SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 19EEB201 DC Machines and Transformers

II YEAR / III SEMESTER

Unit 3 – Testing of DC Motor

Topic 3: Swinburne’s Test

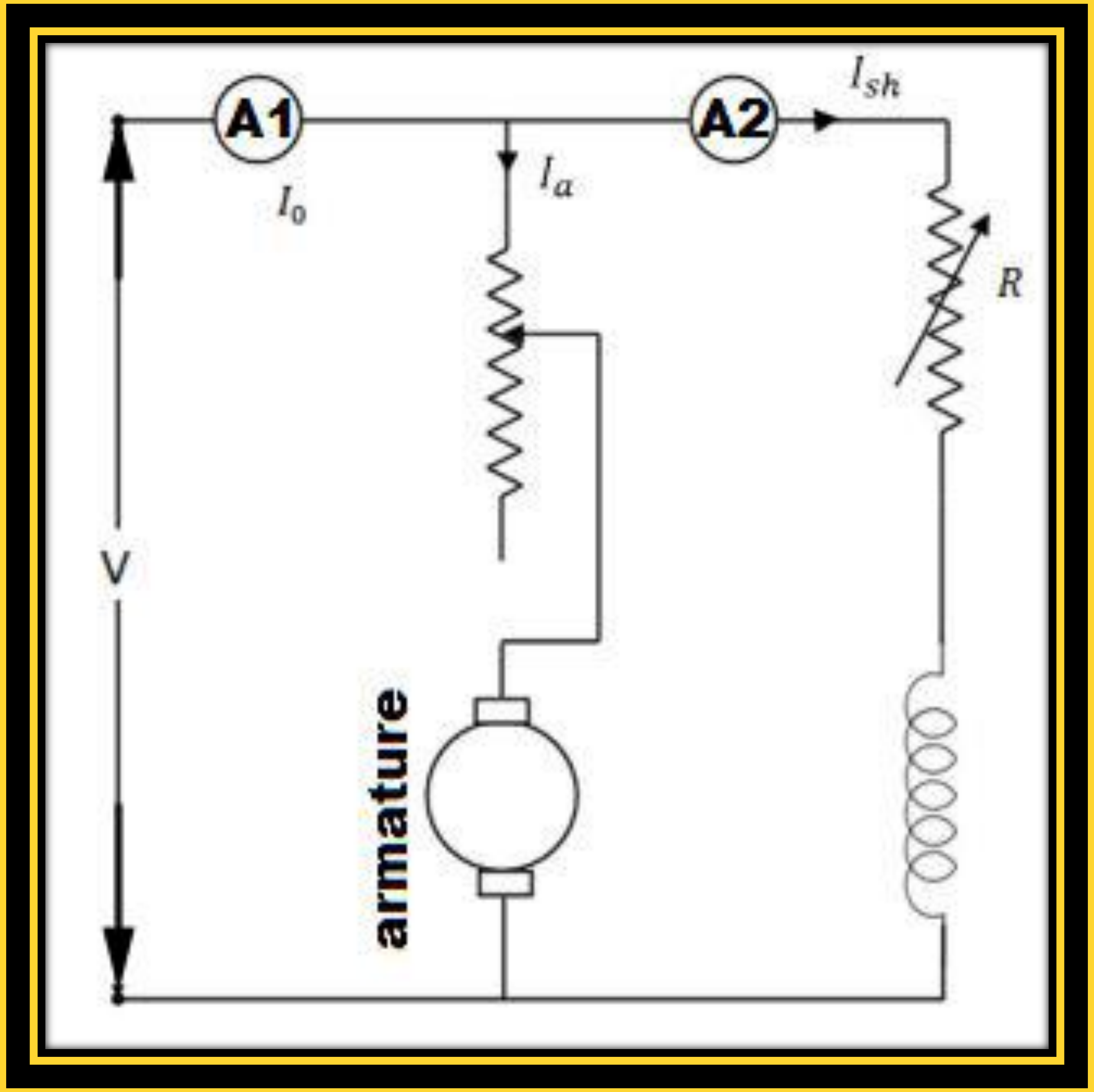
What We'll Discuss

TOPIC OUTLINE

Swinburne’s Test

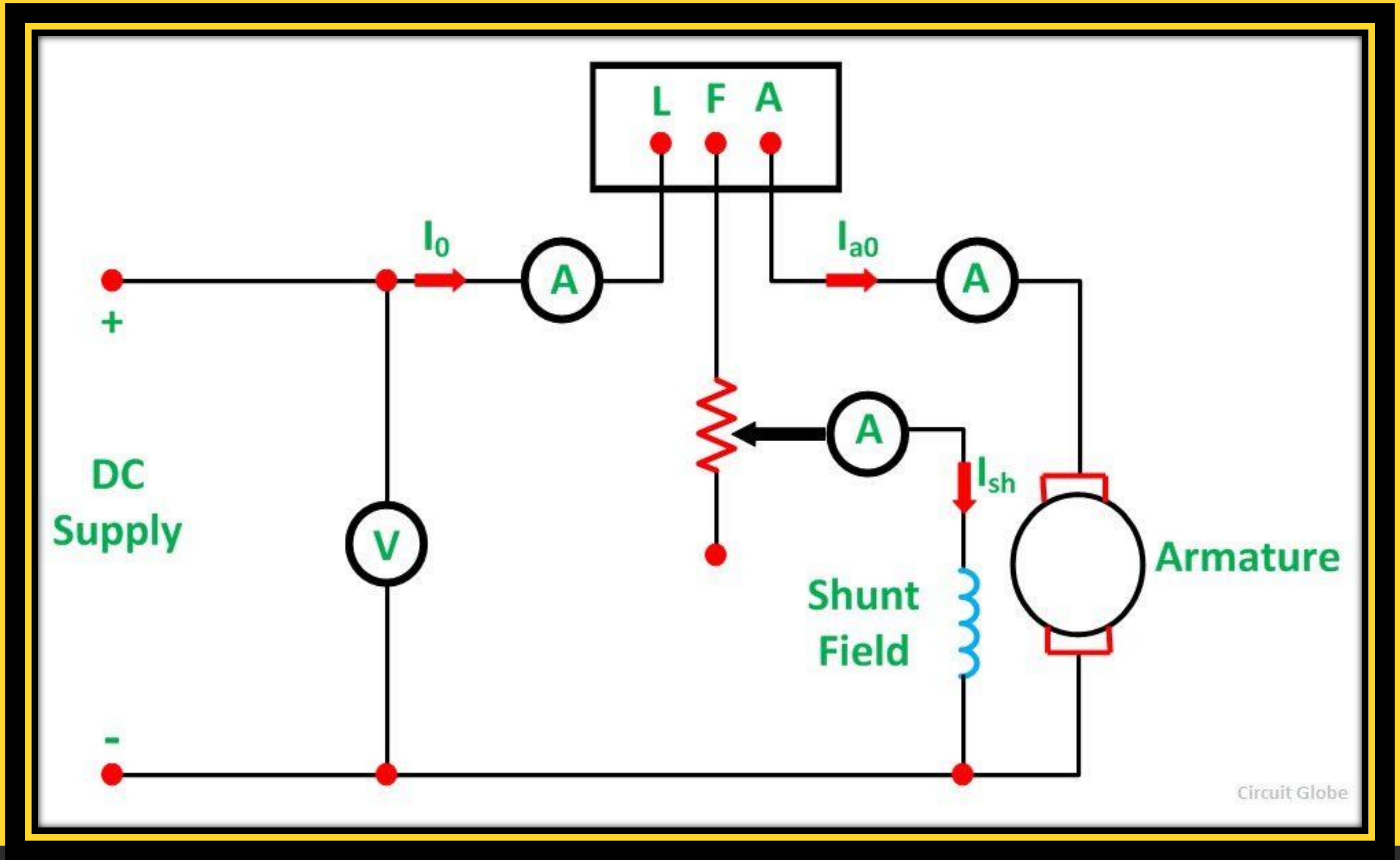
Assessment

Swinburne's Test



Efficiency as a motor = VI-(Pcu + Wc) / VI

Efficiency as a Generator = VI-(Pcu + Wc)/VI



Swinburne's Test

Shunt regulator

The no-load current I_0 is measured by the ammeter A_1 whereas shunt field current I_{sh} is given by ammeter A_2. The no-load armature current is $(I_0 - I_{sh})$ or I_{a0}.

Let, supply voltage $= V$ no-load input $= VI_0$ watt

$\therefore$ Power input to armature $= V(I_0 - I_{sh})$; Power input to shunt $= VI_{sh}$

No-load power input to armature supplies the following :

(i) Iron losses in core (ii) friction loss (iii) windage loss and

(iv) armature Cu loss, $(I_0 - I_{sh})^2 R_a$ or $I_{a0}^2 R_a$

In calculating armature Cu loss, 'hot' resistance of armature should be used. A stationary measurement of armature circuit resistance at the room-temperature of, say, 15°C is made by passing current through the armature from a low voltage d.c. supply [Fig. 31.5 (a)].

If we subtract from the total input the no-load armature Cu loss, then we get constant losses.

$\therefore$ Constant losses $W_c = VI_0 - (I_0 - I_{sh})^2 R_a$

Knowing the constant losses of the machine, its efficiency at any other load can be determined as given below. Let I = load current at which efficiency is required.

Then, armature current is $I_a = I - I_{sh}$ ...if machine is motoring

$= I + I_{sh}$ ...if machine is generating

Efficiency when running as a motor

Input $= VI$, Armature Cu loss $= I_a^2 R_a = (I - I_{sh})^2 R_a$

Constant losses $= W_c$ ...found above

$$\therefore \text{Total losses} = (I - I_{sh})^2 R_a + W_c \; ; \; \eta_m = \frac{\text{input} - \text{losses}}{\text{input}} = \frac{VI - (I - I_{sh})^2 R_a - W_c}{VI}$$

Efficiency when running as a generator

Output $= VI$; Armature, Cu loss $= (I + I_{sh})^2 R_a$; Constant loss $= W_c$ ...found above

$$\therefore \text{Total losses} = (I + I_{sh})^2 R + W_c \; ; \; \eta_g = \frac{\text{output}}{\text{output} + \text{losses}} = \frac{VI}{VI + (I + I_{sh})^2 R_a + W_c}$$

Swinburne's Test

Advantages of Swinburne's test

- The biggest advantage is that the shunt machine is to be run as motor under no load condition requiring little power to be drawn from the supply.
- Based on the no load reading, efficiency can be predicted for any load current.

Disadvantages of Swinburne's test

- However, this test is not sufficient if we want to know more about its performance (effect of armature reaction, temperature rise, commutation etc.) when it is actually loaded.
- Secondly, one should have loads to absorb this power.

RECALL

1. Conduct a Swinburne's test in the laboratory and plot the results

THANK YOU