

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-I & II(NEW) EXAMINATION – SUMMER 2023

Subject Code:2110005

Date:08-08-2023

Subject Name:Elements of Electrical Engineering

Time:10:30 AM TO 01:00 PM

Total Marks:70

Instructions:

1. Question No. 1 is compulsory. Attempt any four out of remaining Six questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

Q.1	Objective Question (MCQ)	Mark
(a)		07
1.	The unit of inductive reactance is (a) Ohm (b) henry (c) joule (d) ohm.m	
2.	The “Superposition theorem” is essentially based on the concept of (a)duality (b) linearity (c) reciprocity (d) non-linearity	
3.	The power factor of a purely resistive circuit is (a) Zero (b) lagging (c) unity (d) leading	
4.	The power taken by a 1-phase load is given by the expression (a) $3V\cos\phi$ (b) $V\cos\phi$ (c) $V\sin\phi$ (d) $3V\sin\phi$	
5.	The Q-factor of a coil is given by (a) Its power factor $\cos\phi$ (b) ratio R/Z (c) reciprocal of its power factor (d) ratio of maximum energy stored and energy dissipated per cycle	
6.	In an ac circuit, the ratio of kW/kVA represents (a) Power factor (b) load factor (c) form factor (d) diversity factor	
7.	The frequency of DC supply is ____ (a) 50 Hz (b) 25 Hz (c) 100 Hz (d) Zero	
(b)		07
1.	Thevenin’s equivalent circuit consists of ____ (a) Series combination of R_{TH} , E_{TH} and R_L (b) Series combination of R_{TH} , E_{TH} (c) Parallel combination of R_{TH} , E_{TH} (d) Parallel combination of R_{TH} , E_{TH} and R_L	
2.	The r.m.s. value of sinusoidal 100 Volt peak to peak is ____ Volt. (a) 50 (b) 100 (c) $50/\sqrt{2}$ (d) $100/\sqrt{2}$	
3.	The power factor at resonance in R-L-C circuit is (a) Unity (b) Zero (c) leading (d) lagging	
4.	Watt.hour is the unit of	

- (a) Electric capacity (b) Electric charge (c) Electric power (d) Electric energy
5. The unit of specific resistance is ____
 (a) Ohm (b) Ohm.m² (c) Ohm.m (d) Ohm².m
6. A battery is a source of
 (a) 1-phase AC voltage (b) 3-phase AC voltage (c) DC voltage (d) AC or DC voltage
7. Three capacitors of value of 8 μF , 16 μF and 32 μF are connected in series, the total capacitance will be
 (a) 56 μF (b) 32 μF (c) 7.32 μF (d) 32/7 μF
- Q.2** (a) State and explain Coulomb's laws. **03**
 (b) Compare similarities and dissimilarities between electrical and magnetic circuit. **04**
 (c) Two capacitors of 4 μF and 8 μF are connected in series and charged from a constant voltage of 210 V supply. Calculate : (a) The voltage across each capacitor (b) The charge on each capacitor. **07**
- Q.3** (a) Explain the factors affecting the resistance of a conducting material. **03**
 (b) Derive the equation for the co-efficient of coupling of two magnetically coupled coils A and B. **04**
 (c) Three resistances R_{AB} , R_{BC} and R_{CA} are connected in delta. Obtain expressions for their equivalent star resistances **07**
- Q.4** (a) Discuss different methods of representation of vector quantities. **03**
 (b) Explain different types of capacitors in brief. **04**
 (c) State and explain self inductance (L). Derive expression of co-efficient of mutual coupling between two coils having inductance of L_1 and L_2 . **07**
- Q.5** (a) Explain : (a) Form factor and (b) Peak factor. **03**
 (b) Derive the equation of energy stored in a Capacitor. **04**
 (c) A series RLC circuit when $R = 10\Omega$, $L = 10\text{mH}$ and $C = 1 \mu\text{F}$ has an applied voltage of 200 V at resonant frequency. **07**
 Calculate the resonant frequency, the current in the circuit and voltage across the element at resonance. Find the Q-factor and bandwidth.
- Q.6** (a) Define: (i) R.M.S. Value (ii) Form factor (iii) Amplitude factor **03**
 (b) A capacitor is charged with 5000 μC . If the energy stored is 1 joule then find: **04**
 (a) Voltage and (b) Capacitance. **07**
 (c) What is the need of earthing? Explain the different methods of earthing.
- Q.7** (a) Discuss staircase wiring with simple diagram. **03**
 (b) Give the circuit diagram of ELCB. Explain its working and applications. **04**
 (c) Obtain the relationship between line and phase values of current in a three phase, balanced, delta connected system. **07**
