LOAD CHARACTERISTIC OF
ALTERNATIVES

At no load, $V_t$ depends on speed and $I_f$.

Load Alternator with leading lagging and unity $F_p$ loads
$R$ constant and $I_f$ constant for each type of load.

Reason why $V_t$ changes

1. $R_a$
2. Armature reaction
3. Armature reactance

With Resistive load $F_p = 1.0$, $V_t = \frac{V_{oc}}{R + X_f}$

$V_t$ = drop increases as $I$ increases
$X_f$ = reactance due to armature reaction
$X_L$ = leakage reactance $V_t$ decreases

With Inductive load $F_p$ lagging

IR drop fixed

Increases effects of $(X_f + X_L)I$ drop $V_t$ decreases

With Capacitive load $F_p$ leading

IR drop exists
$I_x$ adds to $E_f$

Leading angle on current causes $V_t > E_f$ without change in field current.

Armature reactance negated also: field is increased as load increases $V_t$ increases.
Voltage regulation

\[
\%\text{VR} = \frac{V_{NL} - V_{FL}}{V_{FL}} \times 100\%
\]

- \(V_{NL}\) = No-load terminal voltage
- \(V_{FL}\) = Full load terminal voltage

\(V_{FL} = 208\) at Rated speed 1800 RPM for all loads

\(V_{NL}\) = Voltage at terminals of machine when load is removed

Can have negative voltage regulation

- \(\%\text{VR}\) indicates a leading load where \(V_{D}\) across machine increases Terminal Voltage.
5.) Define voltage regulation of alternator with an equation and in words. Explain why a negative voltage regulation can occur and what it means in terms of terminal voltage.