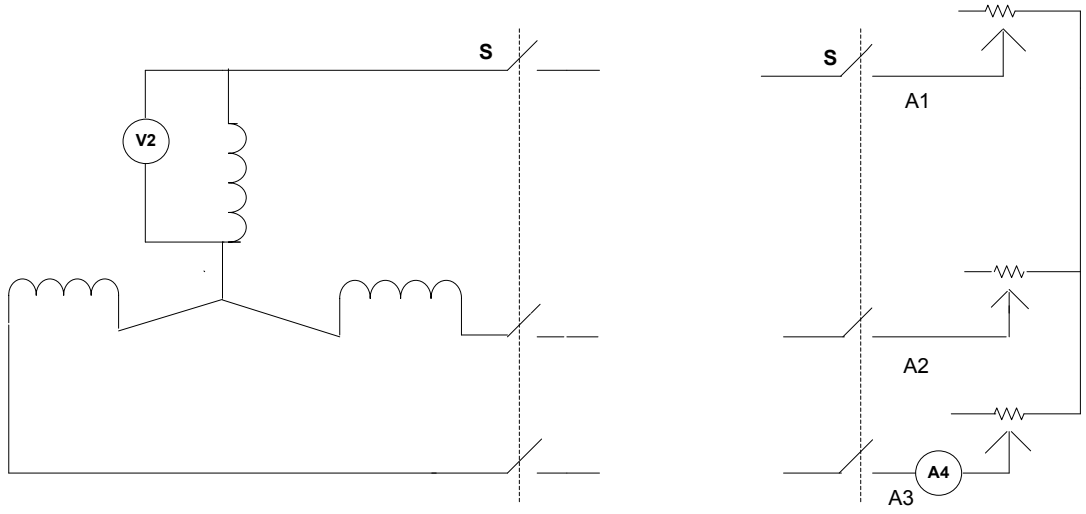


Fig. 3. Shunt DC motor connection diagram



Alternator armature winding
(a)

3-Phase resistive load
(b)

Fig.4. Connection Diagram for load-test