

2122
B.E. (Electrical and Electronics Engineering)
Third Semester
PC-EE-302: Electrical Machine: - I

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Assume data (if any) can be appropriately assumed.

x-x-x

1. Explain in brief.

- a) Write the expression for rotor speed, N_r of three-phase induction machine and hence write various methods of speed control of this machine. (02)
- b) Draw the torque-speed curves of the single- and three-phase induction machines and compare these curves in terms of their starting torques. (02)
- c) Draw the approximate equivalent circuit diagram of a single phase transformer and also write various approximations made. (02)
- d) What is the difference between three-point and four-point starters being used for starting of a DC machine? (02)
- e) How hysteresis and eddy current losses of a transformer can be reduced? (02)

Part A

2. a) The exciting current was found to be 3 amperes when measured on the LV side of the 20-kVA, 2000/200-V transformer. Its equivalent impedance (referred to the HV side) is $8.22 + j 10.2$ ohms. Select the transformer rating as the base. (03)
 - a. Find the exciting current in pu on the LV as well as HV side.
 - b. Express the equivalent impedance in pu on the LV as well as HV side
- b) Connect the three single-phase transformers in delta/delta configuration and explain its working through appropriate phasor diagram. (04)
3. a) Determine the equivalent circuit parameters of a single-phase transformer by conducting appropriate tests on it. Also, name these tests. (03)
(03)
- b) Explain ward-leonard method of speed control of DC machine. (04)
- 4.a) What is armature reaction in DC machine? How the effect of armature reaction can be minimized by reducing the carbon brush resistance? Prove it mathematically. (05)
- b) A 220-V dc generator supplies 4kW at a terminal voltage of 220 V, the armature resistance being 0.4 ohms. If the machine is now operated as a motor at the same

(2)

terminal voltage with the same armature current, calculate the ratio of generator speed to motor speed. Assume that the flux/pole is made to increase by 10% as the operation is changed over from generator to motor.

PART B

5. a) Develop the equivalent circuit diagram of a single-phase induction motor from double revolving theory point-of-view. (07)
- b) Explain the working of a centrifugal switch with the help of appropriate diagram. (03)
6. a) Develop the power-slip characteristics of a three-phase induction machine. And, hence develop the expression for maximum power developed in motoring region. (08)
- b) Develop the condition for maximum torque development of a three-phase induction machine. (02)
7. Write short notes on: (5)
- a. Self-excited induction generator
- b. How rotating torque will be developed in a three-phase induction machine? (5)

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