ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : MAY / JUNE 2010

REGULATIONS : 2007

THIRD SEMESTER : EEE

070280009 - DC MACHINES AND TRANSFORMERS

TIME : 3 Hours **Max.Marks : 100**

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Why the fields in rotating machines should be quasi-static in nature?
2. Write the equation which relates rotor speed in electrical and mechanical radians/second.
3. Write the applications of single excited and the doubly excited magnetic system.
4. Define the terms i) Pole pitch ii) chording angle
5. Define critical field resistance and critical speed in DC shunt generator.
6. What is commutation?
7. Under what circumstances does a DC shunt generator failed to build up?
8. Name any two applications of DC series generator.
9. How does 4 -point starter differ from 3 point starter?
10. Why DC series motor is not started at no load?
11. What is back emf in DC motors?
12. What is the function of a no-voltage release (NVR) coil provided in a DC motor starter?
13. Why transformer is rated in kVA?
14. Mention the condition for maximum efficiency.
15. Define all day efficiency of a transformer.
16. Define the regulation up and regulation down of a transformer.
17. What are the advantages and disadvantages of sumpner's test?

18. Why iron losses are considered as constant loss in Transformer?
19. Give the purpose of conducting polarity test in transformers.
20. Give the expression for load current when the transformer operates at its maximum efficiency.

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. With neat sketch explain the multiple excited magnetic field system in electro mechanical energy conversion systems. Also obtain the expression for field energy in the system.

22. A 4-pole, lap connected DC machine has 540 armature conductors. If the flux per pole is 0.03 web and runs at 1500 RPM, determine the emf generated. If this machine is driven as a shunt generator with same field flux and speed, calculate the line current if the terminal voltage is 400V.Given the R_{sh}=450Ω and R_a=2Ω

23. A 230V, DC shunt motor, takes an armature current at 3.33A at rated voltage and at a no load speed of 1000RPM. The resistances of the armature circuit and field circuit are 0.3 Ω and 160 Ω respectively. The line current at full load and rated voltage is 40A. Calculate, at full load, the speed and the developed torque in case the armature reaction weakens the no load flux by 4%.

24. a) Derive the emf equation of single phase transformer. (6)

b) A 120kVA, 6000/400V, Y/Y, 3-phase, 50Hz transformer has an iron loss of 1800W. The maximum efficiency occurs at ¾ full load. Find the efficiency of the transformer at
(i) Full load and 0.8 pf (6)
(ii)the maximum efficiency at unity pf.

25. Obtain the equivalent circuit of a 200/400V,50Hz,single phase transformer from the following test data:
OC test: 200V,0.7A,70W on LV side
SC test: 15V,10A,85W on HV side

26. Two separately excited DC generators are connected in parallel and supply a load of 200A. The machines have armature circuit resistances of 0.05Ω and 0.1Ω and induced emfs of 425V and 440V respectively. Determine the terminal voltage, current and power output of each machine. The effect of armature reaction is to be neglected.

27. a) Describe the working of 3 point starter for DC shunt motor with neat diagram. (6)
b) Explain Ward-Leonard method of speed control in DC motors. (6)

28. Draw the circuit diagrams for conducting OC and SC tests on a single phase transformer. Also explain how the efficiency and voltage regulation can be estimated by these tests.

*****THE END*****