

ADITYA ENGINEERING COLLEGE (A)

Aditya Nagar, ADB Road, Surampalem

Department of Electrical and Electronics Engineering

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Course: DC Machines and Transformers (201EE3T01)

Unit II: Operation of DC Motors:

Topic: Characteristics of separately-excited and shunt motors.

Semester: III

Academic Year: 2022-23

Teaching Methodology: Practical Demonstration

About the Course: This is a basic course on rotating electrical machines. This course covers Basic constructional features of D.C machine. Emf and torque equations of D.C. machine – generator and motor mode. Armature reaction and its effect. Shunt, series and compound machines. Generator characteristics. Motor characteristics. Efficiency, Speed control methods of dc motors and Basic tests of dc machines.

And also covers basic constructional features and operation of transformers, losses, efficiency and voltage regulation, testing of single-phase transformers. Poly phase connections, tap changing transformers and Scott connection.

Innovative Teaching Methodology: Practical Demonstration

After explaining the concepts to the students, teacher perform implementation of activities in the class room to connect theories to actual practice. With this, the students are able to conduct the experiment in the laboratory and assess the performance.

About the Topic: Characteristics of separately-excited and shunt motors

Generally, three characteristic curves are considered for DC motors which are,

- (i) Developed Torque versus armature current
- (ii) Speed versus armature current
- (iii) Terminal characteristics (Speed versus developed torque)

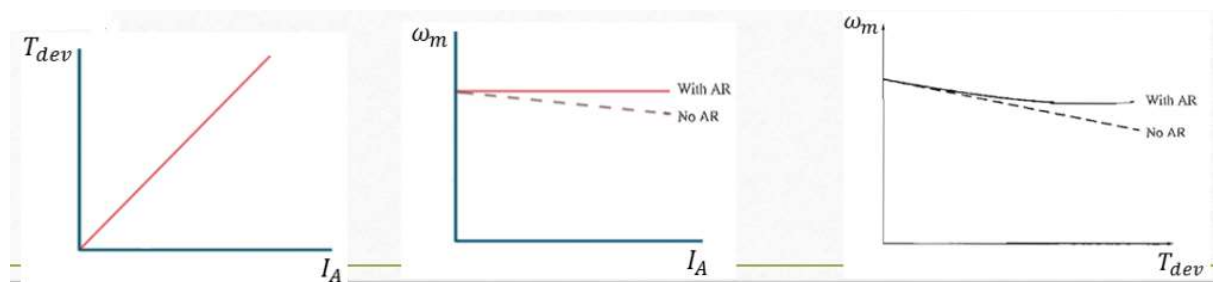
I. Separately excited/ Shunt DC motor:

A separately excited dc motor is a motor whose field circuit is supplied from a separate constant-voltage power supply, while a shunt dc motor is a motor whose field circuit gets its power directly across the armature terminals of the motor. When the supply voltage to a motor is assumed constant, there is no practical difference in behaviour between these two machines.

Torque vs. armature current: Generally, the developed torque is directly proportional to armature current and the relationship is in the form of a straight line, assuming the field flux Φ to be constant as the supply voltage is constant.

Speed vs. armature current: As flux Φ is assumed constant, the speed decreases with armature current increase. But practically, due to armature reaction, Φ decreases with increase in armature current, and hence the speed decrease slightly. Hence, a shunt motor can be assumed as a constant speed motor.

Torque vs. speed: As flux Φ is assumed constant, the speed decreases with developed torque increase. But practically, due to armature reaction, Φ decreases with increase in armature current, and hence the speed decrease slightly. Thus, at heavy loads, the motor speed is almost constant.



DC Series Motor Characteristics:

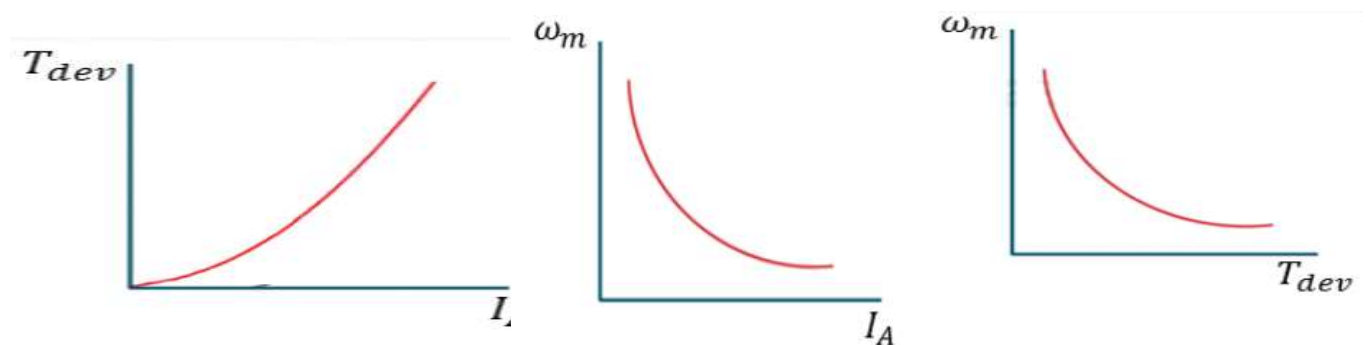




Fig. Practical Demonstration on Brake test of DC shunt Motor

Course Outcomes:

Student will be able to:

- Analyze the characteristics of DC shunt motors.