

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

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

## GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-I Remedial examination March 2009

**Subject code: 110005**

**Subject Name: Elements of Electrical Engineering.**

Date: 19 / 03 / 2009

Time: 02:00pm To 04:30pm

**Instructions:**

**Total Marks: 70**

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

<b>Q1. (A)</b>	Derive an expression for the capacitance of a parallel plate capacitor with plate area 'A' and distance of separation between the plates 'd' in M.K.S.	<b>(07)</b>
<b>(B)</b>	Two capacitors having 8 $\mu\text{F}$ and 4 $\mu\text{F}$ are connected in series and charged from a constant voltage of 210 Volts supply. Calculate (a) The voltage across each capacitor (b) The charge on each capacitor.	<b>(07)</b>
<b>OR</b>		
<b>(B)</b>	A capacitor of 10 $\mu\text{F}$ is connected to a DC supply through a resistance of 1.1 M $\Omega$ . Calculate the time taken for the capacitor to reach 90 % of its final charge.	<b>(07)</b>
<b>Q2(A)</b>	Prove that if a DC current of 'I' amperes is super-imposed in a conductor by an AC current of maximum value 'I' amperes, the root mean square (rms) value of the resultant is $(\sqrt{3}/\sqrt{2})I$ .	<b>(07)</b>
<b>(B)</b>	Two branches numbered '1' and '2' having impedances of $3 + j4 \Omega$ and $3 - j4 \Omega$ respectively are connected to a 230 Volt, 50 Hz rms source. Find out : (i) The total current drawn from the source. (ii) Power factor of that current. (iii) Draw the phasor diagram for $I_1$ , $I_2$ , the total current and supply voltage.	<b>(07)</b>
<b>Q3( A)</b>	State and explain Kirchoff's voltage and current laws.	<b>(05)</b>
<b>(B)</b>	Draw Wheatstone's bridge network ABCD as follows: Resistance between terminals A-B, B-C, C-D, D-A and B-D are 10, 30, 15, 20 and 40 ohms respectively. A 2 volt battery of negligible resistance is connected between terminals A and C. Determine the value and direction of the current in the 40 $\Omega$ resistor.	<b>(05)</b>
<b>(C)</b>	Show that $R_t = R_0(1 + \alpha t)$ . Notations have usual meaning. The resistance of tungsten filament of a lamp is 20 $\Omega$ at the room temperature of 20° C. What is the operating temperature of the	<b>(04)</b>

	filament if the resistance temperature co-efficient of tungsten is $0.005/^{\circ}\text{C}$ at $20^{\circ}\text{C}$ . The base of the lamp is marked 120 Volt, 50 W.	
	<b>OR</b>	
<b>Q3 (A)</b>	Draw the circuit diagram of tubelight with the wiring of choke and starter. Explain the functioning of the circuit.	<b>(05)</b>
<b>(B)</b>	Explain the biological effect of electric current keeping the electric safety in view. Explain plate earthing.	<b>(05)</b>
<b>(C)</b>	Sketch the staircase wiring.	<b>(04)</b>
<b>Q4 (A)</b>	Give the comparison between electric and magnetic circuit.	<b>(05)</b>
<b>(B)</b>	Give the comparison of series resonance and parallel resonance.	<b>(05)</b>
<b>(C)</b>	State and explain Faraday's laws of electromagnetic induction.	<b>(04)</b>
	<b>OR</b>	
<b>Q4 (A)</b>	Two coils having 100 and 1000 turns respectively have a common magnetic circuit of 25 cm. diameter and $625\text{ cm}^2$ cross-section and a constant relative permeability of 2000. Calculate (i) The self inductance of both the coils. (ii) The mutual inductance between them if the co-efficient of coupling is 0.5.	<b>(07)</b>
<b>(B)</b>	Write down the line value and phase value relationship of voltages and currents in 3 phase star and delta connected systems.	<b>(07)</b>
<b>Q5 (A)</b>	Draw and explain the wiring diagram of supply mains with energy meter and distribution box.	<b>(07)</b>
<b>(B)</b>	Give the circuit diagram of ELCB. Explain its working in brief.	<b>(07)</b>
	<b>OR</b>	
<b>Q5 (A)</b>	Explain the construction and working of any type of battery you know. What is its voltage when it is fully charged ?	<b>(07)</b>
<b>(B)</b>	The input power to a 3 phase load is measured by two wattmeter method. The ratio of the readings of the two wattmeters connected for 3 phase balanced load is 4:1. The load is inductive. Find the load power factor.	<b>(07)</b>

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