IQRA National University, Peshawar
Department of Electrical Engineering
Summers 20

Name: _____

Reg.No:_____

Instructor: Engr. Sanaullah Ahmad

Electrical Machines

Total Marks : 50
Attempt All Questions.
Sketch neat and labeled diagrams.

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Mansoor Jadoon

ID 16637

Question No 1.

A. Discuss any two methods of speed control each for series and shunt wound DC motors? 15
(CLO – 3)

B. Consider a 8 poles DC Generator, Number of conductors Z are 480, emf induced per conductor is 2.2V , current per conductor is 100A find the terminal voltage E , output current I and power generated for both lap and Wave windings ? **(CLO – 1)** 10

Question No 2.

A. Determine Relationship between torque and armature current? **(CLO – 2)** 15

B. Differentiate between lap winding and wave winding? **(CLO – 3)** 10

"GOOD LUCK"

Q# 1 (a)

Speed Control for Series DC Motor:-

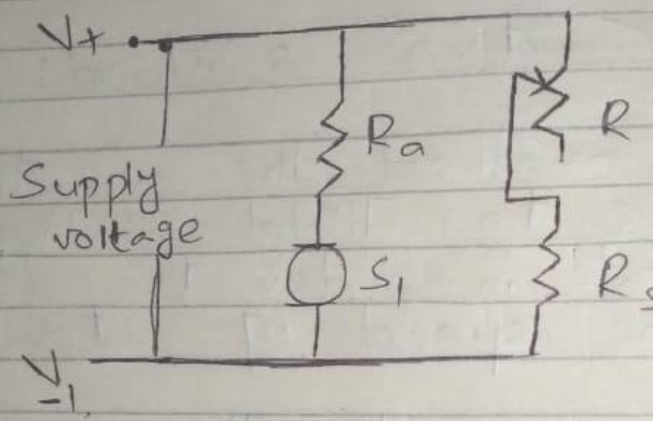
1) Flux Control Method:

In this method the magnetic flux due to field winding is varied in order to vary the speed of motor.

As the megnatic flux depends on the current flowing through the field winding it can be vareed by varying the current through the field winding. This can be achived by using a variable resistor in series with the field winding resistor.

When the variable resistor is kept at its minimum position the rated current flow through

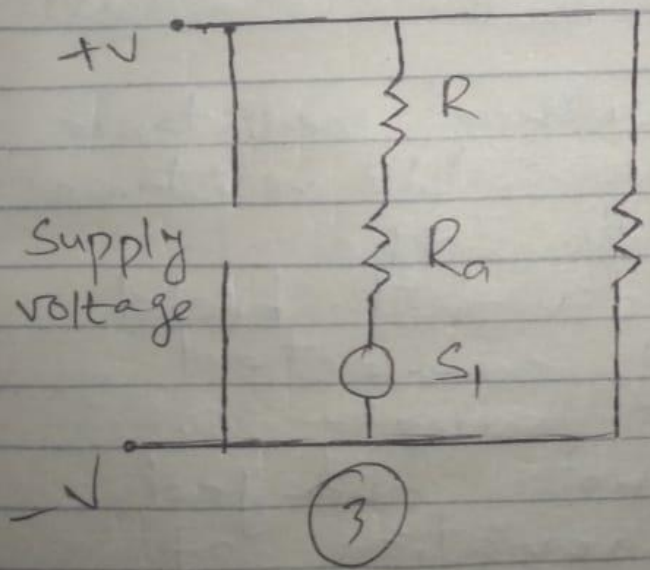
the field winding due to rated supply voltage and as a result the speed kept normal



Armature Control Method:

In this method the speed of DC can be controlled the by controlling the armature resistance to control the voltage drop across the armature. This method also use a variable resistor in series with

armature. When the variable resistor its minimum value the armature resistance is at normal one and therefore the armature voltage drops. When the resistance value is gradually increased the voltage across the armature decrease This turns decrease in speed of motor.



(4)

Speed Control of DC Shunt Motor:

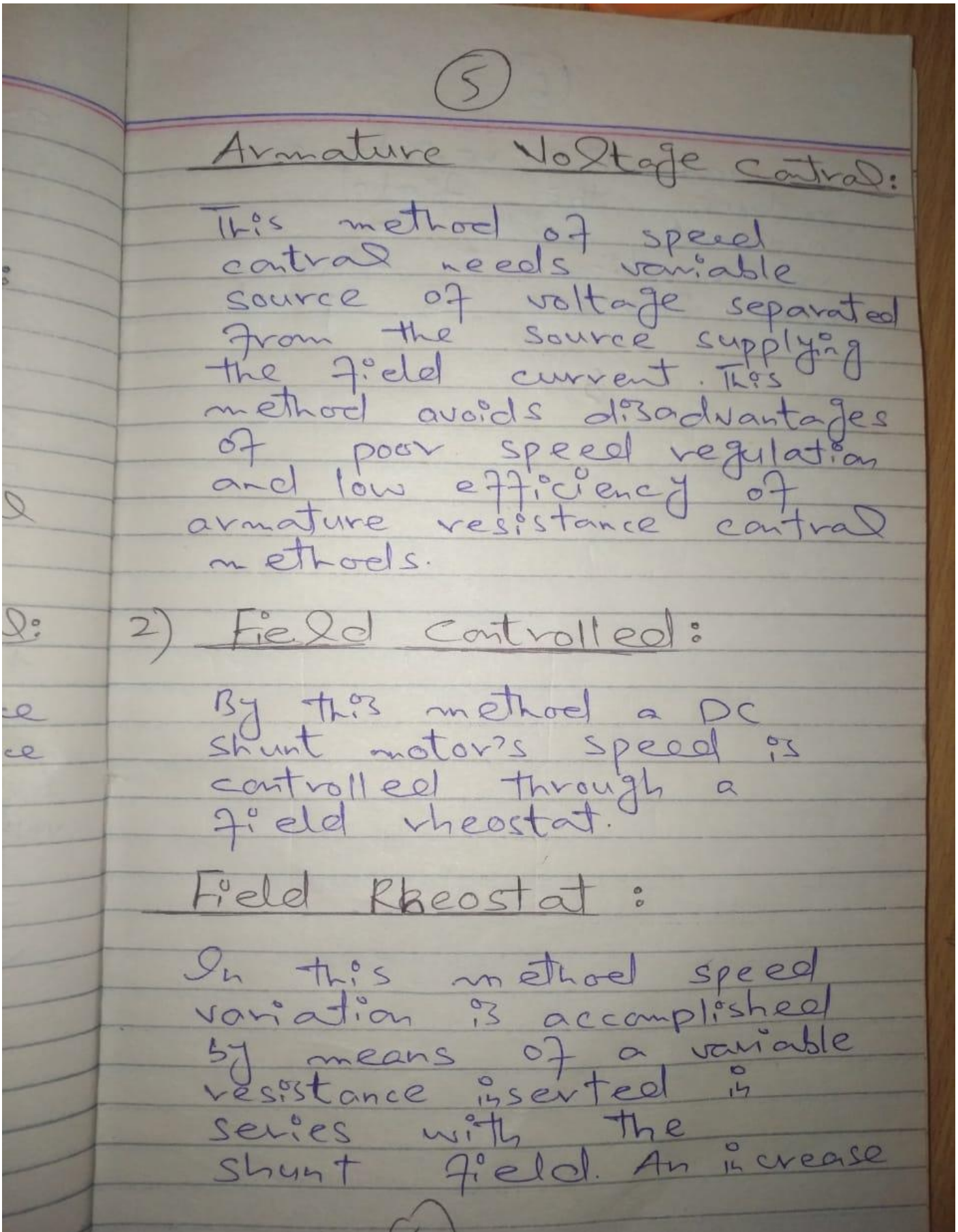
1) Armature control method:

Armature controlled DC shunt motor can be performed in 2 ways.

a) Armature Resistance control
b) Armature voltage control

a) Armature Resistance control:

In this method resistance control a variable resistance is added to the armature circuit. Field is directly connected across the supply so flux is not changed due to variation of series resistance. This applied for DC shunt motor. (This method is used in)



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Armature Voltage Control:

This method of speed control needs variable source of voltage separated from the source supplying the field current. This method avoids disadvantages of poor speed regulation and low efficiency of armature resistance control methods.

2) Field Controlled:

By this method a DC shunt motor's speed is controlled through a field rheostat.

Field Rheostat:

In this method speed variation is accomplished by means of a variable resistance inserted in series with the shunt field. An increase

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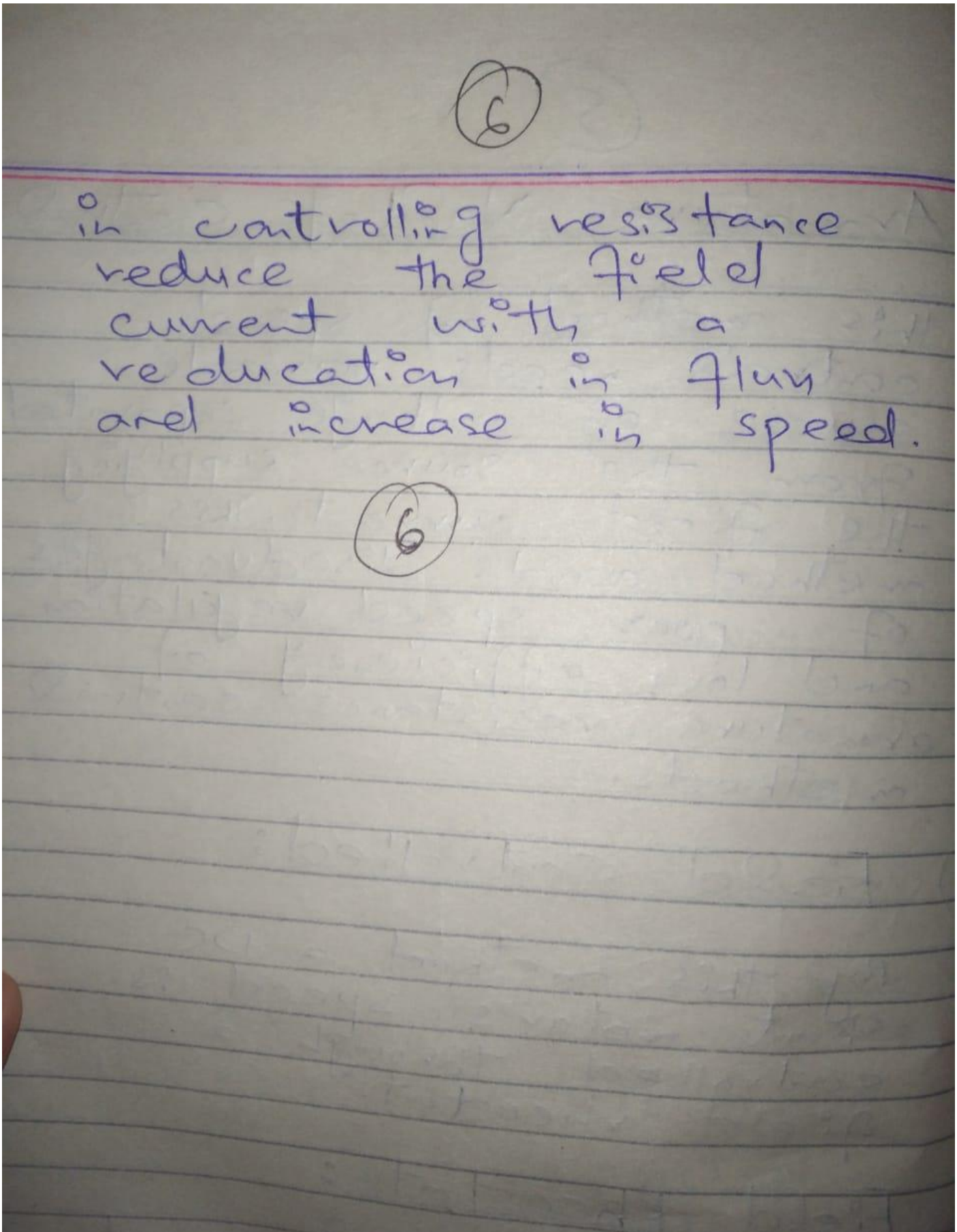

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Q # 2: (A).

Relationship Between Torque and Armature Current:

This characteristic is also known as electrical characteristic. We know that torque is directly propotional to the product of armature current and field flux

$$T_a \propto \phi \cdot I_a$$

In Dc series motors field winding is connected in series with the armature

$$I_a = I_f$$

Therefore before magnetic saturation of the field flux ϕ is directly proportional to I_a.

Hence before magnetic saturation $T_a \propto I_a^2$

Therefore the $T_a - I_a$ curve is parabola for smaller value of I_a.

After magnetic saturation of field flux ϕ is independent of armature current I_a. Therefore torque is (div) varies proportionally to I_a only.

$$T \propto I_a.$$

So after magnetic saturation $T_a - I_a$ curve become a straight line.

Q# 2 (B)

Difference Between Lap and wave winding:

1) In Lap winding the coil is Lap back to the succeeding coil whereas in the case of wave winding the coil are connected in the wave shape.

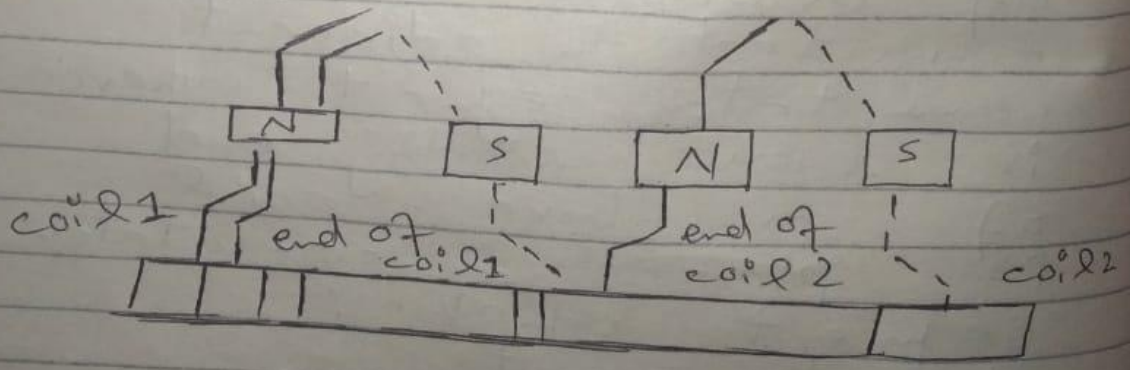
2) In Lap winding the end of armature coil is connected to adjacent commutator segment whereas is wave winding end of armature coil is placed in commutator segment which is placed apart.

3) In Lap winding the number of parallel path is equal to the total number of poles of coil

are in the wave winding the number of wave winding number of parallel path is always equal to 2.

4) The Lap winding is also called parallel winding while wave winding are connected in series.

5) The emf of Lap winding is less as compared to wave winding.



wave winding.

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