Roll No. | | | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2014

ELECTRICAL AND ELECTRONICS ENGINEERING

Semester 4

EE9253 ELECTRICAL MACHINES I

(Regulation 2008)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Draw the electrical equivalent of magnetic circuit.
2. State the relationship between the co-energy and the force exerted in an electro mechanical device.
3. State the advantages of using tap changers in transformers.
4. Where do we use three winding transformers?
5. Distinguish the use of lap and wave windings.
6. State the advantages of distributed windings.
7. Distinguish the usage of shunt and separately excited systems.
8. What is the need for having brush contacts in DC machines?
9. State the reason for having high current through the armature during starting.
10. Discuss the advantages and disadvantages of using permanent magnets in electrical machines.

Part – B (5 x 16 = 80 marks)

11. (i) Illustrate with a neat sketch any two methods of controlling the speed of the DC motor. (10)
(ii) Illustrate with a neat sketch, the test procedure for determining the losses in a DC machine. (6)

12. a) Consider a C-Core magnetic circuit, with rectangular cross section of 25 square mm. Let there be an airgap of 2 mm present in the core. Determine the Flux present in the air gap when 10 A is passed through 100 turns of coil wound around the core. Let the running length of the C core without excluding air gap be 100 mm. (16)

(OR)

b) Consider a singly excited system of your choice and derive expressions for developed torque in terms of energy and co-energy. (16)

13. a) Draw the equivalent circuit of a transformer. Illustrate the test procedure to determine the equivalent circuit parameters. (16)

(OR)

b) Draw the equivalent circuit of a transformer. Derive expressions for maximum torque developed, efficiency and slip at which maximum torque occurs in terms of the equivalent circuit parameters. (16)

14.

a) (i) Draw the lap-winding diagram for a 4-pole, 12-slot armature with two coil-sides/slot. Assume single turn coils and indicate the number and position of brushes. (10)

(ii) Illustrate with a neat sketch MMF pattern of a pulsating field winding (6)

(OR)

b) (i) Explain how the harmonics gets reduced due to short pitched and distributed windings (10)

(ii) Determine the fundamental, third and fifth harmonic breadth factors for a stator with 36 slots wound for 3-phase and 4-poles. (6)

15. a) (i) What is armature reaction? What is the method available to reduce its effect? Explain. (8)

(ii) Derive expressions for the generated voltage in DC Generator (8)

(OR)

b) (i) A 220 V DC generator supplies 4 kW at a terminal voltage of 220 V. The armature resistance is 0.4 Ohms. The machine is operated at the rated terminal voltage with rated armature current but as a motor. Determine the ratio between the motor and generator speed. Let the flux per pole be made to increase by 10% as the operation changes over from generator to motor. (8)

(ii) Write short notes on the commutation problem in Dc machines. (8)