Q.3

Ans:- Swinburne's Test:-

1. This is no-load test, it cannot be performed on a DC Series motor.

2. in this method, the machine, whether it is a motor or a generator is run at no-load as shunt motor at speed and rated terminal voltage V_t.

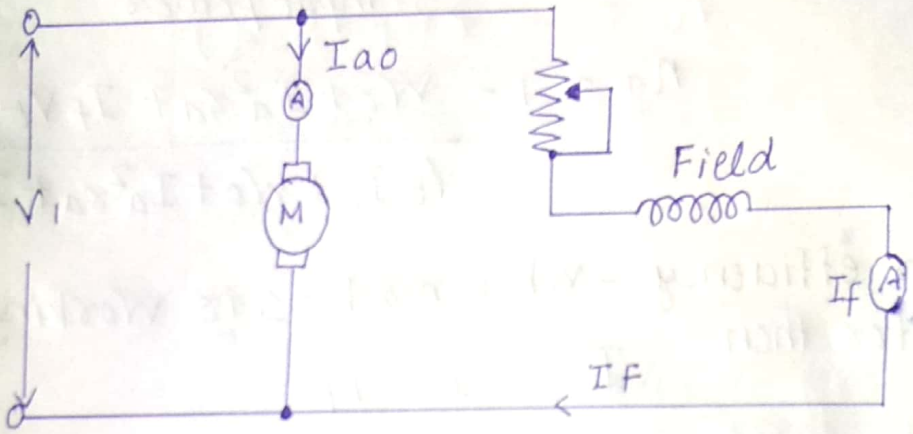

Fig:- Swinburne Test.

(3) let I_F = Field Current

I_{ao} = No-Load armature Current

I_L = load Current

(4) The power absorbed by the armature

$V_t I_{ao}$ = No-load rotational losses (W_o) + Armature loss ($I_{ao}^2 r_a$)

$$W_o = V_t I_{ao} - I_{ao}^2 r_a$$

shunt field loss = $V_t I_f$

(5) Generator efficiency:-

Generator O/P = $V_t I_L$

Armature current $I_a = I_L + I_f$

Armature Cirait loss = $I_a^2 r_a$

Shunt field loss = $V_t I_f$

Total loss = $W_o + I_a^2 r_a + I_f V_t$

$\therefore$ Efficiency, $\eta_g = 1 - \frac{\text{losses}}{\text{input power}}$

$$\eta_g = 1 - \frac{W_o + I_a^2 r_a + I_f V_t}{V_t I_L + W_o + I_a^2 r_a + I_f V_t}$$

6. Motor efficiency:- When machine is working as a motor then $I_a = I_L - I_f$

Motor input = $V_t I_L$

$$\eta_m = 1 - \frac{W_o + I_a^2 r_a + I_f V_t}{V_t I_L}$$

7. Advantages:-

a) Low power is required for testing even large machines since only no-load losses are to be supplied from the mains.

b) The efficiency of the machine can be calculated at any desired load.

8. Disadvantages:-

a) The stray-load loss can't be determined and hence efficiency is over estimated.

b) Steady temperature rise of the machine cannot be determined.