(Pages : 3) **9707**

Reg. No. : .....

Name : .....

Third Semester B.Tech. Degree Examination, January 2016
(2013 Scheme)
Branch : Electrical and Electronics Engineering
13.305 : DC MACHINES AND TRANSFORMERS (E)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. What is compensation winding ? What is its function ?
2. Define the terms 'critical resistance' and 'critical speed' and bring out their role in the process of self-excitation of a dc machine.
3. In every dc generator, a motor action occurs and in every dc motor a generator action occurs ? Explain.
4. Draw the speed-torque characteristics of various types of dc motors.
5. List the applications of dc shunt, dc series and dc compound motors.
6. For a DC motor the field flux-speed control method is called a constant power drive method. Explain.
7. In Sumpner's test, the reading of the wattmeter recording the core losses, remain unaffected when low-voltage is injected in the secondary series circuit ? Explain.
8. Why all-day efficiency of a transformer is less than its full-load efficiency ?
9. How can the problems of unbalanced voltages and third harmonic currents are overcome in star-star connected transformer ?
10. Draw the Scott connection of transformers and mark the terminals and turn-ratio. **(10×2=20 Marks)**

P.T.O.

PART – B

Answer **one full** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. a) Explain the methods to improve the commutation made machine. **10**

    b) A dc-series generator is running at 800 rpm and is supplying a load of 6kW at 120V. The speed is increased to 1200 rpm and load is increased to 9kW. The sum of armature and field resistance is $0.4\,\Omega$. Find new value of armature current and terminal voltage. Neglect armature reaction. **10**

OR

12. a) Discuss the process of self-excitation in a dc machine. What conditions must be fulfilled for self-excitation. **10**

    b) A dc shunt generator has field resistance of $100\,\Omega$. The terminal voltage is 50V at 1000 rpm, 226V at 2000 rpm and 400V at 3000 rpm. Draw magnetization curve at 2000 rpm and find terminal voltage if field resistance is reduced to $80\,\Omega$. Neglect losses. **10**

Module – II

13. a) Describe with neat diagram the working of a three-point starter for a dc-shunt motor. **10**

    b) A 200V d.c. shunt motor takes 27A at rated voltage and runs at 800 rpm. Its field resistance is $100\,\Omega$. If an additional resistance of $20\,\Omega$ is inserted in the armature circuit, compute the motor speed and the line current in case load torque varies as the square of the speed. **10**

OR

14. a) Describe the construction and working of permanent-magnet dc motors. **10**

    b) In a retardation test on a separately excited dc motor, the induced emf in the armature falls from 220V to 190V in 30 sec. on disconnecting the armature from the supply. The same fall takes place in 20 sec. if, immediately after, armature is connected to a resistance which takes 10A (average) during fall. Find stray losses of the machine. **10**

Module – III

15. a) A single phase transformer has 400 primary and 1000 secondary turns. The net cross-sectional area of the core is 60 cm^2. If the primary winding be connected to a 50Hz supply at 520V, Calculate
    i) the peak value of flux density in the core
    ii) the voltage induced in the secondary winding. **10**

    b) A 100kVA single-phase transformer has $N_1 = 400$, $N_2 = 80$, $R_1 = 0.3\,\Omega$, $X_1 = 1.1\,\Omega$, $R_2 = 0.01\,\Omega$, $X_2 = 0.035$. The applied voltage is 2200V. Find
    a) total impedance as referred to primary
    b) voltage regulation and output-voltage at 0.8 lagging power factor full-load. **10**

OR

16. a) Discuss with neat sketch different methods of cooling used for transformers. **10**

    b) In a Sumpner's test on two identical single-phase transformers rated 500kVA, 11/0.4kV, 50Hz the wattmeter reading on H.V. side is 6000W and on L.V. side is 15000W. Find the efficiency of each transformer on half full-load and 0.8 power factor. What will be its maximum efficiency ? **10**

Module – IV

17. a) What are the applications of 3-winding transformers ? How can this transformer be represented by an equivalent circuit. Give the details of tests to find out the parameters of the equivalent circuit. **10**

    b) A balanced 3-phase, 200kW load at 400V and 0.8 power factor lagging is to be supplied from a two-phase 1100V supply. Determine voltage and current rating of each winding of Scott connected transformers and kVA rating of each unit. **10**

OR

18. a) Why are tap changing transformer required ? Explain operation of no load tap changing transformer. **8**

    b) A 3-phase star connected auto-transformer is used to supply a 350V load from a 440V 3-phase system. The load draws 50kW at 0.8 lagging power factor.
    a) Draw a diagram of connections.
    b) Calculate the currents in different windings of autotransformer and show them on the diagram. Neglect losses. **12**
