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.

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 0.25µF are connected in series , the resultant capacitance will be _____

     A) 1 µF   B) 0.125 µF   C) 0.0625 µF   D) 4 µF

5)   The energy stored in electric field is given by the expression_____

          A) $0.5\ C^2\ V^2$ B) $0.5\ CV$ C) $0.5\ C^2 V$ D) $0.5\ CV^2$

6)   If a coil has a resistance of 20 Ω and inductance of 2 H, 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) $\dfrac{1}{\sqrt{L_1 L_2}}$ D) $\dfrac{1}{L_1 L_2}$

8) Three resistance of 10 Ω are connected in star fashion, for equivalent delta connection, resistance of each side will be _____

      A) 30 Ω   B) 3.33 Ω   C) 10 Ω   D) 20 Ω

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)**

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

(b) Derive an expression for 'n' number of resistances connected in series. Give the advantages of series connection.   **07**

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

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

the coil.

(b) Derive the expression of energy $E = \dfrac{1}{2}LI^2$ 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 $C = \dfrac{Q}{V}$. **07**

(b) For a parallel plate capacitor derive the equation of capacitance $C = \dfrac{\varepsilon_0 A}{d}$. 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 Kirchhoff'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   **07**
draw when the capacitance and frequency are both reduced to half?

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