

Registration No.:

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Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)  
Sub\_Code: 23ES1001

2<sup>nd</sup> 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)

- Mention the limitations of Ohm's law.
- Two resistances of  $4\ \Omega$  and  $6\ \Omega$  are connected in parallel across 10 V battery. Calculate the current through  $6\ \Omega$ .
- Mention the Faraday's law of Electromagnetic Induction.
- DC machines are called double excited machines. Justify the statement.
- What is the efficiency of a transformer? What is the condition when the efficiency will be maximum?
- Mention the advantages of 3-phase circuits over 1-phase circuit.
- An alternating voltage is given by  $V = 230\sin 314t$ . Calculate I) frequency, II) maximum value, III) average value, IV) RMS value.
- By which method we can control the speed of a DC shunt motor above rated speed?
- Mention the type of 3-phase induction motor. Give one example of application of 3-phase induction motor.
- What is the reason? we are neglecting the core loss in Short-circuit test of a transformer.

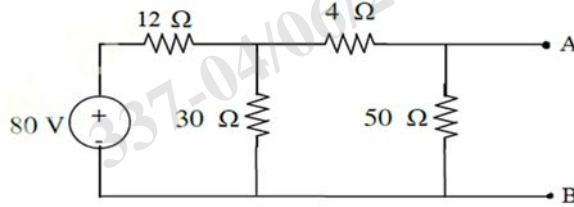
Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Explain about the Star-Delta and Delta-Star transformation in 3-phase circuit.
- Find the current through  $12\ \Omega$  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 cm<sup>2</sup>. 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  $Z_1 = (6 + j8)$  ohms and  $Z_2 = (8 - j6)$  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)