

**NATIONAL BUSINESS AND TECHNICAL  
EXAMINATIONS BOARD (NABTEB)**

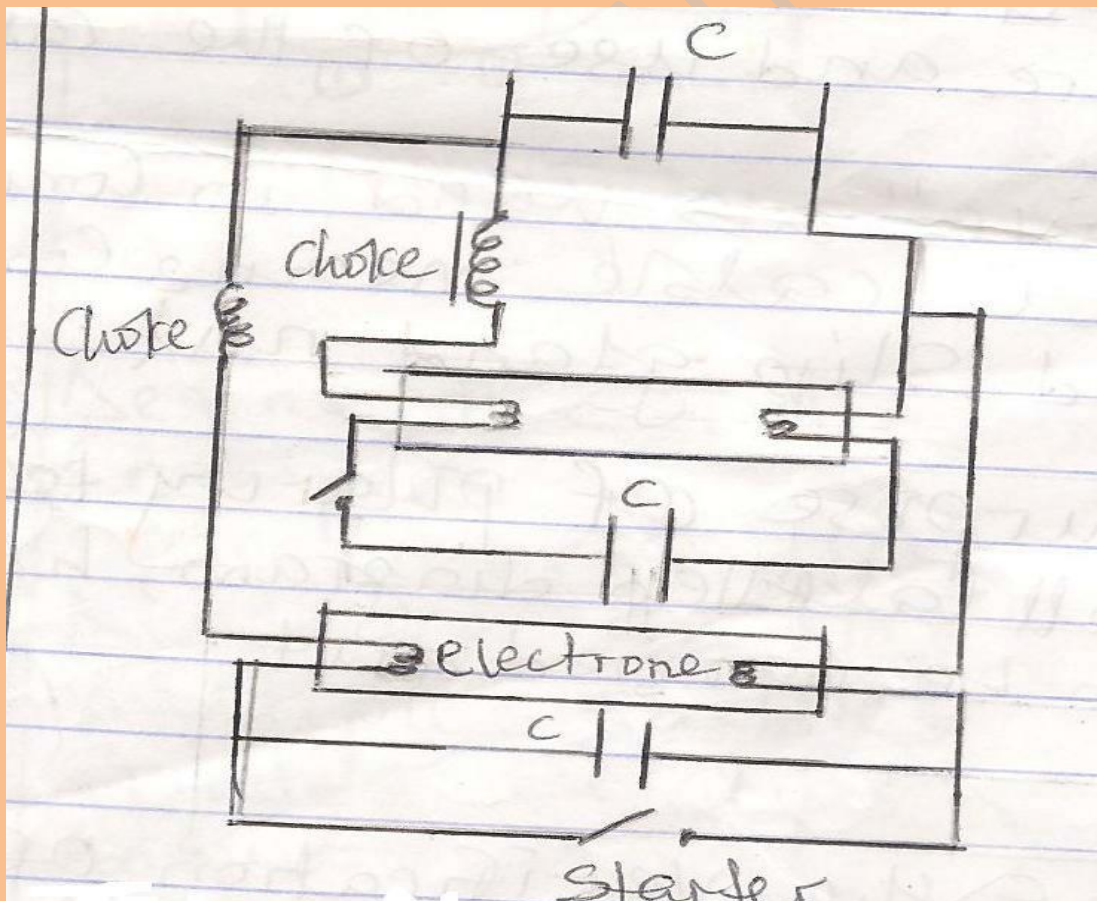
**ELECTRICAL INSTALLATION AND MAINTENANCE  
WORKS (041)**

**Question:**

- 1(a) What is Stroboscopic effect?  
1(b) With the aid of a diagram, show how the connection of a twin fluorescent lamp is carried out.

**Answer:**

Stroboscopic effect is the effect which the flickering of a discharge lamp has on moving machinery.



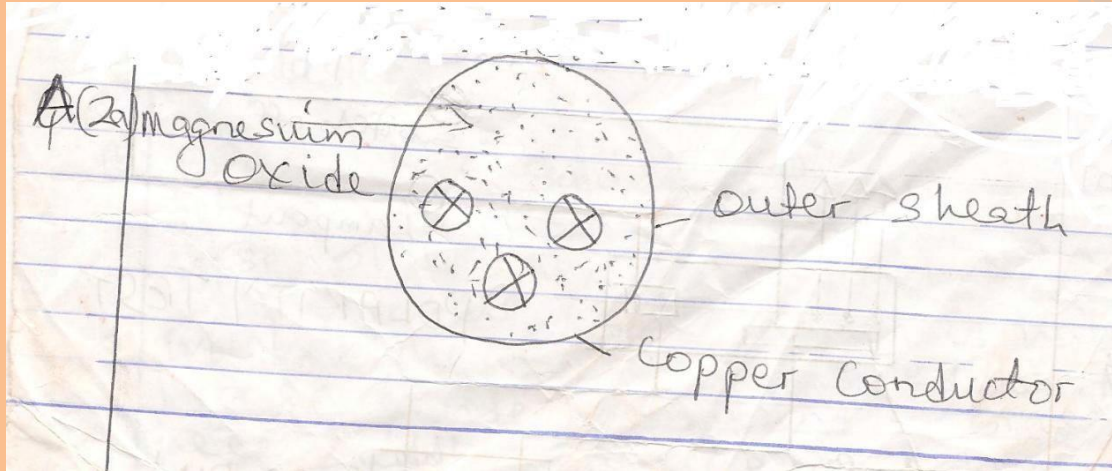
TWIN FLOURESCENT LAMP

**Question:**

- 2(a) Describe the construction of MICC Cable.  
2(b) Explain the term Olive as used in connection with the MICC Cable.

**Answer:**

- 2(a) Magnesium Oxide.



Upper Conductor: Each core consists of a single copper conductor. The common core numbers are: 1, 2, 3, 4 & 7.

Insulation:

The insulation between the cores is Magnesium Oxide. A material capable of withstanding high temperature but absorbent to moisture,

Outer Sheath:

This is a seamless copper tube. The cable is formed by drawing a section through a series of dies so that the relative distance between the cores and sheath is constant during the manufacture and use of the cable.

- 2(b) The term "Olive" as used in connection with the MICC cable means compression ring and slip gland nut.

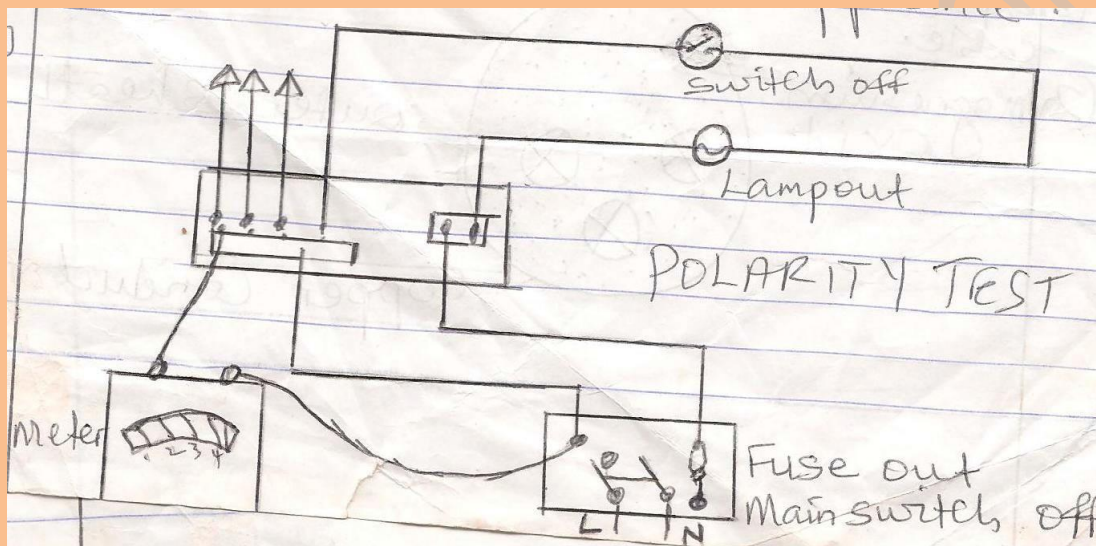
**Question:**

- 3(a) What is the purpose of polarity test?
- 3(b) Show with a well labeled diagram, how the above can be carried out.

**Answer:**

3(a) The purpose of the verification of polarity test is to check that the phase conductor is taken through the fuse and the switch to the appliance.

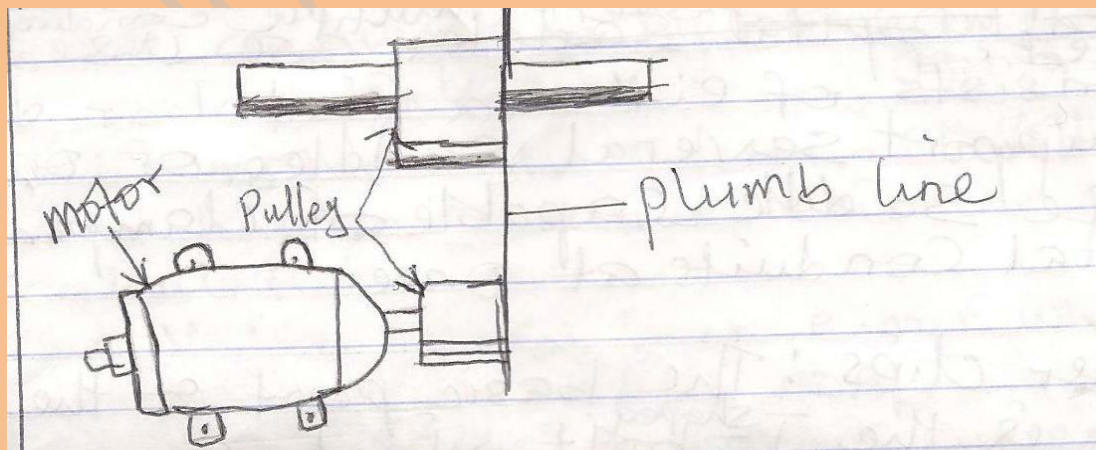
3(b)



**Question 4:**

With the aid of diagram, show how an electric motor can be connect and lining up.

**Answer:**



**Question 5:** Define the following terms.

- (a) Crampets.
- (b) Spacer bar Saddles.
- (c) Distance Saddles.
- (d) Multiple Saddles.
- (e) Girder Clips.

**Answer:**

- a. Crampets: Crampets are only used to secure conduit in conditions where the conduit is to be covered in concrete or plaster.
- b. Spacer bar saddles: This consists of two parts, a saddle and 3 mm thick base plate. The base plate has a slot in the center which is handy. The saddle is fixed to the base plate by means of brass screws. These saddles are used to hold the conduit away from damp plaster, concrete etc.
- c. Distance saddles: These saddles also called hospital saddles are used to keep dust from collecting between the conduit and the wall.
- d. Multiple Saddles: These saddles are used to fasten multiple conduit runs. It consists of either a flat bar drilled to support several saddles or one large saddle capable of clamping several conduits at once.
- e. Girder clips: The basic part of the girder clips is the J-bolt which support the girder clips without any need for drilling the conduit.

**Question 6:**

These faults were reported to have occurred on a D.C. Motor.

- a. Failure to start.
- b. Sparking brushes.

Explain how these faults can be detected and the possible remedy.

**Answer:**

S/NO.	FAULT	CAUSE	REMEDY
(a)	Failure to start	i. Open circuit on starter resistance. ii. Open circuit on field circuit.	<i>Change the starter resistance. Rewind the field winding.</i>
(b)	<i>Sparking at brushes.</i>	(i) <i>Open circuit.</i> (ii) <i>Shorted or earthed armature coil.</i> (iii) <i>Wrong brush position.</i> (iv) <i>Motor overloaded.</i> (v) <i>Dirty or worn out commutator.</i>	<i>Proper connection</i> <i>Proper lamination and insulation.</i> <i>Proper position.</i> <i>Reduce the load.</i> <i>Clean the commutator or replace the commutator.</i>

**Question 7:**

- (a) State and explain THREE types of losses in a d.c. motor.
- (b) A d.c motor with a terminal voltage of 500 V has an armature resistance of 0.2 ohms calculate,
- The value of the back e,m,f, when the armature current is 50A.
  - The value of the armature current when the back e.m.f. is 495 volts (ignore field current and brush drop).

**Answer:**

- (a) There are THREE types of losses in a.d.c. motor: Iron loss, copper loss and mechanical loss.
- Iron loss:- These are losses arising from the magnetic circuit of the machine and are of two types namely eddy current and hysteresis losses.
  - Copper Loss: These losses are due to the flow of current through the copper conductors of the motors and are sometimes termed  $I^2R$  losses.
  - Mechanical loss:- These are made of bearing friction and windage. This is a friction loss due to the movement of the armature through air.

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(b)  $E_b = V - I_a R_a$ .

$$E_b = 500 - (50 \times 0.2)$$

$$E_b = 500 - 10$$

$$\therefore E_b = \underline{490 \text{ V.}}$$

$$V = E_b + I_a R_a$$

$$I_a R_a = V - E_b$$

$$I_a = \frac{V - E_b}{R_a}$$

$$R_a$$

$$I_a = \frac{500 - 495}{0.2}$$

$$0.2$$

$$\therefore I_a = \frac{5}{0.2}$$

$$0.2$$

$$I_a = \underline{25 \text{ A}}$$