E-14

3rd. 27.

1128

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. Missing data (if any) can be appropriately
assumed.

x-x-x

Q1. Explain briefly
  A) Draw the labeled connection diagram of the potential transformer.   (2)
  B) What is meant by the saturation curve? What test must be performed to determine data for its construction?   (2)
  C) Draw only labeled phasor diagram of the transformer for lagging power factor load.   (2)
  D) Write all methods used for the speed control of the induction motor.   (2)
  E) Explain the working principle of the split phase induction motor.   (2)

Part A

Q2. A) A 25 KVA, 2200/220 V, 50Hz distribution transformer is tested for efficiency and regulation as follows:
O.C. test (L.V. side): 220V, 4A, 150W.
S.C. test (H.V. side): 90V, 10A, 350W.

Determine: (i) core loss (ii) equivalent circuit referred to the secondary side. (iii) Regulation of transformer at 0.8 power
factor lagging.   (5)

B) What are the distinguishing features of the star- star, star- delta, delta- star and delta-delta connections in 3-phase
transformer? Compare their advantages and disadvantages.   (5)

Q3. A) A 15 KW, 230V, 1150 RPM, 4 Pole, D.C. Shunt motor has a total of 882 armature conductors arranged in four
parallel paths and yielding an armature circuit resistance of 0.2 ohm. When it delivers rated power at rated speed, the motor
draws an armature current of 73 A at a field current of 1.6 A. calculate the developed torque. Also find the new operating
speed if the field flux is reduced by 80% of its original value for the same developed torque.   (5)

B) Explain with the help of neat diagrams the ward Leonard method of speed control of the DC motor.   (5)

Q4. A) What is armature reaction? Describe the demagnetizing and cross magnetizing effects of armature reaction in a D.C.
machine.   (5)

B) Write a short note on the Instrument Transformers.   (5)

Part B

Q5. A) Write the speed equation of the three phase induction motor. Explain the method of speed control of three phase
induction motor by varying the rotor resistance.   (5)

B) Explain cogging and crawling and methods of their elimination.   (5)

Q6. A) Derive the relationship for torque developed by a three phase induction motor. Draw atypical torque slip
characteristic and deduce the condition for maximum torque.   (5)

B) A 20 HP, 400V, 50C/s, 3-phase star connected induction motor gave the following test data (line Values):
No load test: 400V, 9A, cos φ = 0.2.
Short circuit test: 200V, 50A, cos φ = 0.4.
Stator voltage (d.c) drop test (between two lines): 1.1 V, 5A.
from the stator, find the line current and power factor at full load, and the maximum horse power. Also, draw its equivalent
circuit with values of the elements labeled.   (5)

Q7. A) Describe the construction, working and torque speed characteristics of a shaded pole induction motor. Can we
reverse its direction of rotation?   (5)

B) Develop the equivalent circuit of a pure single phase induction motor using double revolving field theory.   (5)