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# GUJARAT TECHNOLOGICAL UNIVERSITY <br> PDDC - SEMESTER-II • EXAMINATION - WINTER • 2014 

Subject Code: X10901 Date: 01-01-2015
Subject Name: Elements of Electrical Engineering Time: 10:30 am - 01:00 pm
Total Marks: 70
Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
Q. 1 (a) Define following terms with respect to a.c. waveform.
(i) Frequency (ii) Cycle
(iii) Amlitude
(iv) Form factor (v) Peak factor (vi) Power factor (vii) Average value
(b State and explain the Kirchhoff's current and voltage laws.
)
Q. 2 (a) Discuss resonance in R-L-C series circuit. Explain how power factor, inductive07 reactance and resistance vary with frequency.
(b Explain the method of measuring 3-phase power by two wattmeter method.
Q. 3 (a) Establish the relationship between line and phase voltage and current in balanced ..... 07 delta connection. Draw complete phasor diagram of voltages \& currents.

(b The instantaneous voltage across each of the four coils connected in series is ..... 07

) given by

$$
\begin{array}{ll}
\mathrm{V} 1=100 \sin 471 \mathrm{t}, & \mathrm{~V} 2=250 \cos 471 \mathrm{t}, \\
\mathrm{~V} 3=150 \sin (471 \mathrm{t}+\pi / 6) & \mathrm{V} 4=200 \sin (471 \mathrm{t}+\pi / 4)
\end{array}
$$

Determine the total voltage expressed in a similar form.
Q. 4 (a) Explain the method of transforming a delta connected network into star 07
(b A $10 \Omega$ resistor and a 20 mH inductor are connected in series across a $230 \mathrm{~V}, 50$
) Hz supply. Find the circuit impedance, current, active power, reactive power, apparent power and power factor.
Q. 5 (a) Derive equation for charging of capacitor in RC Circuit. Also define time 07
(b) A $10 \mu \mathrm{~F}$ capacitor is connected in series with $1 \mathrm{M} \Omega$ resistor. The combination is
) connected across a 100 V DC supply. Determine:(i) time constant of the circuit (ii) the initial value of charging current (iii) the initial rate of rise of voltage across the capacitor (iv) time taken for the capacitor voltage to reach 60 V .
$\begin{array}{llll}\text { Q. } 6 & \text { (a) Compare similarities and dissimilarities between electrical and magnetic circuit } & \mathbf{0 7} \\ \text { (b } & \text { A series R-L-C circuit consists of a resistance of } 500 \Omega \text {, an inductance of } 50 \mathrm{mH} & \mathbf{0 7} \\ & \text { ) } & \text { and a capacitance of } 20 \mathrm{pf} \text {. Find(i) The resonant frequency(ii) The Q-factor of } \\ & \text { the circuit at resonance (iii) The voltage across inductance. }\end{array}$
Q. 7 (a) Prove that the average power consumption in a pure capacitive circuit is zero.

Define: line voltage, phase voltage
(b Explain the phenomena of generation of alternating voltage and current and
) derive expression for it with suitable diagrams.

