C 40947 **(Pages 2)** Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2013

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

(2009 Scheme—Regular/Supplementary/Improvement)

Time : Three Hours Maximum : 70 Marks

Part A

All questions are **compulsory**.

1. What are commutating poles ? Why are they used ?
2. Define armature reaction.
3. A dc series motor should not be started at no-load. Why ?
4. What are the losses that occur in d.c. machines ?
5. Why the primary of the transformer draws current from the mains when the secondary is not carrying any load (Open circuit) ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. A 4-pole d.c. machine armature has 13 slots. Develop a simplex lap winding with 2 coil sides per slot.
7. Describe with relevant diagrams the different methods of excitation of d.c. machines.
8. Explain the various possible causes for d.c. shunt generator not building up voltages.
9. Explain the speed-current, torque-current and speed-torque characteristics of d.c. shunt motor.
10. Discuss the different methods of speed control of a d.c. motor.
11. Describe the operation of a single-phase transformer, explaining clearly the functions of the different parts.
12. If an autotransformer is made from a two winding transformer having a turns ratio $\frac{T_1}{T_2} = a$, show that $\frac{\textit{magnetizing current as an autotransformer}}{\textit{magnetizing current as a two winding transformer}} = \frac{a-1}{a}$.

(4 × 5 = 20 marks)

Turn over

Part C

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

    (b) With a neat sketch, explain the functions of each part of a d.c. machine.

Or

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

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

15. (a) Develop an expression for demagnetizing and cross magnetizing armature ampere turns in a d.c. generator.

    (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 linear commutation. Neglect mica thickness.

Or

16. Explain the process of building up of voltage in d.c. shunt generator and give the conditions to be satisfied for voltage buildup.

17. Describe Swinburne's test with the help of a neat diagram to find out the efficiency of a d.c. machine. Bring out the main advantages and disadvantages of this test.

Or

18. A 200 V, 14.92 kW d.c. shunt motor when test by swinburne's method gave the following results : Running light : armature current = 6.5 A and field current = 2.2 A

    With armature locked : The current was 70 A when a potential difference of 3 V was applied to the brushes.

    Estimate the efficiency of the motor when working under full-load condition.

19. (a) Describe the merits and demerits of a bank of three single-phase transformers as compared to a three-phase core type transformer.

    (b) Explain why it is essential to have one three-phase winding in delta for the transformers used in three-phase systems.

Or

20. (a) Compare the behaviour of star/star transformer with star/zig-zag transformer.

    (b) A star-star transformer is to be operated in parallel with delta-zigzag transformer. Calculate their HV to LV phase turns ratio, in case primary and secondary voltages are 420 V and 140 V respectively.