Enrollment No: _____ Exam Seat No: _____

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name: Fundamental of Electrical Engineering
Subject Code: 4TE01FEE1 Branch: B.Tech (All)
Semester: I Date: 16/03/2019 Time: 02:30 To 05:30 Marks: 70

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 Attempt the following questions: (14)

1) The resistivity of the conductor depends on_____of the conductor.

A) Area B) Length C) Type of material D) None of these

2) Resistance of metalic conductor is _____ propotional to its area.

A) Directly B) Inversly

3) How many coulombs of charge flow through a circuit carrying a current of 10 A in 1 minute?

A) 10 B) 600 C) 6000 D) 1200

4) The unit of permeability is _____.

A) Henry/Metre B) Weber C) Henry D) Metre/ Henry

5) A capacitor carries a charge of 0.1 C at 5 V. Its capacitance is_____

A) 0.2 F B) 0.5 F C) 0.05 F D) 0.02 F

6) To obtain a high value of capacitance, the permittivity of dielectric medium should be_____

A) Low B) Zero C) High D) Unity

7) If a pure inductor is connected across the ac source, the average power taken by the inductor is____Watt

A) A few B) Zero C) Hundred D) Maximum

8) The peak value of sine wave is 100 V. Its rms value is _____

A) 63.7 V B) 141.4 V C) 100 V D) 70.71 V

9) If $e_1 = A\sin\omega t$ and $e_2 = B\sin(\omega t + \phi)$, then

A) e_1 leads e_2 by ϕ B) e_2 lags e_1 by ϕ C) e_2 leads e_1 by ϕ D) e_1 is in phase with e_2

10) At higher frequencies, the value of capacitive reactance_____

A) Decreases B) Remains same C) Increases D) Depends on applied voltage

11) In series RLC circuit what is the power factor just below the resonance frequency?

A) Lagging B) Leading C) Unity D) Zero

12) In a balanced 3-phase delta connected system, Line voltage is equal to Phase Voltage.

A) True B) False

13) A transformer transforms_____.

A) Voltage B) Current C) Frequency D) Voltage and Current

14) For a step up transformer, transformation ratio K is _____

A) =0 B) >1 C) =1 D) < 1

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(a) Define temperature co-efficient of resistance. Prove that $\alpha_t = \frac{\alpha_0}{1+\alpha_0 t}$, where α_0= temperature co-efficient of resistance at 0° C. **07**

(b) Explain the effect of temperature on the resistance of the following. **07**

i) Pure metals ii) Semiconductors

iii) Electrolytes iv) Insulators

Q-3 **Attempt all questions** **(14)**

(a) State Faraday's first law and second law electromagnetic induction. Derive the equation of induced emf $e = N\frac{d\phi}{dt}$. Where N= Number of turns in a coil, ϕ = flux in the coil. **07**

(b) Derive the expression of inductance for the coupled coil connected in series **07**

Q-4 **Attempt all questions** **(14)**

(a) Define capacitance. Derive an expression of total capacitance for n number of capacitors when connected in series. **07**

(b) Derive the expression of energy $E = \frac{1}{2}CV^2$ stored in a electric field of the capacitor. Where, C=capacitance of capacitor, V= Voltage across the capacitor. **07**

Q-5 **Attempt all questions** **(14)**

(a) Obtain an expression for the equivalent delta network resistance for a given star network. **07**

(b) State and explain Kirchhoff's current and voltage law. **07**

Q-6 **Attempt all questions** **(14)**

(a) Derive the relationship between the voltage and current for purely inductive circuit. Draw the waveforms and phasor for voltage and current.

(b) Define resonance. Derive the expression of the resonance frequency for the series RLC cicuit**.**

Q-7 **Attempt all questions** **(14)**

(a) Explain the two wattmeter method for the measurement of power for a balanced three phase circuit. **07**

(b) Derive the following relation for 3 phase balanced star connection. **07**

i) Relation between line voltage and phase voltage

ii) Relation between line current and phase current

Q-8 **Attempt all questions** **(14)**

(a) Derive the emf equation $e = 4.44\, fN\phi_m$ for a single phase transformer Where f= frequency of supply, N= number of turns either primary or secondary side, ϕ_m = maximum flux in the core. **07**

(b) A single phase transformer has 400 primary turns 1000 secondary turns. The net cross-sectional area of the core is 60 cm^2. If the primary winding to be connected to a 50 Hz supply at 520 V (rms), Calculate, **07**

i) Peak value of the flux density in the core

ii) Voltage induced in the secondary winding.