1. A 10-KVA 2400/240-V 60-Hz transformer was tested with the following results: power input during short-circuit test = 340W, power input during open-circuit test = 168 W. Determine:
   (a) the efficiency of this transformer at full load
   (b) the load at which maximum efficiency occurs
   The load power factor is 0.8.   (20%)

2. A three-phase 60 Hz four-pole 220-V wound-rotor induction motor has a stator winding Δ connected and a rotor winding Y connected. The rotor has 40% as many turns as the stator. For a rotor speed of 1710 rpm, calculate:
   (a) the slip
   (b) the blocked rotor-induced voltage per phase E_{BR}
   (c) the rotor-induced voltage per phase E_R
   (d) the voltage between rotor terminals
   (e) the rotor frequency   (20%)

3. A 50 Hz, 11 KV, three-phase alternator with earthed neutral has a reactance of 5 ohms per phase, and is connected to busbar through a circuit breaker. The capacitance to earth between the alternator and the circuit breaker is 0.02 μF per phase. Assuming the resistance of the generator to be negligible, calculate the following:
   (a) Maximum value of recovery voltage E_{max} (phase to neutral).
   (b) Maximum value of restriking voltage (phase to neutral).
   (c) The average rate of rise of restriking voltage (RRRV) up to the first peak.
   (d) Frequency of oscillation.   (20%)

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4. A surge of 15 kV magnitude travels along a cable towards its junction with an overhead line. The inductance and capacitance of the cable and overhead line are respectively 0.3 mH, 0.4 μF and 1.5 mH, 0.012 μF per km. Find the voltage rise at the junction due to the surge. (20%)

5. Explain each of the following terms:

   (a) Load factor

   (b) Plant factor

   (c) Peterson coil

   (d) Rogowski coil

   (e) Swing bus

   (f) Skin effect

   (g) Einstein's formula

   (h) Electrostatic precipitator

   (i) MHD power generation

   (j) Relative air density.   (20%)