

C.U.SHAH UNIVERSITY

Summer Examination-2017

Subject Name: Fundamental Electrical Engineering

Subject Code: 4TE01FEE1

Branch: B.Tech (All)

Semester: 1

Date: 24/03/2017

Time: 10:30 To 01:30

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.
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Q-1 Attempt the following questions: (14)

- 1) If the diameter of a wire is doubled the resistance of wire becomes _____
A) Twice B) One-half C) One -fourth D) Four-times
- 2) The temperature co-efficient of resistance is positive in case of _____
A) Insulators B) Conductors C) Electrolytes D) Both A and C
- 3) The capacitance of an air capacitance decreases when air is replaced by some dielectric.
A) True B) False
- 4) When four capacitors of $0.25\mu\text{F}$ are connected in series , the resultant capacitance will be _____
A) $1\mu\text{F}$ B) $0.125\mu\text{F}$ C) $0.0625\mu\text{F}$ D) $4\mu\text{F}$
- 5) The energy stored in electric field is given by the expression _____
A) $0.5 C^2 V^2$ B) $0.5 CV$ C) $0.5 C^2V$ D) $0.5 CV^2$
- 6) If a coil has a resistance of 20Ω and inductance of 2H , the time constant will be _____
A) 10 sec B) 40 sec C) 0.1 sec D) None of the above
- 7) If L_1 and L_2 are two coils, coefficient of coupling of two coils is proportional to _____
A) $L_1 L_2$ B) $\sqrt{L_1 L_2}$ C) $\frac{1}{\sqrt{L_1 L_2}}$ D) $\frac{1}{L_1 L_2}$



- 8) Three resistance of 10Ω are connected in star fashion, for equivalent delta connection, resistance of each side will be _____
- A) 30Ω B) 3.33Ω C) 10Ω D) 20Ω
- 9) 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
- 10) 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
- 11) At higher frequencies, the value of capacitive reactance _____
- A) Decreases B) Remains same C) Increases D) Depends on applied voltage
- 12) In a balanced 3-phase star connected system, the equation for three phase power is given by _____
- A) $V_{ph} I_{ph} \cos \phi$ B) $2V_{ph} I_{ph} \cos \phi$ C) $3V_{ph} I_{ph} \cos \phi$ D) $\sqrt{3}V_{ph} I_{ph} \cos \phi$
- 13) A transformer operates _____
- A) On AC supply only B) On DC supply only C) Both AC and DC supply
- 14) For a step down transformer, transformation ratio K is _____
- A) >1 B) $=1$ C) $=0$ D) <1

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

Q-2 Attempt all questions

**(14)
07**

- (a) Define temperature co-efficient of resistance. Prove that $\alpha_t = \frac{\alpha_0}{1 + \alpha_0 t}$, where $\alpha_0 =$ temperature co-efficient of resistance at 0°C .
- (b) Derive an expression for 'n' number of resistances connected in series. Give the advantages of series connection.

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, $\phi =$ flux in



the coil.

- (b) Derive the expression of energy $E = \frac{1}{2} LI^2$ stored in a magnetic field of the inductor. Where, L=Inductance of inductor, I= Current through the inductor. **07**

Q-4 Attempt all questions (14)

- (a) Explain the action of a capacitor and derive the equation for the capacitance $C = \frac{Q}{V}$. **07**

- (b) For a parallel plate capacitor derive the equation of capacitance $C = \frac{\epsilon_0 A}{d}$. Where, C = Capacitance of a capacitor, A= Area of the plate, d= Distance between the two plates, ϵ_0 =permittivity of free space. **07**

Q-5 Attempt all questions (14)

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

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

Q-6 Attempt all questions (14)

- (a) Show that the form factor is 1.11 and peak factor is 1.414 for alternating current. **07**

- (b) Explain the following sinusoidal function terminology. **07**
i) Waveform ii) Instantaneous Value iii) Time period and Frequency

Q-7 Attempt all questions (14)

- (a) For a three phase delta connected balance system, Derive the relation between **07**
i) Phase Voltage and Line Voltage
ii) Phase Current and Line Current

- (b) Derive the relationship between the voltage and current for purely inductive AC circuit. Draw the waveforms and phasor for voltage and current. **07**



Q-8

Attempt all questions

(14)

- (a) A capacitor connected to a 230 V, 50 Hz supply draws 15 A. What current it will draw when the capacitance and frequency are both reduced to half? **07**
- (b) Derive the emf equation $e = 4.44fN\phi_m$ 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**

