

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-I &II (NEW) EXAMINATION – SUMMER-2019

Subject Code: 2110005

Date: 20/06/2019

Subject Name: Elements of Electrical Engineering

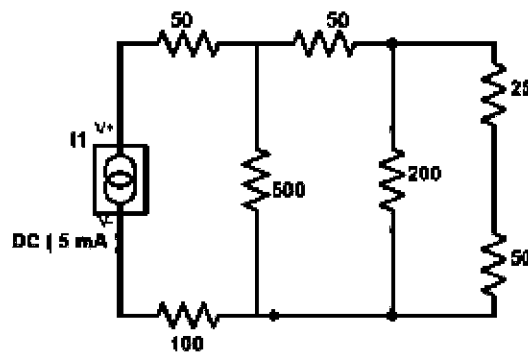
Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Question No.1 is compulsory. Attempt any four out of remaining six questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1	Objective Question	Mark
(a)	Answer the following multiple choice questions.	07
1.	Which of the following relations is incorrect? (a) $P=V^2G$ (b) $V= \sqrt{PR}$ (c) $G=P/I^2$ (d) $I=\sqrt{(P/R)}$ P= power, V= Voltage, I= current, R=resistance, G=conductance	
2.	Ohm's law is not applicable to (a) ac circuit (b) dc circuit (c) semi-conductor (d) linear circuits	
3.	Which of the following is a vector quantity? (a) electric charge (b) electrical potential (c) electric field intensity (d) none of the above	
4.	Which law states that the induced e.m.f. and current always oppose the cause of producing them? (a) Lenz (b) Fleming (c) Faraday (d) Maxwell	
5.	Which of the following frequencies has the longest time period? (a) 10 kHz (b) 1 kHz (c) 10 Hz (d) 1 Hz	
6.	The resonance frequency for the series RLC circuit where, $R=100 \Omega$, $L = 80 \text{ mH}$, $C = 3160 \text{ pF}$. (a) 15 kHz (b) 10 kHz (c) 8 kHz (d) 12 kHz	
7.	Series connection of cells (a) increases the efficiency (b) increases the voltage output (c) increases the current output (d) decreases the internal resistance	
(b)	Answer the following	07
1.	Give reason why are all equipments connected in parallel to the supply.	
2.	If resistance of each branch is 3Ω in a delta connected load, what would be the resistance of each branch in star equivalent?	
3.	Give relationship between electric flux density and electric field intensity.	
4.	What do you mean by capacitance? Give its unit.	
5.	State Fleming's left hand rule.	
6.	Define rms value.	
7.	Differentiate between phase and line voltages in three phase circuits.	
Q.2	(a) State and Explain Kirchhoff's laws in context with DC circuits.	03
	(b) Calculate the current I through 25Ω resistance in the circuit shown below if Input I1 of 5 mA is applied using a current source.	04



- (c) What do you mean by resistance temperature co-efficient? Derive & obtain the expression $\alpha_2 = 1/(1/\alpha_1 + (t_2 - t_1))$ with usual notation. **07**
- Q.3** (a) State and explain Coulomb's law of electrostatics. **03**
 (b) Derive an expression for co-efficient of mutual coupling between two coils having self-inductances of L_1 and L_2 with usual notations. **04**
 (c) Two square conducting plates having cross sectional area of 2500 cm^2 and 1 cm distance between them are connected across a 600 V supply voltage. They have a dielectric 0.8 cm thick having a relative permittivity of 4 between them. The remaining space is filled with air. Calculate the capacitance of the condenser and the energy stored in it. **07**
- Q.4** (a) Define: (1) Magnetic flux density (2) Magnetic field intensity (3) Reluctance. **03**
 (b) A circular ring of a mild steel has a diameter of 20 cm and 2 mm side air gap. The cross sectional area is 3.2 cm^2 . Estimate the mmf required to establish a flux of 0.6 mWb. Assume relative permeability of mild steel = 900. **04**
 (c) Define the co-efficient of coupling. Derive the relationship between self-inductance and mutual-inductance. **07**
- Q.5** (a) Give comparison between series and parallel resonance. **03**
 (b) An alternating voltage is $v = 100 \sin 100t$. Find (i) Time period and frequency (ii) Angular velocity (iii) Form factor (iv) Peak factor. **04**
 (c) Prove that current in purely capacitive circuit leads its voltage by 90° and average power consumption in pure capacitor is zero. **07**
- Q.6** (a) Define power factor. Enlist the demerits of low power factor. **03**
 (b) A delta connected balanced 3-phase load is supplied from a 3-phase 400 V supply. The line current is 20 A and the power taken by the load is 10,000 W. Find (i) impedance in each branch (ii) the line current, power factor and power consumed if the same load is connected in star. **04**
 (c) Show that for star connection of three phase circuit, the line voltage is equal to 1.732 times the phase voltage whereas line current is equal to phase current. Also draw phasor diagram to support your answer. **07**
- Q.7** (a) Give classification of various types of lighting schemes and explain any two. **03**
 (b) Explain the construction of cable with neat diagram. **04**
 (c) What do you mean by earthing? Analyze earthing concept with the help of a device ELCB (Earth leakage circuit breaker) used at our residence. **07**
