2124
B.E. (Electrical and Electronics Engineering)
Third Semester
EE-301: Electric Machinery - I

Time allowed: 3 Hours   **Max. Marks: 50**

*NOTE: Attempt **five** questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Assume suitably missing data, if any.*

x-x-x

Q1a. How eddy current losses can be reduced in a single-phase transformer?   2

b. Draw the phasor diagram of a single phase transformer at no-load.   2

c. What is the major difference between three-point and four-point starter of a DC machine?   2

d. Define the concept of slip in three-phase induction machine.   2

e. What is the difference between main winding and auxiliary winding of a single-phase induction machine?   2

Part-A

Q2 Two single-phase transformers having the same voltage ratio on no-load operate in parallel to supply a load of 1000 kVA at 0.8 p. f. lagging. One transformer is rated at 400 kVA and has a per unit equivalent impedance of 0.01+j0.06; the other is rated at 600 kVA and has a per unit impedance of 0.01+j0.05. Determine the load on each transformer in kVA and the operating power factor.   10

Q3a. Derive the expression for efficiency of a single-phase transformer and also derive the condition for maximum efficiency.   3,2

b. Explain any one method of speed control of DC shunt motor.   5

Q4a. Derive the expression for induced emf in a DC machine.   4

b. A lap wound DC shunt generator having 80 slots with 10 conductors per slot generates an emf of 400 V at no load, when running at 1000 rpm. At what speed should it be rotated to generate a voltage of 220 V on open circuit?   6

Part-B

Q5 Develop the expression for electromagnetic torque developed for a three-phase induction machine. Also, develop the expressions for starting and maximum torques.   5,2,3

Q6a. Develop the equivalent circuit model of a single-phase induction motor based on revolving field theory.   5

b. Explain the concept of double revolving field theory with appropriate phasor representations.   5

Q7 Write short notes on following:
a. Self-excited induction generator
b. Blocked rotor test on a three-phase induction machine.   5
                                                                5

x-x-x