Registration No.:

2ⁿᵈ Semester Regular/Back Examination: 2024-25
SUBJECT: Basic Electrical Engineering
BRANCH(S): AE, AEIE, AERO, AUTO, BIOTECH, CHEM, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CSEIOT, CSIT, CST, ECE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MECH, METTA, MINERAL, MINING, MME
Time: 3 Hours
Max Marks: 100
Q.Code: S611
Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
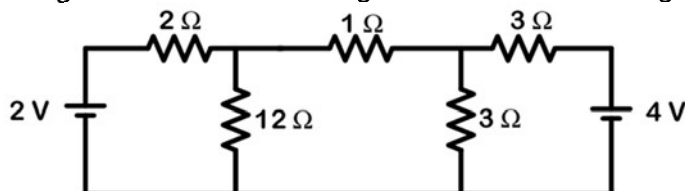**The figures in the right hand margin indicate marks.**

Part-I

Q1   Answer the following questions: (2 x 10)
  a)   Mention the limitations of Ohm's law.
  b)   Two resistances of 4 Ω and 6 Ω are connected in parallel across 10 V battery. Calculate the current through 6 Ω.
  c)   Mention the Faraday's law of Electromagnetic Induction.
  d)   DC machines are called double excited machines. Justify the statement.
  e)   What is the efficiency of a transformer? What is the condition when the efficiency will be maximum?
  f)   Mention the advantages of 3-phase circuits over 1-phase circuit.
  g)   An alternating voltage is given by V = 230sin314t. Calculate I) frequency, II) maximum value, III) average value, IV) RMS value.
  h)   By which method we can control the speed of a DC shunt motor above rated speed?
  i)   Mention the type of 3-phase induction motor. Give one example of application of 3-phase induction motor.
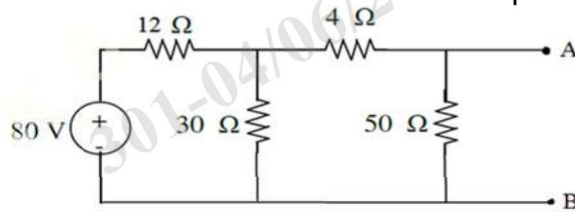 **j)**   What is the reason? we are neglecting the core loss in Short-circuit test of a transformer.

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   (6 x 8)
  a)   Explain about the Star-Delta and Delta-Star transformation in 3-phase circuit.
  b)   Find the current through 12Ω resistor for the given circuit below using Kirchoff's laws.

c) A non-magnetic ring has a mean diameter of 46.5 cm and a cross-sectional area of 12 cm². It is uniformly wound with 500 turns. Calculate the Field strength and Total flux produced in the ring by a current of 1A.

d) Define Thevenin's theorem. Find the Thevenin's equivalent R_{AB} for the circuit shown below.

e) The impedances of series circuit are Z1 = (6 + j8) ohms and Z2 = (8 – j6) ohms. If the applied voltage is 120V, find total impedance, current, and power factor. Draw the phasor diagram.

f) Explain about various parts of a three-phase induction motor and describe the function of each component.

g) Write down the analogy between magnetic circuits and electric circuits.

h) A 4-pole DC motor takes an armature current of 6 A. The armature has 480 lap connected conductors. The flux per pole is 20 mWb. Calculate the gross torque developed by the motor.

i) Define transformer efficiency and derive the condition under which it will have maximum efficiency.

j) A balanced star connected load having an impedance (15 + j20) Ω per phase is connected to a three phase 440 V, 50 Hz supply. Find the line currents and the power absorbed by the load. Assume RYB phase sequence.

k) Explain the basic structure of the electrical power system.

l) Calculate the emf generated by a 6 pole DC generator having 480 conductors and driven at a speed of 1200 rpm. The flux per pole is 0.012 Wb. Assume the generator to be (I) Lap wound, (II) Wave wound.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)   (16 x 2)

Q3 Explain the concept of back EMF in a DC motor and its significance. The counter emf of Shunt motor is 227 V. The field resistance is 160 Ω and field current 1.5 A. If the line current is 36.5 A, find the armature resistance also find armature current when the motor is stationary.   **(16)**

Q4 Derive the expression for the torque developed by a three-phase induction motor. Show the torque-slip characteristics. Explain about the slip value under different operating regions of the Induction motor.   **(16)**

Q5 Explain with neat schematics about different tests on a single phase transformer and develop an equivalent circuit from the tests.   **(16)**

Q6 Define Torque and derive the expression for torque in a D.C. Motor. How to control the speed of D.C. Shunt motor? Explain it with any one example.   **(16)**