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Reg. No. : .....

Name : .....

Third Semester B.Tech. Degree Examination, November 2014
(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. Draw the external characteristics of shunt and cumulative compound DC generators.
2. State the condition under which DC generator fails to excite.
3. Explain back e.m.f. in DC motors.
4. Why starters are necessary for DC motors ?
5. Explain why the brushes of DC machines are given backward shift.
6. Explain why transformers are rated in kVA.
7. What losses are present in a transformer ?
8. Give the condition to be satisfied for parallel operation of transformer.
9. Discuss the advantages of autotransformer.
10. In a Tap changing transformer on which side is the tap connected H.V side or L.V side ? **(10×2=20 Marks)**

PART – B

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

Module – I

11. a) Explain in detail the armature reaction in the DC machines. 10

P.T.O.

b) A 220V D.C shunt generator runs at 1000 rpm and takes current of 25 A. Find the resistance to be added to the field circuit to increase the speed to 1200 rpm at an armature current of 40 A. Assume flux is proportional to field current. Armature resistance and field resistance are 0.3Ω and 500Ω respectively. **10**

OR

12. a) Explain with neat sketch the process of commutation in a DC machine. **10**

b) A 12 pole D.C generator has a simplex wave wound armature containing 144 coils of 10 turns each. The resistance of each turn is 0.011Ω. Its flux per pole is 0.05 Wb and it is running at a speed of 200 rpm. Obtain the induced armature voltage and the effective armature resistance. **10**

Module – II

13. a) Explain the methods speed control of D.C shunt and series motors. **10**

b) A retardation test is performed on a separately excited D.C machine as a motor. The induced voltage falls from 240 volts to 220 volts in 25 seconds, on opening the armature circuit and in 6 seconds on suddenly changing the armature connection from supply to a load resistance, which takes an average current of 10 Amperes. Find the efficiency of the machine running as a motor taking a current of 25 ampere's from 250 volts supply. Armature resistance and field resistance of Machine : $R_a = 0.30\Omega$ and $R_{sh} = 200\Omega$. **10**

OR

14. a) Explain the Hopkinson test for obtaining the efficiency of two similar shunt motors. **10**

b) In Hopkinson's test on two identical dc shunt machines, the following readings were obtained :

Line current : 49.4 A, Line voltage : 460 V, Motor Armature Current : 300 A; Field currents : 5 A and 4.4 A. Armature resistance of each machine : 0.05Ω. Calculate the efficiency of each machine. **10**

Module – III

15. a) Discuss the different methods of cooling used for transformers. **10**

b) Find all-day efficiency of a transformer having maximum efficiency of 98% at 15 kVA at unity power factor and loaded as follows :

i) 12 hours – 2 kW at 0.5 p.f lag.

ii) 6 hours – 12 kW at 0.8 p.f lag.

iii) 6 hours – at no-load. **10**

OR

16. a) Develop the phasor diagram of a single-phase transformer under lagging power factor load. 10

    b) A 100 kVA, 2400/240 V, 50 Hz single phase transformer has an exciting current of 0.64 A and a core loss of 700 watts, when its high-voltage side is energized at rated voltage and frequency. Calculate the two components of the exciting current.

    If the above transformer supplies a load current of 40 A at 0.8 p.f lag on its 1.v side, then calculate the primary current and its power factor. Ignore leakage impedance drops. 10

Module – IV

17. a) Explain the working principle and construction of an auto-transformer. 8

    b) A 200 VA, 120/12 V two-winding transformer is to be used as an auto-transformer. The input voltage is 120 V. (a) What is the secondary voltage ? (b) What is the maximum VA rating of auto-transformer ? 12

OR

18. a) Explain the advantage of using a tertiary winding in a bank of star-star transformer. 8

    b) A 100 kVA, 3-phase, 50 Hz, 3300/400 V transformer is delta-connected on the hv and star-connected on the 1.v side. The resistance of the hv winding is 3.5Ω per phase and that of the 1.v winding 0.02Ω per phase. Calculate the iron losses of the transformer at normal voltage and frequency if its full-load efficiency be 95.8% at 0.8 p.f (lag). 12
