

Registration No.:

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: RBE2B001

2nd Semester Back Examination: 2024-25

SUBJECT: Basic Electrical Engineering

BRANCH(S): AEIE, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MECH, METTA, MINING

Time: 3 Hours

Max Marks: 100

Q.Code: S612

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

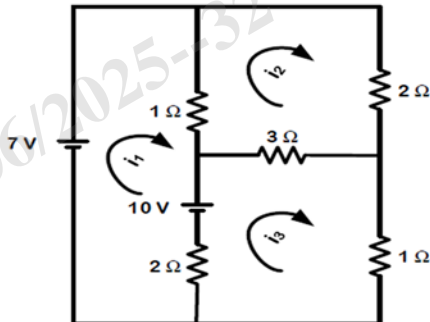
Q1 Answer the following questions: (2 x 10)

- Under which conditions the Ohm's law is valid?
- An Electric iron is rated 1000 W, 240 V. Find the current drawn & resistance of the heating element.
- Mention the terms Active & Passive elements with suitable example for each.
- What do you mean by Slip, under what condition slip will become zero?
- What will happen to the primary current of a transformer, if the secondary current increases? Justify your answer.
- State the Lenz's law and mention its applications.
- Under what condition the impedance of the R-L-C circuit will be minimum?
- Draw the no-load phasor diagram for a single-phase transformer.
- Mention the emf equation of a DC motor and mention each parameters of the equation.
- Let's say a complex number is represented in rectangular form as $Z = 3 + j4$. How can we express Z in polar form?

Part-II

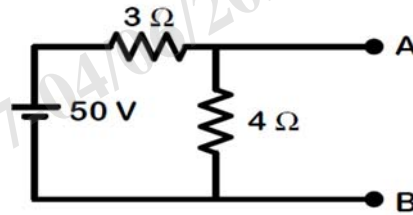
Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Applying Kirchoff's law find i_1 , i_2 , i_3 for the below given circuit.

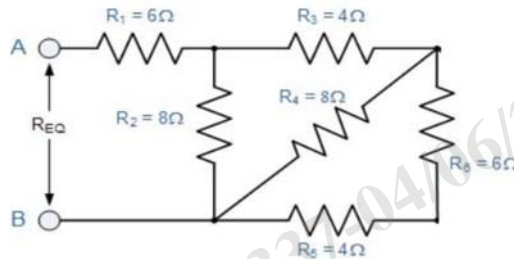


- Explain the working principle of a single-phase transformer.
- Explain B-H Curve and Draw with all parameters.
- Explain about different types of DC motors based on the field excitation.
- Explain the working principle of 3-phase induction motor.

- f) A circuit is having resistance R & L in series with a capacitor C. An AC voltage is applied to the circuit. Derive equations for voltage, current, impedance, and PF. Draw the phasor diagram.
- g) Define Norton's Theorem and find the Norton's equivalent circuit across AB for the circuit given below.



- h) Derive the emf equation of dc shunt generator with detail explanations.
- i) An unbalanced four wire star connected load has a balanced voltage of 400 V, the loads are $Z_1 = (4 + j8) \Omega$, $Z_2 = (3 + j4) \Omega$ and $Z_3 = (10 + j15) \Omega$. Calculate the
 (I) Line currents
 (II) Currents in the neutral wire and
 (III) Total power
- j) Find the equivalent resistance R_{EQ} for the circuit shown below.



- k) Define and Biot Savart Law and derive the expression for magnetic field at a point due to a current carrying conductor with neat diagram.
- l) A magnetic circuit has 150 turns-coil, the cross-sectional area and the length of the magnetic circuit is $5 \times 10^{-4} \text{ m}^2$ and $25 \times 10^{-2} \text{ m}$ respectively. Find the value of magneto motive force, magnetic field intensity, magnetic flux density, relative permeability, and reluctance when the current is 2 Amp and the total flux is $0.3 \times 10^3 \text{ Wb}$.

Part-III

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

(16 x 2)

- Q3 Derive EMF equation of a transformer. A 100 kVA, 11000/400 V, 50 Hz transformer has 40 secondary turns. Calculate the number of primary turns and primary and secondary currents. (16)
- Q4 Explain in detail about (i) RMS value, (ii) Average value, (iii) Form factor, (iv) Peak factor (v) Prove that the form factor of the sinusoidal wave is 1.11. (16)
- Q5 Explain resonance for series RLC circuit and derive the equation for resonant frequency. A series RLC circuit of $R = 40 \Omega$, $L = 50.07 \text{ mH}$ and a capacitor is connected across a 400 V, 50 Hz, A.C supply. This RLC combination draws a current of 10 A. Calculate (i) Power factor of the circuit. (ii) Capacitor value. (16)
- Q6 Describe the (i) no-load and (ii) blocked rotor test of an induction motor. Draw the equivalent circuit diagram with proper labeling. (16)