

B.TECH SEM - III (2007 COURSE) (ELECTRICAL ENGG.) :
WINTER - 2017

SUBJECT : DC MACHINES THEORY & DESIGN

Day : **Monday**
Date : **15/01/2018**

W-2017-2367

Time : **10.00 AM TO 01.00 PM**
Max. Marks : 80

N.B.:

- 1) **Q.No.1 and Q.No.5 are COMPULSORY.** Out of the remaining questions attempt **ANY TWO** questions from each section.
- 2) Answers to both the sections should be written in **SEPARATE** answer books.
- 3) Use of non programmable **CALCULATOR** is allowed
- 4) Draw neat and labeled diagrams **WHEREVER** necessary.
- 5) Figures to the right indicate **FULL** marks.
- 6) Assume suitable data if necessary.

SECTION – I

- Q.1** a) Derive the emf equation of DC Generator. **[05]**
- b) State and explain the different types of DC motor. **[05]**
- c) Explain the effect of armature reaction on losses in DC machines. **[04]**
- Q.2** a) A long shunt compound generator delivers a load current of 50A at 500V and has armature series field and shunt field resistance of 0.05Ω , 0.03Ω and 250Ω respectively. Calculate the generated voltage and the armature current. Allow 1V per brush for contact drop. **[07]**
- b) Explain the various characteristics of shunt and series generator. **[06]**
- Q.3** a) Derive the torque equation of a DC motor. **[07]**
- b) Explain with neat sketch the different speed control methods for DC shunt motor. **[06]**
- Q.4** a) Explain the swinburne's test on DC motor. Also state the advantages of swinburne's test. **[07]**
- b) In a brake test on dc shunt motor, the tensions on the two sides of the brake were 2.9kg and 0.17kg. Radius of the pulley was 7cm. Input current was 2 amp at 230v. The motor speed was 1500rpm. Find the torque, power output and efficiency. **[06]**

SECTION – II

- Q.5** a) Derive the output equation for a DC machine. **[05]**
- b) Discuss the temperature rise and efficiency of a DC machine. **[05]**
- c) Write different modes of heat dissipation. Explain any two. **[04]**

P.T.O.

Q.6 a) Find the main dimensions of a 35kw, 110v, 4-pole DC shunt generator using following data: **[06]**
 $B = 0.5T$, $a_c = 27000ac/m$, pole arc = $0.7 \times$ pole pitch, $L = 1.1 \times$ pole arc, full load efficiency = 85%, field current = 10A, armature resistance drop = 4V.

b) Define: **[07]**
i) Total Magnetic Loading
ii) Total Electric Loading
iii) Specific Magnetic Loading
iv) Specific Electric Loading

Q.7 a) A 250V, 37kw dc shunt generator has to exert a maximum torque of 150% of full load torque during the starting period. The resistance of the armature circuit is 0.2Ω and full load efficiency is 84%. The no. of studs is 08. Determine : **[07]**
i) The upper and lower limits of current during starting.
ii) The resistance of each section.

b) Write short note on: **[06]**
i) Losses in DC machines
ii) Design of heating coil

Q.8 a) The temperature rise of a transformer is $35^{\circ}C$ after 1 hr. and $45^{\circ}C$ after 2 hrs. of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. **[07]**

b) Write short notes on different modes of heat dissipation. **[06]**

* * * *