SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

CHITTOOR-517127

DEPARTMENT OF ELECTRICAL AND ELECTRONCIS ENGINEERING

ELECTRICAL MACHINES - I (18EEE222)

UNIT I

D.C. GENERATORS-CONSTRUCTION & OPERATION

PART-A

1. What is the difference between Lap winding and Wave Winding of a DC Machine armature.
2. List the factors involved in the voltage build up of a shunt generator.
3. Why the external characteristics of a DC shunt generator is more drooping than that of a separately excited generator?
4. What are the requirements of the excitation systems?
5. Why fractional pitched winding is preferred over full pitched winding?
6. Define Commutation and Commutation period.
7. Define Winding factor
8. Draw a schematic diagram indicating flow of energy in the conversion of Mechanical Energy to Electrical form.
9. What is armature reaction in DC generators? What are its effects?
10. Write the EMF equation of DC generator explaining all terms.

PART-B

1. Derive an expression for the emf of DC generator.
2. A 6-pole DC generator has 150 slots. Each slots has 8 conductors and each conductor has resistance of 0.01Ω.The armature terminal current is 15 A. Calculate the current per conductor and the drop in armature for Lap and Wave winding connections.
3. Write short notes on the following:
   (i) Self and separately excited DC generators
   (ii) Commutation.
4. Obtain the condition for maximum efficiency of the DC generator.
5. A 400V DC shunt generator has a full load current of 200 A. The resistance of the armature and field windings are 0.06 Ω and 100 Ω respectively. The stray losses are 2000 W.Find the Kw output of prime mover when it is elivering full load and find the load for which the efficiency of the generator is maximum.

UNIT II

TYPES OF D.C GENERATORS

PART-A

1. Mention the uses of DC generators.
2. Give few applications of Ward-Leonard systems.
3. Draw the External Characteristics of a DC Shunt generator.
4. What are the Characteristics of DC generators?
5. What are the different types of DC generators?
6. How the generators are classified based on method of excitation?
7. State the application of various types of generators.
8. Define back pitch and front pitch.
9. Define winding pitch and commutator pitch.
10. Why the air gap between the pole pieces and the armature is kept very small?

PART-B

1. Explain the different methods of excitation and characteristics of a DC generators with suitable diagrams.
2. Two DC shunt generators are connected in parallel to supply a load of 5000 A. Each machine has an armature resistance of 0.03 Ω and field resistance of 60 Ω but the emf of one machine is 600V and that of the other machine is 640 V. What power does each machine supply?
3. Explain armature reaction and commutation in detail.
4. Draw the OCC Characteristics and External Characteristics of DC generator.
5. A 100 kW DC hunt generator driven by a belt from an engine runs at 750 rpm and is connected to 230 V dc mains. When the belt breaks, it continues to run as a motor drawing 9kW from the mains. At what speed would it run? Given: Armature resistance= 0.018 Ω and field resistance=115Ω
6. Draw the performance characteristics of different types of DC generators and explain them.

UNIT III
D.C MOTORS

PART-A

1. Why the Starters necessary for starting DC motors?
2. Why is belt drive not suitable for DC series motor.
3. What is the significance of back emf in a DC motor?
4. Why DC series motor called variable speed motor?
5. List the merits and demerits of Swinburne's test.
6. What are the methods of speed control in DC motor?
7. Mention the application of various DC motor.
8. Give few applications of Ward-Leonard systems.
9. Draw the characteristics of DC compound motor.
10. State the voltage equation of DC motor.

PART-B

1. Explain the different methods of excitation and characteristics of a DC motors with suitable
diagrams.

2. Explain the various methods of controlling the speed of a DC shunt motor and bring out their
merits and demerits. Also, state the situations where each method is suitable.
3. (i) Derive from the fundamental, emf and torque equations and explain the characteristics of
Dc shunt motor.
(ii) What are the merits and demerits of Hopkinson's test?
4. (i) Discuss in detail about shunt armature speed control of dc shunt motor.
(ii) A 500V dc shunt motor running at 700 rpm takes an armature current of 50A.Its effective
armature resistance is 0.4Ω. What resistance must be placed in series with the armature to reduce
the speed to 600 rpm, the torque remaining constant?
5. (i) What are the various starting methods of DC motor? Explain any one method.
(ii) Explain in detail the various method of speed control in DC motor?

UNIT IV

SPEED CONTROL OF DC MOTOR ANALYSIS

PART-A

1. State Fleming's left hand rule?
2. How to reverse the direction of rotation of dc motor?
3. What is Back emf?
4. Draw the circuit model of various types of motors.
5. Define Speed regulation of dc motor.
6. Write the torque equation of a DC motor.
7. Draw the Speed-Current and torque-current Characteristics of a DC series motor.
8. State the function of NO Volt coil of the starter.
9. When you will say the motor is running at base speed?
10. State the advantages and disadvantages of Flux control method?

PART-B

1. With neat circuit diagram explain the conduction of Swinburne's test.
2. A DC series motor runs at 500 rpm on 220 V supply drawing a current of 50 A. The total resistance of the machine is 0.15Ω, Calculate the value of the extra resistance to be connected in series with the motor circuit that will reduce the speed to 300 rpm. The load torque being then half of the previous to the current.
3. A 250 V dc shunt motor runs at 1000 rpm on no load and takes 5A.The armature and shunt field resistance are 0.2Ω and 250Ω respectively. Calculate the speed when loaded and taking a current of 50A.Due to armature reaction the field weakens by 3%
4. (i)Draw and explain the characteristics of compound motor
   (ii)Explain the factor affecting the speed of a DC motor.

5. Explain the important ratings of a DC motor.
6. A 250V DC shunt motor has R f =150Ω and R a =0.6Ω.The motor operates on no-load with a full field flux at its base speed of 1000 rpm with Ia=50A.If the machine drives a load requiring a torque of 100 Nm, Calculate armature current and speed of motor. If the motor is required to develop 12 kW at 1200 rpm. What is the required value of the external series resistance in the field circuit? Assume linear magnetization. Neglect saturation and armature reaction.

UNIT V
TESTING OF D.C MACHINES

PART-A

1. Demonstrate How to reverse the direction of rotation of DC Motor?
2. Show at what load does the efficiency is maximum in DC Shunt Machines.
3. Illustrate the circuit model of various types of motors.
4. Point out why the Starters necessary for starting DC Motors?
5. What will happen to the speed of a dc motor when its flux approaches to zero?
6. Explain why Swinburne's test cannot be performed on DC Series Motor.
7. Criticize "belt drive not suitable for DC Series Motor why?"
8. Explain the significance of back emf in a DC Motor?
9. Explain the function of no-volt release in a Three point starter?
10. Mention the effects of differential compounding and cumulatively compound on the performance of DC Compound motor.

PART-B

1. Draw and Explain the Load Characteristics of Differentially and Cumulatively Compound DCGenerator
2. In commutation Explain the following terms (i)Mechanical Cause of Commutation (ii) Electricalcause of commutation (iii) Process of commutation (iv) Methods to improve commutation.
3. Explain in Detail about Swinburne's Test
4. Explain in Detail about Hopkinson's Test
5. Explain in Detail about Field's Test
6. Explain in Detail about Retardation's Test