C 15643 (Pages : 3) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2011

EE 09 404/PTEE 09 403 – D.C. MACHINES AND TRANSFORMERS

(2009 Admissions)

Time : Three Hours Maximum : 70 Marks

Part A

All *questions are* **compulsory.**

1. What are dummy coils?
2. What is meant by demagnetizing and cross-magnetising effects of armature reaction in d.c. machine?
3. What are the different methods of speed control of a d.c. motor?
4. Define all day efficiency.
5. What are the possible connections for a three-phase transformer bank?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. With a neat sketch, explain the functions of each part of a d.c. machine.
7. What are the different types of d.c. machines according to the ways in which fields are excited? Draw the connection diagram of each type.
8. Explain the methods of improving commutation.
9. Explain the speed-current, torque-current and speed-torque characteristics of d.c. compound motor.
10. Draw the power flow diagram of a d.c. generator and a d.c. motor.
11. Derive expressions for the r.m.s. values of the induced voltages in the two windings of a single-phase transformer connected to sinusoidal supply.
12. Explain the advantages of using a tertiary winding in a bank of star-star transformers.

(4 × 5 = 20 marks)

Part C

13. (a) A coil is wound with 300 turns over a steel ring of relative permeability 900 having a mean circumference of 40 mm and cross-sectional area of 500 mm^2. If a current of 25 A is passed through the coil find mmf, reluctance and flux.

(b) Point out the analogy between electric and magnetic circuits.

Or

14. (a) A 4 pole d.c. machine armature has 13 slots. Develop a simplex lap winding with 2 coil sides per slot.

(b) A coil of 300 turns and of resistance 10 Ω 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 d.c. If the relative permeability of the ring is 1500, find the magnetizing force, the reluctance, the mmf and the flux.

15. (a) Explain clearly the process of commutation.

(b) A 4 pole lap wound armature running at 1500 r.p.m. delivers a current of 150 A and has 64 commutator segments. The brush spans 1.2 segments and inductance of each armature coil is 0.05 mH. Calculate the value of reactance voltage assuming sinusoidal commutation. Neglect mica thickness.

Or

16. Explain the period of commutation, reactance voltage during commutation, e.m.f. commutation and resistance commutation.

17. A 4 pole d.c. shunt motor has a flux per pole of 0.04 Wb and the armature is lap wound with 720 conductors. The shunt field resistance is 240 Ω and the armature resistance is 0.2 Ω. Brush contact drop is 1 V per brush. Determine the speed of the machine when running as a

(a) Generator supplying 120 A and

(b) Motor taking 60 A.

The terminal voltage in each case is 480 V.

Or

18. The Hopkinson's test on two shunt machines gave the following results on full-load :

Line voltage = 250 V ; Line current excluding field currents = 50 A ; Motor armature current = 380 A ; Field currents = 5 A and 4.2 A.

Assuming resistance of each machine as 0.02 Ω, determine the efficiency of each machine.

19. A three-phase, 11 kV alternator delivers 10 MVA to a three-phase, 132 kV transmission line through three identical single-phase transformers. Determine the voltage, current and kVA ratings of each transformers if they are connected in (a) Yy ; (b) Dd ; (c) Yd ; (d) Dy.

Or

[redacted]

20. (a) In Yy0 transformer, the polarities of phase winding B are reversed. Explain, with phasor diagrams, its effect on the secondary output voltages.

(b) In a Yy0, 11000/433 V, three-phase transformer, the polarities of phase B winding get reversed. Find the magnitude of the output voltages with appropriate phasor diagrams.

(4 × 10 = 40 marks)

[redacted]