

# 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  $20\Omega$  and inductance of  $2\text{H}$ , 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)  $\frac{1}{\sqrt{L_1 L_2}}$       D)  $\frac{1}{L_1 L_2}$



- 8) Three resistance of  $10 \Omega$  are connected in star fashion, for equivalent delta connection, resistance of each side will be \_\_\_\_\_
- A)  $30 \Omega$     B)  $3.33 \Omega$     C)  $10 \Omega$     D)  $20 \Omega$
- 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  $\phi$     B)  $e_2$  lags  $e_1$  by  $\phi$     C)  $e_2$  leads  $e_1$  by  $\phi$     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  $0^\circ \text{C}$ .
- (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,  $\epsilon_0$ =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 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,  $\phi_m$  = maximum flux in the core. **07**

