TED (15) – 4031

(REVISION — 2015)

Reg. No. .....

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FOURTH SEMESTER DIPLOMA EXAMINATION IN ELECTRICAL AND ELECTRONICS ENGINEERING — APRIL, 2017

DC MACHINES

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. State the purpose of commutator in a dc motor.
2. Define back pitch.
3. State the basic difference in construction between a dc motor and generator.
4. Which speed is possible in armature voltage control method ?
5. List out any two applications of dc shunt motor. (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Explain the purpose of the following in a dc machine.
   (a) Yoke
   (b) Pole core and pole shoe
   (c) Armature core
2. Derive the e.m.f. equation of a dc generator.
3. Explain the causes of failure to build up of voltage in a self excited dc shunt generator.
4. Define the following :
   (a) Critical speed (b) Critical field resistance
5. State the significance of back e.m.f. in a dc motor.
6. Illustrate the performance characteristics of dc series motor.
7. Draw the circuit arrangements of a swinburne's test in a dc shunt motor.

(5×6 = 30)

[P.T.O.

[207]

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Calculate the induced e.m.f. and efficiency of a 4 pole dc shunt generator having an armature resistance of 0.45 and a shunt field resistance of 75. The generator is delivering 15A to a load having a resistance of 15. Allow a drop of IV per brush, neglect iron and friction losses. 8

(b) Explain the working principle of a single loop generator with the help of a neat sketch. 7

OR

IV (a) Distinguish between terminal voltage and induced e.m.f. 8

(b) Explain different types of dc generators according to their field excitation with proper sketches. 7

UNIT — II

V (a) State and explain armature reaction and its effects. 8

(b) Draw and explain the O.C.C. of a separately excited dc shunt generator. 7

OR

VI (a) Define communication. What are the different methods of improving communication ? 8

(b) List out and explain the necessity of parallel operation of dc generator. 7

UNIT — III

VII (a) List out and draw the classifications of a dc motor based on field connections. 8

(b) A 200V dc shunt motor runs at 1100 r.p.m. at no load and takes 6A. Armature and shunt field resistances are 0.5Ω and 220Ω respectively. Calculate the speed when loaded and taking 25A. Assume flux to be constant. 7

OR

VIII (a) Draw and write the voltage equation of a dc shunt motor. 4

(b) Draw and explain different methods of speed control of dc shunt motor. 6

(c) A 220V dc shunt motor has an armature resistance of 1Ω and field resistance of 180Ω. Find out the back e.m.f. if the line current is 12A. 5

UNIT — IV

IX (a) A 440V dc shunt motor takes 6A when running on no load. Its armature and shunt resistances are 0.65 and 200 respectively. Find out the output of the motor and efficiency when running on full load and taking a current of 25A. 12

(b) List out any three applications of dc shunt motor. 3

OR

X (a) Illustrate the mechanical and electrical characteristics of a dc shunt generator. 8

(b) Explain the construction and working of a permanent magnet dc motor. 7