1. IDENTIFICATION OF DIFFERENT TERMINALS OF A DC MACHINE BY TEST LAMP METHOD AND MULTIMETER METHOD AND TO MEASURE INSULATION RESISTANCE BY MEGGER

AIM: IDENTIFICATION OF DIFFERENT TERMINALS OF A DC MACHINE BY TEST LAMP METHOD AND MULTIMETER METHOD AND TO MEASURE INSULATION RESISTANCE BY MEGGER.

APPARATUS REQUIRED

S.NO	Name of the tools/equipments	specification	Type	Quantity
01	Screwdriver	150mm	Insulated	1No
02	Insulated combination pliers	6"	Insulated	1No
03	D.E. spanner set	5mm to 18mm		1Set
04	Series/ shunt type ohmmeter	0-50 ohms	Digital	1No
05	DC compound machine	220V/ 3KW		1No
06	PVC Insulated copper cable	1.5 sq mm	Multi core	5 m
07	Test lamp	220 v,100 W		1No
08	Megger	500 v,20 mega ohm	Analog	1No

PROCEDURE

TASK 1: Read and interpret the name plate details of a DC machine

1 .Read the name-plate details of the given DC compound machine and record them.

Name plate details

Manufacturer-
Type, model-
Type of current
Function. Generator/motor-
Serial number-
Type of connection sep./shunt/series/compound-
Rated voltage volts-
Rated power k.w.-
Rated exc.voltage volts-
Rating class. -
Insulation class -
Rated current amps-
Rated speed .r.p.m.-
Rated Exc.current amps-
Direction of rotation-
Protection class-

2. Remove the terminal cover
3. Identify DC machines terminals.

TASK 2: Measure shunt field resistance by an ohmmeter

1. Take a series type ohmmeter or multimeter; select a proper ohmic range and set its value to zero by shorting the prods.

Connect the meter leads to the shunt field terminals of the machine as per the FIG.

2 Read, and record the value of the shunt field resistance below. The value of the shunt field resistance is

_____ohms.

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3. Refix the terminal cover

4. Compare the readings obtained in Tasks 1 and 3. If there is any difference write the reasons in the space given below

Task 3: Measure armature resistance using an ohmmeter

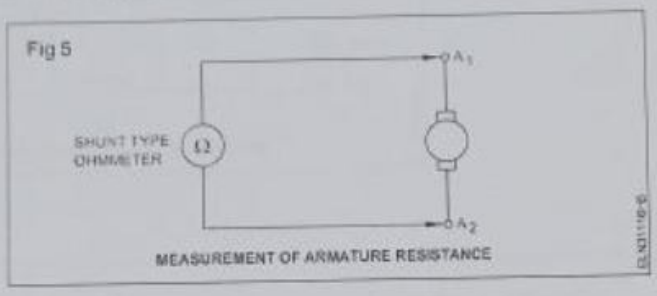
Adjust ohms 'Zero' and ohms 'Infinity' of the ohmmeter

1 Connect the ohmmeter across the armature terminals and measure the resistance.

Note down the meter reading and record it below. Armature resistance value is_____ohms.

2 Replace the terminal cover and keep all tools, equipment and meters at their places.

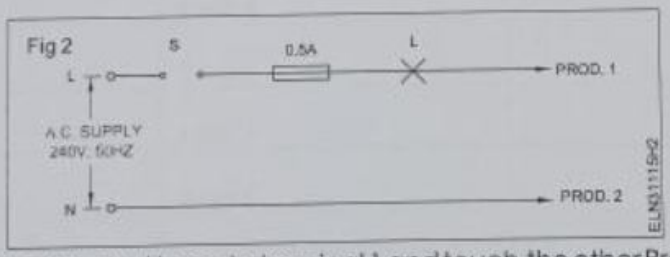
3 Compare the readings of Task 1 & 2. If there is any difference, find the reasons for that and write your conclusions in the space b



Test and identify the pairs of terminals of a DC compound machine

1. Prepare a test lamp for 240V 25W

2. Identify one of the cables as the phase cable and connect it to the test lamp through the switch and fuse

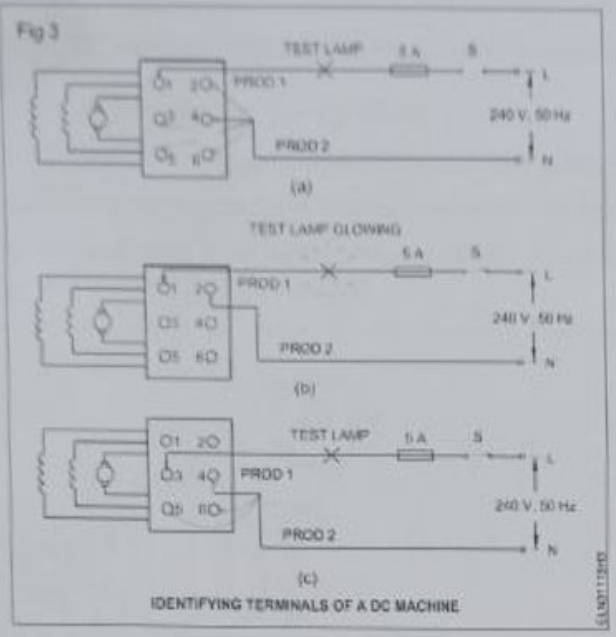


Connect Prod 1 of the test lamp to terminal 1 and touch the other Prod 2 to the rest of the terminals, one by one

3. Check the condition of the lamp.

4. Connect Prod 1 of the test lamp to another terminal as shown in Fig 3 and repeat the procedure of steps 2 and 3 to find the second pair of terminals and write the results in Table.

Fig 3



IDENTIFYING TERMINALS OF A DC MACHINE

Sl no	Pairs of terminals	Condition of lamps	Identifi- cation
1	1 and 2		
2	1 and 2		
3	1 and 4		
4	1 and 5		
5	1 and 6		
6	3 and 4		
7	3 and 5		
8	3 and 6		
9	5 and 6		
10	Brush to -- 2		
11	Brush to -- 3		
12	Brush to -- 5		

Conclusion

Armature terminals_____and_____. (Mark them as A_1 & A_2.)

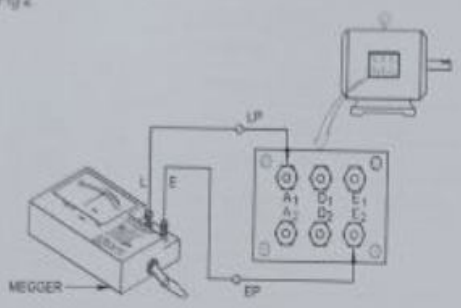
Shunt field terminals_____and_____. (Mark them as E_1 & E_2.)

Series field terminals_____and_____. (Mark them as D_1 & D_2.)

Task-4 Test a DC machine for insulation resistance between windings

1. Fill up the columns 1 to 4 in Table 1.
2. Connect the Megger between armature and shunt field terminals. (Fig 2)
3. Rotate the Megger at its rated speed, and note down the reading in Table 1.
4. Repeat step 3 for testing the insulation between the shunt field and series field after connecting the Megger terminals. (Fig 2)

Fig 2



INSULATION TEST ON DC MACHINE

Insulation resistance test between windings of a DC machine

Date	Time	Weather condition	Duty cycle	Test between terminals	Insulation resistance in mega ohms	Remarks
1	2	3	4	5	6	7
				Armature and shunt field		
				Shunt and series field		
				Series field and armature		
				Armature and the body		
				Series field and the body		
				Shunt field and the body		

2. DISMENSIONAL AND MATERIAL STUDY OF VARIOUS PARTS OF DC MACHINE.

AIM: DIMENSIONAL AND MATERIAL STUDY OF VARIOUS PARTS OF DC MACHINE.

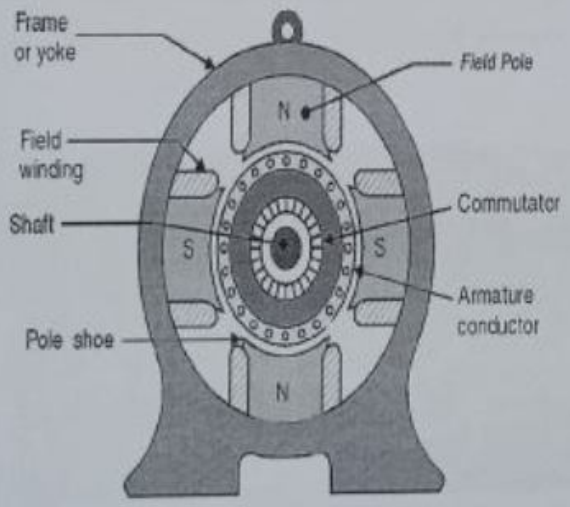
APPARATUS REQUIRED

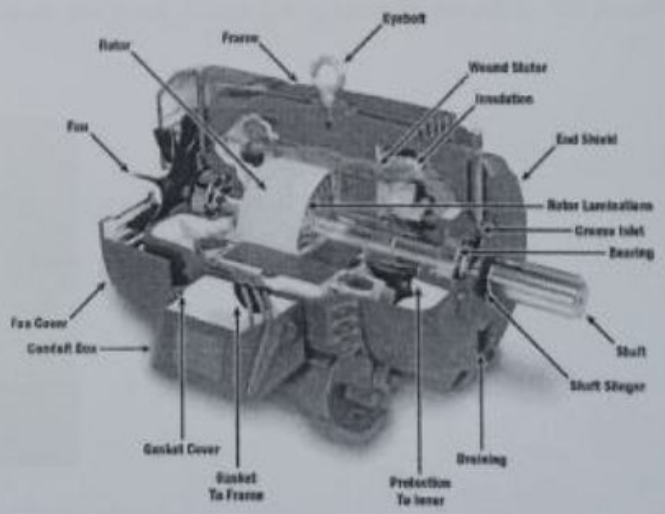
S.NO	Name of the tools/equipments	specification	Type	Quantity
01	Pulley puller	6"		1No
02	Hammer	500 gms		1No
03	Cutting pliers	200mm		1No
04	Centre punch, Length	100mm		1No
05	Spanner set	5mm to 20mm		1Set
06	Screwdriver, heavy duty	12"	Insulated	1No
07	Mallet, hardwood.	60mm dia		1No
08	DC machine			1No

THEORY

Construction of DC Machine

The construction of DC machine can be done using some of the essential parts like Yoke, Pole core & pole shoes, Pole coil & field coil, Armature core, Armature winding conductor, commutator, brushes & bearings. Some of the parts of the DC machine is discussed below.



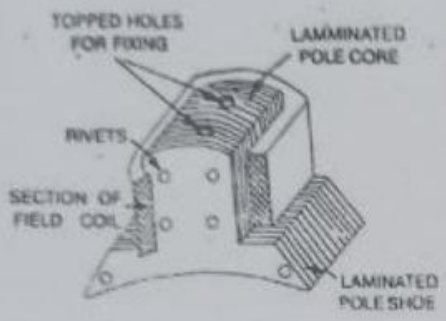


Yoke

Another name of a yoke is the frame. The main function of the yoke in the machine is to offer mechanical support intended for poles and protects the entire machine from the moisture, dust, etc. The materials used in the yoke are designed with cast iron, cast steel otherwise rolled steel.

Pole and Pole Core

The pole of the DC machine is an electromagnet and the field winding is winding among pole. Whenever field winding is energized then the pole gives magnetic flux. The materials used for this are cast steel, cast iron. It can be built with the annealed steel laminations for reducing the power drop because of the eddy currents.



Pole Shoe

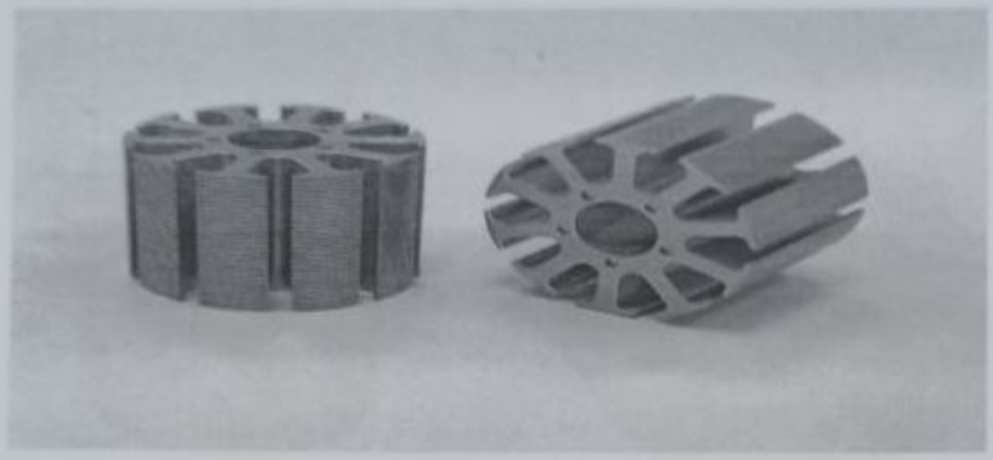
Pole shoe in DC machine is an extensive part as well as enlarge the region of the pole. Because of this region, flux can be spread out within the air-gap as well as extra flux can be passed through the air space toward armature. The materials used to build pole shoe is cast iron cast steel, and also used annealed steel lamination to reduce the loss of power because of eddy currents.

Field Windings

In this, the windings are wounded in the region of pole core & named as field coil. Whenever current is supplied through field winding then it electromagnet the poles which generate required flux. The material used for field windings is copper.

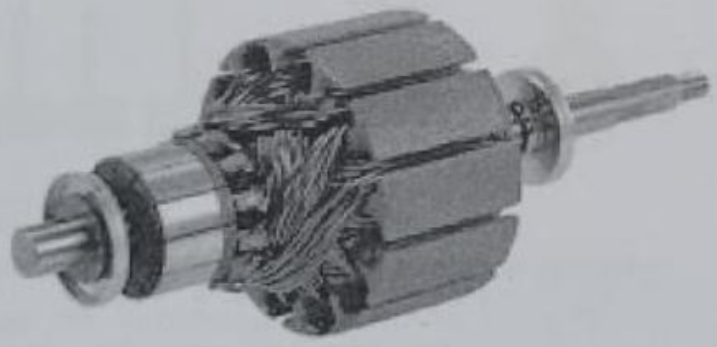
Armature Core

Armature core includes the huge number of slots within its edge. Armature conductor is located in these slots. It provides the low-reluctance path toward the flux generated with field winding. The materials used in this core are high permeability low-reluctance materials like iron cast steel. The lamination is used to decrease the loss because of the eddy current.



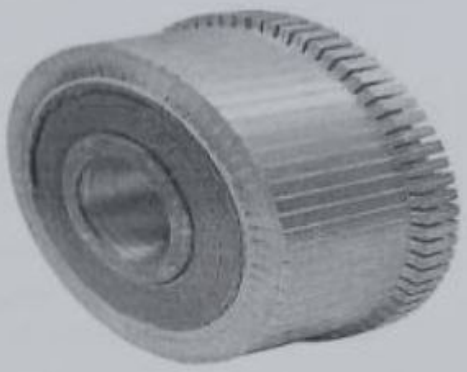
Armature Winding

The armature winding can be formed by interconnecting the armature conductor. Whenever an armature winding is turned with the help of prime mover then the voltage, as well as magnetic flux, gets induced within it. This winding is allied to an exterior circuit. The materials used for this winding are conducting material like copper.



Commutator

The main function of the commutator in the DC machine is to collect the current from the armature conductor as well as supplies the current to the load using brushes. And also provides uni-directional torque for DC-motor. The commutator can be built with a huge number of segments in the edge form of hard drawn copper. The Segments in the commutator are protected from thin mica layer.



Brushes

Brushes in the DC machine gather the current from commutator and supplies it to exterior load. Brushes wear with time to inspect frequently. The materials used in brushes are graphite otherwise carbon which is in rectangular form.

PROCEDURE

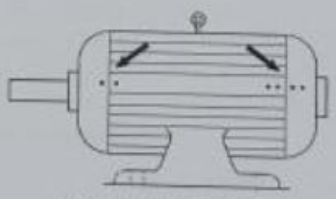
Dismantle, inspect and reassemble DC compound generator

1 Read the manufacturer's instruction booklet, and particularly take into account any special instructions regarding dismantling procedures.

2 Remove the fuse-carriers from the main switch, disconnect the DC machine from the supply and display the "Man-on-line board" on the main switch.

3 Remove the foundation bolts of the machine and shift the machine to the

Fig 1



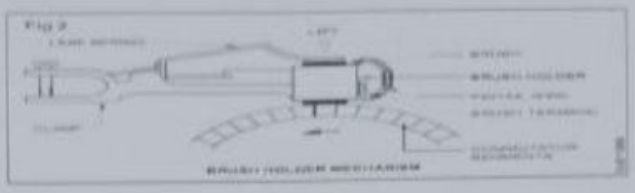
IDENTIFICATION PUNCH MARKS

workbench.

4 Conduct a visual inspection.

5 Clean the outside surface of the motor. Remove all dirt and grease with a dry cloth soaked in petrol/kerosene.

6 Make punch marks on both the end plates and yoke. (Fig 1)



7 Mark the rocker arm position with respect to the end plate.

8 Remove the brushes from the brush-holder. (Fig 2)

9 Check pulley tight and adjust.

10 Remove the grease cup stud and open the grease cup

11 Loosen the studs of both the end plates and then remove the end plate of the shaft side.

12 Remove the armature from the body of the machine

13 Remove the bearings using a bearing puller

14 Reassemble the yoke, armature and end plates

15 Check the freeness of the shaft by rotating the shaft by hand

16 Insert the brush in the holder, adjust the brush tension, and bed the brushes

17 Position the rocker-arm in the end plates as per original marking.

18 Re-install the machine in the foundation and tighten the foundation bolts and connect the generator.

19 Check whether the generator is operating smoothly without any vibration.

OBSERVATION

Table

Name plate details

Manufacturer-
Type, model-
Type of current
Function, generator/motor-
Serial number-
Type of connection sep/shunt/series/compound-
Rated voltage volts-
Rated power k.w.-
Rated exc.voltage volts-
Rating class. -
Insulation class -

Rated current amps-
Rated speed r.p.m.-
Rated Exc.current amps-
Direction of rotation-
Protection class-

Stator Part

Slno	Name of the part	Measurement
01	Length of yoke	
02	Diameter of yoke	
03	No of poles	
04	Length of pole	
05	Width of pole	
06	No of inter poles	
07	No of carbon brushs	
08	No of bearing	

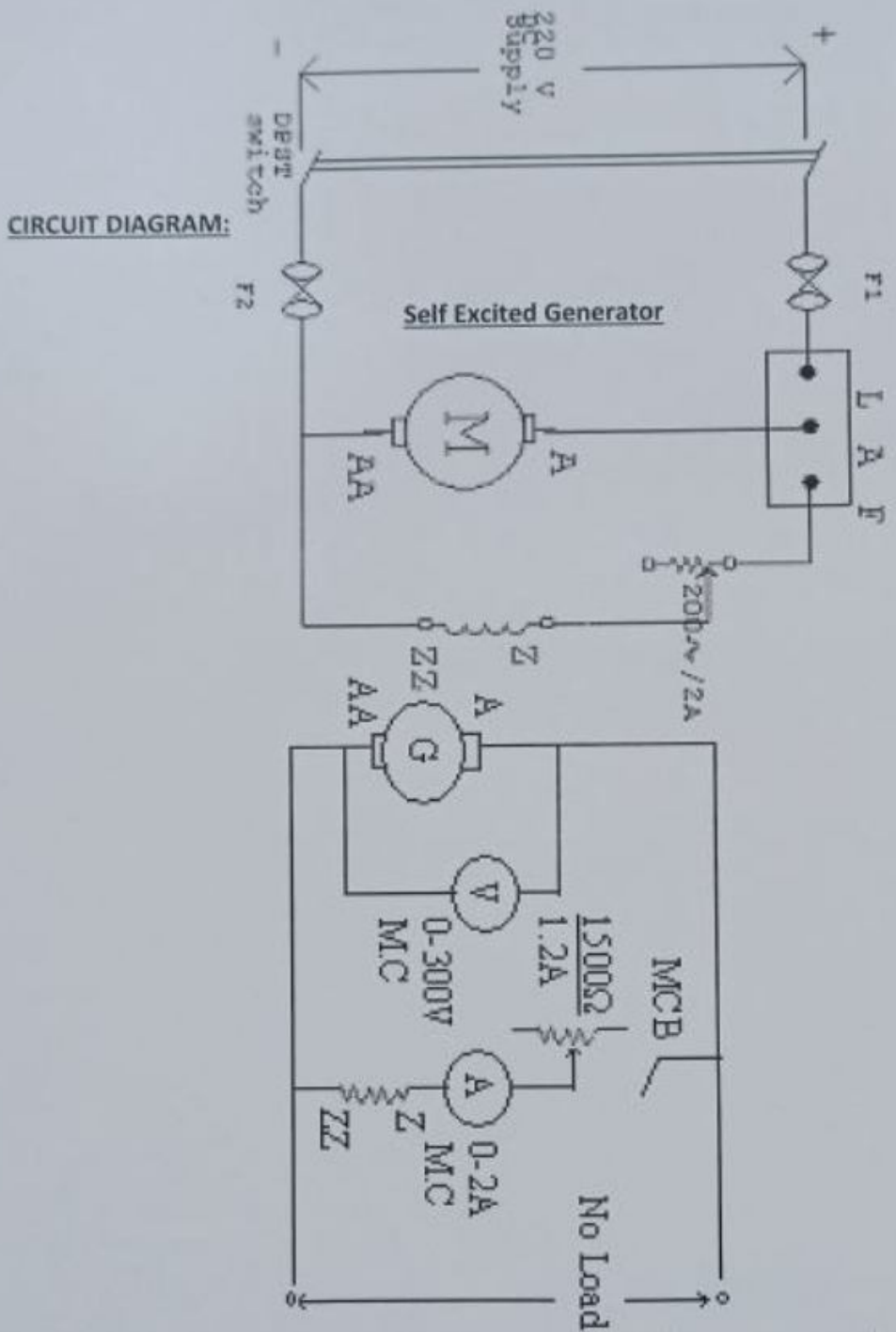
Rotor Part

Slno	Name of the part	Measurement
01	Length of shaft	
02	Length of armature	
03	Diameter of armature	
04	Length of commutator	
05	Diameter of commutator	
06	No of slots of armature	
07	Number of conductor in each slot	
08	Size of conductor	
09	No of commutator segment	

Reasoning questions:

1) What is the function of the commutator?
2) What is the function of brush?
3) What is slot?
4) What is the function of pole shoes?
5) Which type of material is required for armature core.
6) Which type of materials used for the construction of brushes.

CIRCUIT DIAGRAM:



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