Instructions –  
(1) All Questions are Compulsory.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
(8) Use of Steam tables, logarithmic, Mollier’s chart is permitted.

Marks

1. a) Attempt any THREE of the following: 12
   (i) State the factors on which severity of shock depends.
   (ii) Explain preventive maintenance of induction motor.
   (iii) State the method of measurement of insulation resistance and explain any one method.
   (iv) Explain the use of filler guage.
b) **Attempt any ONE of the following:**

(i) List the tests to be carried out on transformer as per IS-2026. Also state the objective of heat run test on transformer.

(ii) A 3-phase induction motor has the following data:

- Stator resistance, $R_1 = 1 \Omega$, Reactance, $X_1 = 3 \Omega$
- Rotor standstill, $R_2 = 1 \Omega$, Reactance $X_2 = 2 \Omega$

No load exciting circuit impedance is $(10 + j 50) \Omega$, voltage per phase $V_1 = 250$ volts, stator to rotor turns ratio = 1, i.e. $K = 1$, Slip = 0.05

Show these values in equivalent circuit and work out:

1) Stator current ($I_1$)
2) Equivalent rotor current ($I'_2$)
3) Output (Mechanical)
4) Motor efficiency.

2. **Attempt any TWO of the following:**

   a) Which types of precautions to be taken while working on electrical installation? (any eight)

   b) List the eight factors affecting preventive maintenance schedule.

   c) List the mechanical, magnetic and electrical faults in the electrical equipments.
3. **Attempt any FOUR of the following:**

   a) Explain the trouble shooting chart of 3 φ transformer.

   b) Explain routine test for measurement of D.C. resistance of winding.

   c) State and explain the properties of transformer oil.

   d) Explain any four method of cleaning of insulation of electrical machines.

   e) What data/parameters do we get from no load test and blocked rotor test on 3-φ induction motor.

   f) Explain factors affecting earth resistance.

4. a) **Attempt any THREE of the following:**

   (i) Explain the open delta (delta-delta) test on transformer.

   (ii) Which electrical tests are carried out before commissioning of transformer.

   (iii) State factors involved in designing the machine foundation.

   (iv) State which precautions to be taken to avoid fire due to electrical reasons.

b) **Attempt any ONE of the following:**

   (i) State the classification of insulating material as per IS.

   (ii) A 1-φ transformer of 100 KVA, 11000/2200 volts, 50 Hz, gave the following results:

   1) O.C. test : $V_O = 2200$ V, $I_O = 1.59$ A, $W_O = 980$ W
   - L.V. side

   2) S.C. test : $V_SC = 580$ V, $I_SC = 9.1$ A, $W_SC = 1100$ W
   - H.V. side (with L.V. shorted)

   Calculate the efficiency and regulation of transformer at full load 0.8 p. f. (lagging).
5. Attempt any TWO of the following: 16
   a) State and explain the factors affecting the life of insulating material.
   b) State the method of neutral grounding. Explain the solid grounding and state advantages of grounding.
   c) A 3-phase, 500 V squirrel cage. Induction motor gave the following test results:
      No load test: 500 V, 4 A, 750 Watts.
      Blocked rotor test: 100 V, 16 A, 800 Watts.
      Draw the circle diagram and determine:
      (i) efficiency
      (ii) p.f. when motor is supplying 25 H.P.

6. Attempt any FOUR of the following: 16
   a) What are the effects of misalignment on the performance of machine.
   b) Explain importance and purpose of earthing.
   c) Draw the experimental set up of the Sumpner’s test on 1-φ transformer. Also write its procedure.
   d) Explain routine preventive maintenance of transformer.
   e) Explain how S.C. test is performed on single phase transformer.
   f) State four safety signs and symbols used in industry.