

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER- I & II (NEW) EXAMINATION – WINTER 2019****Subject Code: 2110005****Date: 11/01/2020****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 (MCQ)	Mark
(a)		07
1.	A circuit contains two unequal resistances in parallel [a] current is same in both [b] large current flows in larger resistance [c] potential difference across each is same [d] smaller resistance has smaller conductance	
2.	Which medium has least dielectric strength? [a] Air [b] Quartz [c] Glass [d] Paraffin wax	
3.	Which of the following is a vector quantity? [a] Magnetic potential [b] Magnetic field intensity [c] Flux density [d] Relative permeability	
4.	If the current and voltage are out of phase by 90° , the power is [a] Minimum [b] Maximum [c] Zero [d] $1.1 \cdot V \cdot I$	
5.	In ac circuits, the ac meters measure [a] RMS values [b] Peak values [c] Mean value [d] Mean square value	
6.	Which of the following statement is not correct? [a] A primary cell is an electrochemical cell [b] After charging, a primary cell can be again put to use [c] Dry cell is a primary cell [d] Leclanche cell is used in experiments, where constant supply of current is not needed.	
7.	Candela is the unit for [a] Light flux [b] Brightness [c] Luminous efficiency [d] Luminous intensity	
(b)		07
1.	A resistor is to be connected across a 45 V battery to provide 1 mA of current. The required resistance with a suitable wattage rating is [a] 45 Ω , 10W [b] 4.5 Ω , 2 W [c] 450 k Ω , 20W [d] 45 k Ω , $\frac{1}{4}$ W	
2.	The capacitance reactance of an ac circuit containing 35 μ F capacitance at a frequency of 60 Hz will be [a] 50 Ω [b] 60 Ω [c] 75 Ω [d] 100 Ω	
3.	A property of a material which opposes the creation of magnetic flux in it is known as [a] magneto motive force [b] reluctance [c] permeance [d] reluctivity	

4. If one cycle of ac waveform occurs every milli-second, the frequency will be
 [a] 1/1000 Hz [b] 50 Hz [c] 100 Hz [d] 1000 Hz
5. In an ac source $R=36\ \Omega$, frequency = 50 Hz and $L = 0.12\text{ H}$, then phase difference between current and voltage is nearly
 [a] 90° [b] 60° [c] 45° [d] 75°
6. In a lead acid battery, during charging
 [a] anode becomes whitish in colour [b] voltage drops
 [c] specific gravity of acid increases [d] the cell gives out energy
7. In a fluorescent tube circuit, choke acts as
 [a] starter [b] power factor improving device
 [c] source of heat [d] current limiting device
- Q.2** (a) Two wires A & B made up of same material, wire B has twice the length of wire A and having half the diameter to that of A. Calculate the ratio R_B/R_A . **03**
- (b) Why domestic appliances are connected in parallel? Give comparison with series circuit? **04**
- (c) Three resistances R_{AB} , R_{BC} and R_{CA} are connected in delta. Obtain expressions for their equivalent star resistances. **07**
- Q.3** (a) State and explain Coulomb's laws. **03**
- (b) Discuss B-H curve of a ferro-magnetic material and explain the following. (i) Magnetic saturation (ii) Hysteresis (iii) Residual Magnetism (iv) coercive force. **04**
- (c) A capacitor of $0.1\ \mu\text{F}$ is charged from a 100 V battery through a series resistance of $1\ \text{K}\Omega$. Find **07**
 (i) The time for the capacitor to receive 63.2% of its final charge.
 (ii) The charge received in this time
 (iii) The final rate of charging
 (iv) The rate of charging when the charge is 63.2% of the final charge.
- Q.4** (a) Give comparison between magnetic and electric circuits. **03**
- (b) Derive an expression for the equivalent capacitance of a group of capacitors when they are connected (i) in parallel (ii) in series. **04**
- (c) A ring composed of three sections. The cross-sectional area is 0.001 m^2 for each section. The mean arc length are $I_a = 0.3\text{ m}$, $I_b = 0.2\text{ m}$, $I_c = 0.1\text{ m}$. An air-gap length of 0.1 mm is cut in the ring. μ_r for sections a, b, c are 5000, 1000 and 10,000 respectively. Flux in the air gap is $7.5 \times 10^{-4}\text{ Wb}$. Find (i) mmf (ii) exciting current if the coil has 100 turns. (iii) Reluctance of the sections. **07**
- Q.5** (a) Define: (i) r.m.s. value (ii) Form factor (iii) Amplitude factor **03**
- (b) Distinguish between (i) apparent power (ii) active power and (iii) reactive power in ac circuits. **04**
- (c) What is resonance in AC circuit? Elaborate resonance in case of series R-L-C circuit with the help of phasor diagram and sketch the resonance curve. **07**
- Q.6** (a) List out the merits of two watt meter method. **03**

- (b) Phase voltage and current of a star-connected inductive load is 150 V and 25 A. Power factor of load is 0.707 (lag). Assuming that the system is 3-wire and power is measured using two wattmeters, find the readings of wattmeters. **04**
- (c) Obtain the relationship between line and phase values of current in a three phase, balanced, delta connected system. **07**
- Q.7**
- (a) List out the different types of illumination schemes. **03**
- (b) Discuss the Lead acid battery with charging & discharging equations. **04**
- (c) Define term 'earthing'. State all the methods of earthing and explain any one of them. **07**

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