

TED (10)–3054

Reg. No. ....

(REVISION—2010)

Signature .....

THIRD SEMESTER DIPLOMA EXAMINATION IN ELECTRICAL AND  
ELECTRONICS ENGINEERING—OCTOBER, 2012

DC MACHINES

[Time : 3 hours

(Maximum marks : 100)

PART—A

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. Mention any two insulating materials used in the construction of DC machines.
2. Write any two metals used in DC machines in the order of their conductivities.
3. State the principle behind the working of a DC generator.
4. Give any two reasons for poor commutation.
5. Write voltage equation of a long shunt compound motor. (5×2=10)

PART—B

II Answer *any five* of the following questions. Each question carries 6 marks.

1. (a) State properties and applications of ferro-magnetic materials. 4  
(b) Write factors that affect hysteresis loss. 2
2. Explain constructional details of field poles and method of fixing them to the yoke, with neat sketch. 6
3. Explain classification of DC self excited generator with neat schematic diagrams. 6
4. (a) State critical speed and critical field resistance. 4  
(b) Mention any two reasons for the failure of DC shunt generator to building up the voltage. 2
5. Explain the method of improving commutation in DC machines. 6
6. A 220 V DC shunt motor takes a current of 40 A and runs at 1100 rpm. If the armature and shunt field resistances are 0.25  $\Omega$  and 220  $\Omega$  respectively, find the torque developed by the armature. 6
7. (a) Briefly explain the necessity of starters for starting a DC shunt motor. 4  
(b) Mention various losses that occur in a DC motor under load. 2

## PART—C

(Answer one full question from each unit. Each question carries 15 marks.)

## UNIT—I

- III (a) Mention two advantages of grain oriented sheet steel compared to other magnetic materials. 2
- (b) Draw B-H curves for ferromagnetic material and explain. 5
- (c) Write short notes on :
- (i) Eddy current loss
- (ii) Hysteresis loss
- (iii) Classification of insulating material with respect to temperature
- (iv) Importance of residual magnetism in self excited generators. (4×2=8)

OR

- IV (a) List magnetic materials used in electric machines. 3
- (b) Give any three important properties of carbon and any one application of carbon in DC machines. 4
- (c) Write short notes on :
- (i) Applications of copper in DC machines
- (ii) Retentivity and residual magnetism
- (iii) Magnetic materials
- (iv) B-H curves. (4×2=8)

## UNIT—II

- V (a) The armature of a DC generator has 51 slots each contains 20 conductors. The flux per pole is 0.007 wb. Compute generator emf when the speed is 1500 rpm, if armature is :
- (i) Wave wound (ii) Lap wound
- Number of poles = 4. 7
- (b) Explain the constructional details of commutator in a DC machine with neat sketch. 8

OR

- VI (a) Derive emf equation of a DC generator. 7
- (b) Explain the construction of yoke and armature of a DC generator with neat sketch. 8

## UNIT—III

- VII (a) Draw open circuit characteristics of a DC shunt generator and explain method of obtaining critical resistance. 7
- (b) Explain the process of commutation in DC generator with neat sketch. 8

OR

- VIII (a) Draw and explain the external characteristics of a DC shunt generator. Why does the external characteristic curve turn back as the generator is over loaded? 8
- (b) Explain briefly the four bad effects of armature reaction. 4
- (c) Give reasons for the more rapid fall of terminal voltage in a self excited DC shunt generator than in a separately excited when loaded. 3

## UNIT—IV

- IX (a) Explain working principle of a DC shunt motor. 4
- (b) Derive armature torque equation for a DC shunt motor. 4
- (c) Determine the torque developed in the armature of a DC motor having 774 conductors in the wave wound armature. The flux per pole is 0.024 wb. Number of poles is 4 and armature current is 50 A. 7

OR

- X (a) Draw Torque Vs Armature current characteristics of DC series motor and shunt motor. Compare characteristics and write comments. 6
- (b) List any one applications of :  
 (i) DC series motor  
 (ii) DC shunt motor  
 (iii) Permanent magnet DC motor. 3
- (c) Explain the construction and working of a permanent magnet DC motor with neat sketch. 6
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