

Seat No.: _____ Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- 1st / 2nd EXAMINATION (NEW) – SUMMER 2018

Subject Code: 2110005

Date: 28-05-2018

Subject Name: Elements of Electrical Engineering

Time: 02:30 pm to 05:00 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)

(a) Choose the most appropriate option from the following. **07**

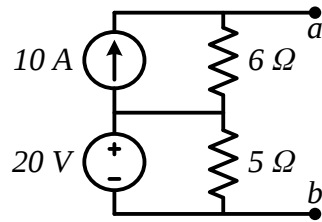
1. The nodal method of circuit analysis is based on _____.
(a) KCL and Ohm's law (b) KVL and Ohm's law
(c) KCL and KVL (d) KCL, KVL and Ohm's law
2. In which of the following types of capacitors, care should be taken with regard to the polarity while connecting it in a circuit?
(a) Paper capacitor (b) Ceramic capacitor
(c) Electrolytic capacitor (d) Mica capacitor
3. Permeance is analogous to _____.
(a) resistivity (b) reluctance (c) resistance (d) conductance
4. A current is said to be alternating when it changes in _____.
(a) magnitude only (b) direction only
(c) both magnitude and direction (d) neither magnitude nor direction
5. In a series RLC high Q circuit, the current peaks at a frequency _____.
(a) greater than the resonant frequency (b) equal to the resonant frequency
(c) less than the resonant frequency (d) none of the these
6. The rated voltage of a three-phase power system is given as _____.
(a) rms phase voltage (b) rms line to line voltage
(c) peak phase voltage (d) peak line to line voltage
7. The major advantage of secondary cell is that _____.
(a) electrolyte used is very cheap (b) chemical action not reversible
(c) chemical action is reversible (d) none of the these

(b) Choose the most appropriate option from the following. **07**

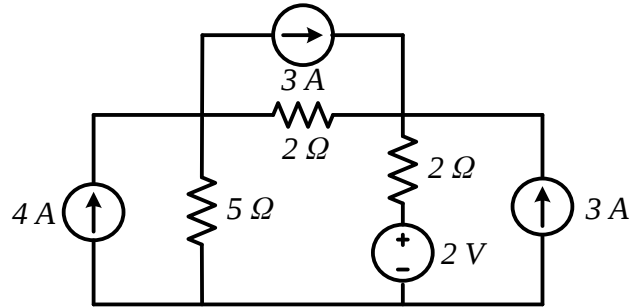
1. The resistivity of the conductor depends on _____.
(a) length of the conductor (b) type of material
(c) area of the conductor (d) none of these
2. Work done in charging a capacitor is given by _____.
(a) $2QV$ (b) $(1/2)QV$ (c) $2CV$ (d) $(1/2)CV$
3. The right-hand rule for determining the direction of the induced EMF was introduced by _____.
(a) Faraday (b) Lenz (c) Fleming (d) Maxwell
4. In an AC circuit power is dissipated in _____.
(a) resistance only (b) inductance only (c) capacitance only (d) none of these
5. The power factor of which of the following will be unity.
(a) Purely capacitive circuit (b) Purely inductive circuit
(c) Purely resistive circuit (d) both 'a' and 'b'
6. In the two-wattmeter method of measurement, if one of the wattmeters reads zero, then power factor will be _____.
(a) zero (b) unity (c) 0.866 (d) 0.5
7. The choke in tubelight wiring provides _____.

(a) high current (b) high power (c) high impulse voltage (d) low reactance

- Q.2 (a)** Replace given network of following figure with a single current source and a resistor across terminals 'a' and 'b'. **03**



- (b)** Find current flowing through 5 Ω resistor of the following figure using mesh analysis. **04**



- (c)** Compare magnetic and electric circuits by similarities and differences. **07**

- Q.3 (a)** Define electric flux density (D) and electric field intensity (E); and then establish relationship between them. **03**

- (b)** Analyze the series and parallel connection of capacitors. **04**

- (c)** Explain construction of cable in detail. **07**

- Q.4 (a)** Discuss three different ways of expressing self-inductance. **03**

- (b)** Derive expression of energy stored in capacitor, connected to a DC supply. **04**

- (c)** Derive expressions for delta to star and star to delta conversion of resistive network. **07**

- Q.5 (a)** Explain the effect of frequency on resistance, inductive reactance and capacitive reactance. **03**

- (b)** A choke coil is connected to DC supply of 220 V; the current drawn by the coil is 22 Amp. When the same coil is connected to an AC supply of 220 V, 50 Hz, the current is 10 A. Determine (i) Resistance (ii) Impedance (iii) Reactance (iv) Inductance of choke coil. **04**

- (c)** Define RMS value and average value, and then prove that both are equal for a square wave. **07**

- Q.6 (a)** Write advantages of 3-phase system over a single-phase system. **03**

- (b)** A series RLC circuit consists of a resistance of 500 Ω, inductance of 50 mH and a capacitance of 20 pF. Find (i) resonant frequency (ii) Q factor of the circuit (iii) half power frequencies. **04**

- (c)** With neat circuit diagram and a phasor diagram, prove that, two wattmeters are sufficient to measure total power in 3-phase system. **07**

- Q.7 (a)** Classify various types of Lighting scheme and explain any two. **03**

- (b)** What is grounding & earthing? **04**

- (c)** How the power factor of a 3-phase balanced load can be determined using two wattmeters? **07**
