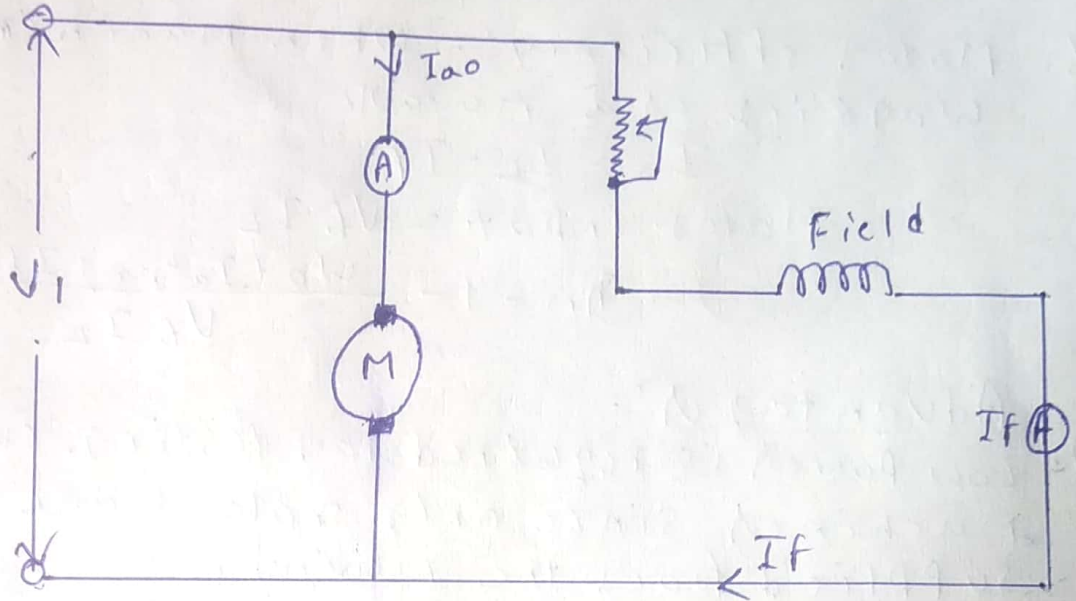
Q3
Ans

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 rated speed and rated terminal voltage V_t.



3. Let I_f = Field current
I_{ao} = No-load armature current
I_L = Load current

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 circuit loss $= I_a^2 r_a$

Shunt field loss $= V_t I_f$

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

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.

$$I_a = I_L - I_f$$

Motor input $= V_t I_L$

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

Advantages:-

1. Low power is required for testing even large machines since only no load are to be supplied from the mains.
2. The efficiency of the machine can be calculated at any desired load.

Disadvantages:-

1. The stray-load loss cannot be determined and hence efficiency is overestimated.
2. Steady-temp. rise of the machine cannot be determined.
3. The test dose not indicate whether commutation would be satisfactory when the machine is loaded.