GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–I & II(NEW)EXAMINATION – SUMMER 2022

Subject Code:3110005   **Date:12-08-2022**
Subject Name:Basic Electrical Engineering
Time:10:30 AM TO 01:00 PM   **Total Marks:70**
Instructions:
   1. **Attempt all questions.**
   2. **Make suitable assumptions wherever necessary.**
   3. **Figures to the right indicate full marks.**
   4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Calculate the Resistance of a 100 m length of wire having a uniform cross sectional area of 0.02 mm^2 and having resistivity of 40 µΩ-cm.	**03**
	(b)	Explain Kirchoff's law for DC series network in brief.	**04**
	(c)	Define the following terms for AC (alternating current) signal: (i) Peak Factor (ii) Form Factor (iii) Average Value (iv) RMS Value (v) Time period (vi)Frequency (vii) Cycle	**07**
Q.2	**(a)**	State the Superposition theorem with suitable example.	**03**
	(b)	State the Norton's theorem with suitable example.	**04**
	(c)	For the Wheatstone bridge diagram shown in Figure 1, obtain the current flowing through the 20Ω resistance using Thevenin's equivalent network.	**07**

OR

	(c)	Derive an expression for the voltage across the capacitor during charging through the resistor at any instant Vc = V(1-e $^{-t/RC}$). Assume that RC series circuit is connected across a DC supply of voltage V.	**07**
Q.3	**(a)**	Write the comparison between Series resonance and Parallel resonance condition in AC circuit.	**03**
	(b)	Distinguish between (i) Apparent power (ii) Active power and (iii) Reactive power in ac circuits.	**04**
	(c)	Prove that the current in purely Capacitive circuit leads its voltage by 90° and average power consumption in pure capacitor is zero.	**07**

OR

Q.3	**(a)**	List out the merits of two-watt meter method.	**03**
	(b)	Draw Impedance triangle, Voltage triangle, Power triangle for single phase R-L series circuit.	**04**
	(c)	Obtain the relationship between line and phase values of current in a three phase, balanced, delta connected system.	**07**
Q.4	**(a)**	Explain working principle of single phase Transformer.	**03**
	(b)	Mention Merits and Demerits of Single Phase Induction Motor.	**04**
	(c)	Explain construction of Alternator with neat diagram.	**07**

OR

Q.4	**(a)**	Write applications of Auto Transformer.	**03**
	(b)	Compare Squirrel cage induction motor and Slip ring Induction Motor.	**04**
	(c)	Describe construction of a DC machine.	**07**
Q.5	**(a)**	Explain the protective device Switch Fuse unit in detail.	**03**
	(b)	With help of suitable labeled diagram, explain any two types of wires used in the residential and commercial wiring.	**04**

	(c)	Explain different methods of Power factor Improvement.	07

OR

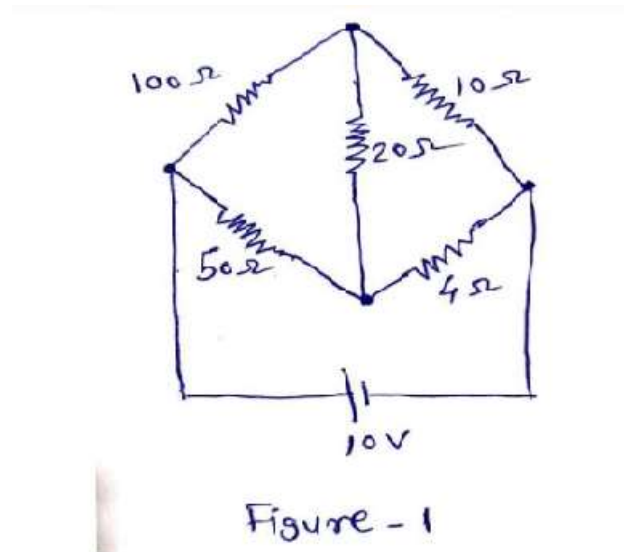| Q.5	(a)	Compare MCB and ELCB.	03
	(b)	Write safety precautions for Electrical Appliances.	04
	(c)	Classify different types Earthing and explain any one in detail.	07

Figure – 1

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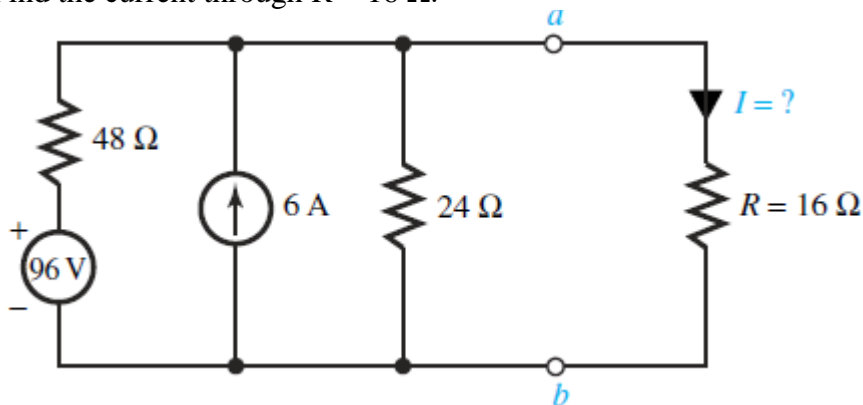
GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–I &II (NEW) EXAMINATION – SUMMER-2019

Subject Code: 3110005   **Date: 20/06/2019**
Subject Name: Basic Electrical Engineering
Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**
Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Marks

Q.1 **(a)** State and explain Kirchoff's voltage and current laws. **03**
(b) Compare the resistive series and parallel circuit. **04**
(c) Consider the circuit shown in Figure. Reduce the portion of the circuit to the left of terminals a–b to (a) a Thévenin equivalent and (b) a Norton equivalent. Find the current through $R = 16\ \Omega$. **07**

Q.2 **(a)** For series resonant circuit with brief description draw the phasor diagrams for following conditions (i) At resonant (ii) Below resonant (iii) Above resonant. **03**

(b) Prove that the sum of readings of two watt meters connected to measure power in three phase circuit gives total power consumed by the circuit. **04**

(c) A series RLC circuit with L= 160 mH, C= 100 μF and R = 40 Ω is connected to a sinusoidal voltage V(t) = 40 Sinωt, with ω= 200 rad/sec. Find (i) What is the Impedance of the circuit. (ii) Let the current at any instant in the circuit be I(t) = I_0 Sin(ωt-Φ). Find I_0 (iii) What is the Phase Φ ? **07**

OR
(c) A balanced star connected load of (4+j3) Ω per phase is connected to a balance 3 phase 400 V supply. Find the line current, power factor, active power and reactive power. **07**

Q.3 **(a)** For A.C. sinusoidal current prove that $I_{rms} = 0.707\ I_m$. **03**
(b) Explain voltage step-up and step-down operation in autotransformer with diagram. **04**
(c) Explain various connections of three phase transformer with diagram. **07**

OR
Q.3 **(a)** Explain in brief single phase RC parallel circuit with phasor diagram **03**
(b) Derive the E.M.F. equation of a single phase transformer. **04**

	(c)	Explain with diagram construction of core type and shell type transformer.	07
Q.4	(a)	State significance of the back emf in DC motor.	03
	(b)	Classify and compare various DC motor.	04
	(c)	Explain construction of synchronous generator with diagram.	07

OR

Q.4	(a)	Give the classification of Induction motor.	03
	(b)	Discuss how the rotating magnetic field is produced in three phase induction motor.	04
	(c)	Explain the working of single phase induction motor with diagram.	07

Q.5	(a)	State function of various parts of HT cable.	03
	(b)	Give the comparison of fuse and MCB.	04
	(c)	Explain plate earthing with diagram.	07

OR

Q.5	(a)	What is power factor and why improvement is required in that?	03
	(b)	State and explain in brief important electrical characteristics of battery.	04
	(c)	Calculate the electricity bill amount for a month of April, if 4 bulbs of 40 W for 5 h, 4 tube lights of 60 W for 5 h, a TV of 100 W for 6 h, a washing machine of 400 W for 3 h, a water pump of 0.5 HP for 15 minutes are used per day. The cost per unit is Rs 3.50. Consider 1 HP = 746 watts	07

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Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER 1&2 EXAMINATION – SUMMER 2020
Subject Code: 3110005   **Date:10/11/2020**
Subject Name: Basic Electrical Engineering
Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**
Instructions:
    1. **Attempt all questions.**
    2. **Make suitable assumptions wherever necessary.**
    3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	A resistance of 10Ω is connected in series with two resistances each of the 15Ω arranged in parallel. What resistance must be shunted across this parallel combination so that total current taken shall be 1.5 A with 20 V applied?	**03**
	(b)	State the superposition theorem with suitable example.	**04**
	(c)	For the Wheatstone bridge diagram shown in **Figure 1**, obtain the current flowing through the 20Ω resistance using Thevenin's equivalent network.	**07**
Q.2	**(a)**	Explain Kirchoff's law for DC series network in brief.	**03**
	(b)	Define the following terms for AC (alternating current) signal:	**04**
		(i) Crest Factor (ii) Form Fator (iii) Average Value (iv) RMS Value.	
	(c)	A current of 5 A flows through a non-inductive resistance in series with a choking coil when supplied at 250V,50Hz. If the voltage across the resistance is 125 V and across the coil 200V, calculate (i) impedance, reactance and resistance of the coil (ii) the power absorbed by the coil (iii) and total power.	**07**

OR

	(c)	Prove that the current in purely inductive circuit lags its voltage by 90° and average power consumption in pure inductor is zero.	**07**
Q.3	**(a)**	Write the comparison between series resonance and parallel resonance condition in AC circuit.	**03**
	(b)	Derive the relation between line-voltage and phase-voltage for three-phase four wire star connection network. Also, prove that the total three-phase power consumption in star connection is $P_T = \sqrt{3}\ V_L\ I_L\ \cos\varphi$.	**04**
	(c)	Explain various connections of three phase transformer with diagram.	**07**

OR

Q.3	**(a)**	Explain magnetic hysteresis.	**03**
	(b)	Derive the E.M.F. equation of a single phase transformer	**04**
	(c)	State the difference in core type and shell type transformer with neat and clean construction diagram.	**07**
Q.4	**(a)**	How the rotating magnetic field is produce in three-phase induction motor? Explain in brief.	**03**
	(b)	Why single-phase induction motor is not self starting while three-phase induction motor is self starting. Explain in brief.	**04**
	(c)	Explain construction of Alternator with neat diagram.	**07**

OR

Q.4 **(a)** Justify that how back e.m.f. in DC motor acts like a governor. **03**

(b) State the comparison of generator and motor action with respect to design and working principle. Draw the necessary diagram. **04**

(c) Write working principle of DC motor with neat diagram. **07**

Q.5 **(a)** Calculate the resistance of a 100 m length of wire having a uniform cross sectional area of 0.02 mm^2 and having resistivity of 40 $\mu\Omega$-cm. **03**

(b) Discuss types of cables used for residential and commercial wiring. **04**

(c) Explain the following protective devices in detail: **07**

(i) SFU (ii) MCB (iii) ELCB

OR

Q.5 **(a)** A d-c generator has an e.m.f of 200 volts and provides a current of 10 amps. How much energy does it provide each minute? **03**

(b) Explain the construction of the lead-acid battery with neat diagram. **04**

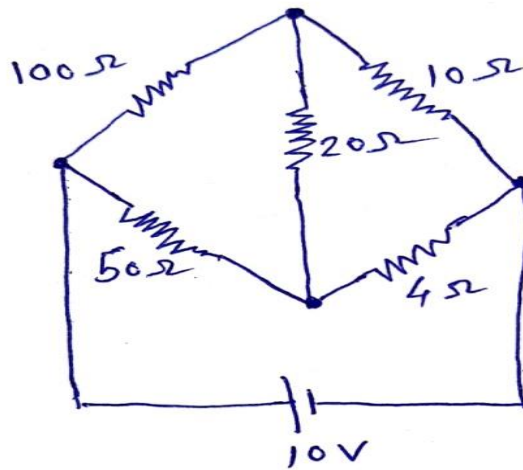**(c)** Explain different types earthing and its importance in electrical utility system in detail. **07**

Figure - 1

GUJARAT TECHNOLOGICAL UNIVERSITY
BE –SEMESTER 1&2(NEW SYLLABUS)EXAMINATION- WINTER 2018

Subject Code: 3110005   **Date: 18-01-2019**
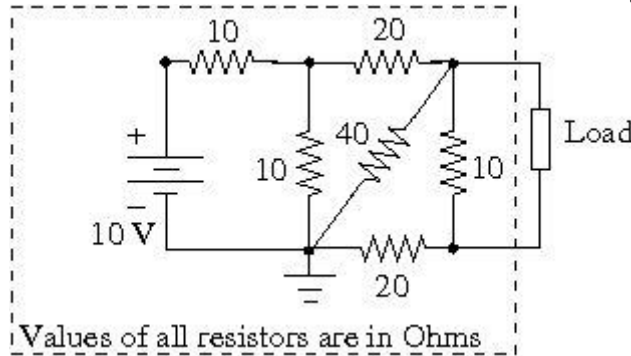**Subject Name: Basic Electrical Engineering**
Time: 10:30 am to 01:00 pm   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Define Amplitude, Frequency and Time period for alternating quantities.	**03**
	(b)	Briefly describe the operating principle of a transformer.	**04**
	(c)	Obtain the value of Norton's equivalent current and Norton's equivalent resistance for the network shown in the following figure.	**07**

Values of all resistors are in Ohms

Q.2	**(a)**	Prepare a list of parts of a DC machine. Explain any one part in detail.	**03**
	(b)	Briefly describe the auto transformer and its applications.	**04**
	(c)	The maximum values of voltage and current in a circuit are 400 V and 20 A respectively. Both the quantities are sinusoidal with 50 Hz frequency. The instantaneous values of voltage and current at time t=0 second are 283 V and 10 A respectively (both increasing and positive). Obtain the equations of voltage and current in this circuit at time 't' second. Also find out the active power consumption in the circuit.	**07**

OR

	(c)	In a series R-L circuit, a voltage of 10 V at 50 Hz frequency produces a current of 750 mA. In the same circuit with same magnitude of applied voltage with a frequency of 75 Hz produces a current of 500 mA. Find out the values of R and L in the circuit.	**07**
Q.3	**(a)**	Briefly describe pipe earthing.	**03**
	(b)	Mention the types of single phase induction motor. Explain any one of them.	**04**
	(c)	Derive the equations of active, reactive and apparent powers in a series R-L circuit with sinusoidal AC supply.	**07**

OR

Q.3	(a)	Give a list of safety devices used for home appliances.	03
	(b)	Give a comparison between squirrel cage induction motor and wound rotor induction motor.	04
	(c)	Derive the equations of capacitor voltage and circuit current in a series R-C circuit connected to a DC supply through a switch. Assume that switch is initially open and it is closed at time t=0 second.	07
Q.4	(a)	Discuss the difference between MCB and Fuse.	03
	(b)	Why the consumers should improve their power factor?	04
	(c)	Explain Thevenin's theorem. Take suitable example and explain the steps to apply Thevenin's theorem for a resistive circuit with a constant DC voltage source.	07

OR

Q.4	(a)	What is MCCB? Where is it used?	03
	(b)	Compute the monthly energy charges for an air conditioner having consumption of 2 kW. Daily usage of the air conditioner is 10 hours. Energy charges are Rs 8 per unit.	04
	(c)	Explain the term power factor. Explain the steps to obtain power factor of an AC circuit with parallel connection of R, L and C elements.	07
Q.5	(a)	Describe the stator construction of a single phase induction motor.	03
	(b)	Write a short note on Miniature Circuit Breaker (MCB)	04
	(c)	Explain the term rotating magnetic field with proper diagrams in case of a three phase induction motor.	07

OR

Q.5	(a)	Describe the construction of rotor for a slip ring type three phase induction motor.	03
	(b)	Write a short note on Earth Leakage Circuit Breaker (ELCB).	04
	(c)	Explain the working principles of a synchronous generator and a synchronous motor.	07

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Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– I & II (NEW) EXAMINATION – WINTER 2019

Subject Code: 3110005   **Date: 11/01/2020**

Subject Name: Basic Electrical Engineering

Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	State Ohm's law and Kirchhoff's Laws in context with DC circuits.	**03**
	(b)	A 100V,60 Watt bulb is to be operated from a 220V supply. What is the resistance to be connected in series with the bulb to glow normally?	**04**
	(c)	Derive an expression for equivalent resistances of a star connected network to transform into a Delta connected network.	**07**
Q.2	**(a)**	State Thevenin's and Norton's Theorems.	**03**
	(b)	Compare series and parallel resonance in ac circuit.	**04**
	(c)	A single phase R-L-C circuit having resistance of 8Ω, inductance of 80mH and capacitance of 100µF is connected across single phase ac 150 V , 50Hz supply. Calculate the current, power factor and voltage drop across inductance and capacitance.	**07**

OR

	(c)	Derive an expression for the voltage across the capacitor during charging through the resistor at any instant $V_C = V(1-e^{-t/RC})$. Assume that RC series circuit is connected across a DC supply of voltage V.	**07**
Q.3	**(a)**	Define the following terms in connection with AC waveforms:- 1. Q-Factor　　2. Power Factor 3.Form factor.	**03**
	(b)	Draw impedance triangle, Voltage triangle, Power triangle for single phase R-L series circuit.	**04**
	(c)	Derive the relationship between Phase and Line values of voltages and currents in case of 3-phase Star- connection.	**07**

OR

Q.3	**(a)**	Define the terms:- 1. Real power 2. Reactive power　3. Apparent power.	**03**
	(b)	Derive the EMF equation of single phase transformer.	**04**
	(c)	With neat circuit diagram and a phasor diagram prove that two watt meters are sufficient to measure total power in 3-phase system.	**07**
Q.4	**(a)**	Explain working principle of single phase Transformer.	**03**
	(b)	Give Merits, Demerits and Applications of Induction Motor.	**04**
	(c)	Explain in detail the construction of an Alternator.	**07**

OR

Q.4	**(a)**	Explain working principle of D.C. Motor.	**03**
	(b)	Compare poly phase Induction Motor and single phase Induction Motor.	**04**

	(c)	Explain Generation of Rotating Magnetic Field in 3-phase Induction Motor with diagrams and equations.	07
Q.5	(a)	Classify different types of cables with reference to voltage and insulation materials.	03
	(b)	Explain the terms:- 1. Residual magnetism 2. Coercive Force.	04
	(c)	Explain the process of charging and discharging of Lead acid cell.	07

OR

Q.5	(a)	Compare MCB and ELCB.	03
	(b)	Write safety precautions for electrical Applications.	04
	(c)	Explain different methods of power factor improvement.	07

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