C 26883 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION MAY 2012

EE 09 404/PTEE 09 403—DC MACHINES AND TRANSFORMERS

(2009 Admissions)

Time : Three Hours Maximum : 70 Marks

Part A

All questions are **compulsory.**

1. What is the function of Equalizer rings in a lap wound dc machine ?
2. How do the Interpoles help commutation in a dc machine ?
3. How does a differentially compounded motor behave under high over-load conditions ?
4. Why is the transformer core built from thin stampings ?
5. In a three phase shell type transformer, the direction of the winding on the central limb is reversed with respect to outer two limbs. Why ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. With a neat sketch, explain the functions of each part of a dc machine.
7. Derive the emf equation of a dc generator.
8. Give the conditions to be satisfied for voltage buildup in a dc shunt generator.
9. Draw the power flow diagrams of a dc generator and a dc motor.
10. Bring out the main advantages and disadvantages of Swinburne's test.
11. Develop the phasor diagram of a single phase transformer under load condition. Assume lagging power factor load.
12. State the conditions necessary before two three phase transformers may be connected in parallel and the conditions for satisfactory parallel operation on load.

(4 × 5 = 20 marks)

Part C

13. (a) Derive the relation between mmf, reluctance and flux.

    (b) A coil of 300 turns and of resistance 10 Q is wound uniformly over a steel ring of mean circumference 30 cm, and cross-sectional area 9 cm^2. It is connected to a supply at 20 V dc. If the relative permeability of the ring is 1500, find the magnetizing force, the reluctance, the mmf and the flux.

Or

Turn over

14. (a) Bring out the difference between dynamically and statically induced emfs.

(b) Write short notes on Magnetic hysteresis and hysteresis loss.

15. (a) With neat sketches, explain the armature reaction in dc machines.

(b) An 8 pole dc generator has 480 wave connected armature conductors. The armature current is 200 A. Find the cross-magnetizing and demagnetizing ampere turns per pole if

(i) brushes are on GNA ;

(ii) brushes are shifted by 6^0 electrical from GNA ; and

(iii) brushes are shifted by 6^0 mechanical from GNA.

Or

16. Explain the process of commutation in a dc machine and describe the methods to improve it.

17. (a) With a neat sketch, explain the construction and working of a three point starter.

(b) A 110 kW belt driven shunt generator running at 400 r.p.m on 220 V busbars continues to run as a motor when the belt breaks. As a motor it takes 11 kW. Find the speed at which it will run as a motor if the resistance of the armature and field are 0.025 Ω and 55 Ωrespectively. Brush contact drop is 2 V.

Or

18. Briefly explain the Hopkinson's test for determination of efficiency of d.c. shunt machines. Also bring out the advantages and limitations of this test.

19. (a) If the magnetizing current of a single phase transformer is assumed a sine wave, then show that the flux wave must be flat-topped.

(b) The voltage applied to the primary of a single phase transformer at no-load is given by

$$v = 200 \cos \omega t + 80 \cos 3\omega t$$

If the primary has 300 turns, then calculate the maximum value of the flux in the core for a fundamental supply frequency at 50 Hz.

Or

20. Describe in detail, the four phasor groups pertaining to three phase transformers. Draw the phasor diagrams and connection schemes for each of these four groups.

(4 × 10 = 40 marks)

[redacted]