

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE SEMESTER 1<sup>st</sup> / 2<sup>nd</sup> (OLD) EXAMINATION WINTER 2016**

**Subject Code: 110005**

**Date: 31/01/2017**

**Subject Name: Elements of Electrical Engineering**

**Time: 10:30 AM TO 1:00 PM**

**Total Marks: 70**

**Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Derive the equation of Star to Delta and Delta to Star transformation. **07**  
(b) A coil has a resistance of 18  $\Omega$  when its mean temperature is 20° C and of 20  $\Omega$  when its mean temperature is 50° C. Find its mean temperature rise when its resistance is 21  $\Omega$  and the surrounding temperature is 15° C. **07**
- Q.2** (a) Derive equation for charging of capacitor in RC circuit. Also define time constant of circuit. **07**  
(b) Obtain the relation  $L = (L_1L_2 - M^2) / (L_1+L_2+2M)$  for equivalent inductance when two inductors are connected in parallel such that the mutually induced emf opposes the self induced emf. **07**
- Q.3** (a) Derive the equation of capacitance of parallel plate capacitor with uniform dielectric medium and with composite dielectric medium. **07**  
(b) Briefly explain following, **07**  
(1) Eddy current loss (2) Hysteresis loss  
(3) Statically induced emf (4) Dynamically induces emf.
- Q.4** (a) Explain series R-L-C circuit with the phasor diagram for  $X_L > X_C$ ;  $X_L < X_C$  &  $X_L = X_C$ . **07**  
(b) R-L-C series circuit with a resistance of 10  $\Omega$ , inductance of 0.2 H and capacitance of 40  $\mu\text{F}$  is supplied with a 100 V supply at variable frequency. Find the following with respect to series resonant circuit. **07**  
(1) The frequency at which resonant takes place (2) the current (3) power (4) power factor (5) voltage across R, L and C at that time (6) quality factor (7) half-power frequencies.
- Q.5** (a) Prove that current in purely inductive circuit lags its voltage by 90° and average power consumption in pure inductor is zero. **07**  
(b) A coil of 2000 turns is wound uniformly over non magnetic ring of mean circumference 80 cm and cross sectional area of 0.6  $\text{cm}^2$ . If the current through the coil is 2 Ampere Calculate, **07**  
(1) Magnetizing force (2) reluctance (3) flux (4) flux density.
- Q.6** (a) Explain two wattmeters method for 3-phase power measurement. **07**  
(b) Discuss the various types of lighting schemes. **07**
- Q.7** (a) Explain charging of battery from AC supply with schematic diagram. **07**  
(b) Explain working of ELCB & MCB. **07**

\*\*\*\*\*