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Code No. : 22214

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (E.E.E.) II Year II-Semester Main & Backlog Examinations, May-2017

Electrical Machinery-I

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Explain the terms (a) Flux linkages (b) Leakage flux
2. Give examples for multiple excited magnetic systems.
3. Explain the concept of armature reaction and list the methods for minimizing the effects of armature reaction.
4. Distinguish between lap winding and armature winding.
5. List the factors affecting the process of commutation in a DC machine.
6. Discuss the various speed control methods of DC motors.
7. Derive an expression for the induced emf in a transformer.
8. What are various losses that occur in a transformer?
9. Illustrate the necessity of tap changing transformers.
10. Distinguish between Y-Y connection and Δ - Δ connection of transformers.

Part-B (5 × 10 = 50 Marks)

(All bits carry equal marks)

11. a) Derive an expression for the mechanical force developed in an attracted armature type relay excited by an electric source.
b) Two coupled coils have self and mutual inductance of $L_{11} = 2 + 1/2x$; $L_{22} = 1 + 1/2x$; $L_{12} = L_{21} = 1/2x$ over a certain range of linear displacement x . The first coil is excited by a constant current of 20A and the second coil by a constant current of -10A. Find:
i) Mechanical work done if x changes from 0.5 to 1m
ii) Energy supplied by each electrical source in part (a)
iii) Change in field energy in part (a)
12. a) Compare the Volt-Ampere characteristics of various types of DC generators.
b) By means of a neat diagram showing the cross section of a DC machine, discuss various parts and their functions.
13. a) A DC shunt motor takes 2A on no load when connected to 250 V DC mains with an armature resistance of 1Ω when the field current is 1 A. Determine the load current corresponding to maximum efficiency.
b) Describe Swinburne's test. What are the advantages and disadvantages of Swinburne's test?
14. a) Describe how polarity test on a transformer is conducted.
b) A 20kVA, 50 Hz, 2000/200 V distribution transformer has a leakage impedance of $0.42 + j0.52 \Omega$ in the High Voltage winding and $0.004 + j0.05 \Omega$ in the Low Voltage winding. When seen from the L.V. side the shunt branch admittance Y_0 is $(0.002 - j0.015)$ mho at rated voltage and frequency. Draw the equivalent circuit referred to (a) H.V. side and (b) L.V. side, indicating all the impedances on the circuit.

15. a) Compare ON-load and OFF- load tap changing transformers.
b) Draw the schematic diagram of Y- Δ connection of 3- Φ transformers. Explain the advantages of this scheme
16. a) Explain the concept of field energy.
b) A 220V DC generator supplies 4 kW at a terminal voltage of 220V. The armature resistance is 0.4 Ohms. If the machine is now operated at the same terminal voltage with the same armature current calculate the ratio of generator speed to motor speed assuming that the flux per pole is made to increase by 10% as the operation is changed over from generator to motor.
17. Write short notes on any *two* of the following:
a) Field's test
b) On load Phasor diagram for lagging load for a Transformer.
c) On load tap changer.

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B.M.T.