(EC/EE/EI 213 (CR))

Total No. of Questions : 9] [Total No. of Pages : 03
B.Tech. II/IV YEAR DEGREE EXAMINATION, APRIL/MAY - 2014
(First Semester)
EC/EE/EI
Circuit Theory

Time : 03 Hours Maximum Marks : 70

Answer Question No. 1 compulsorily. [14 x 1 = 14]
Answer ONE question from each unit. [4 x 14 = 56]

Q1) a) Define average value for sinusoidal input wave?
b) Define crest factor.
c) Define Active Element and give an example.
d) Write the relation from star to delta for a balance load impedances?
e) Define twig, graph?
f) What is loop matrices?
g) Write the condition for Resonance in series RLC circuit?
h) Define power triangle?
i) Define ‘Q’ factor ?
j) Draw the impulse response of series RL circuit?
k) Define selectivity?
l) Write the laplace transform of parabolic wave?
m) Define final value theorem?
n) Obtain laplace transform of \( f(t) = 1 - e^{-t} \).

UNIT - 1

Q2) a) Find the voltage drop across x - y terminals.

b) Find out currents through each resistor by applying nodal analysis for the circuit show in figure.

OR

N-2793 P.T.O.
**Q3)** a) Obtain the fundamental loop and fundamental cut-set matrices for the graph shown in figure.

![Graph](image)

b) Using Node analysis, find the value of \( \alpha \) for the circuit. Show in following figure, when the power losses in the 1Ω resistor is 9W.

![Figure](image)

**UNIT - II**

**Q4)** a) A voltage of ‘v’ volts is applied is a circuit containing only resistance of 10 Ω. If the voltage wave be represented by \( v = 10 \sin (314t) \), find the peak current, rms current average current and form factor?

b) Determine the following from the figure shown

i) Total impedance
ii) Total line current
iii) Phase angle and powerfactor.

![Figure](image)

**OR**

**Q5)** a) i) Define Real, Reactive, complex power
ii) Explain power triangles and Impedance triangles?

b) Obtain the average power consumed by circuit given in figure. Also Determine the power factor.

![Figure](image)
UNIT - III

Q6) a) Define and explain Reciprocity theorem with an example.
b) Find the current through 3 $\Omega$ resistor in the circuit shown in figure using Norton’s theorem.

OR

Q7) a) Derive an expression for Resonance frequency in series RLC circuit. Also Define Bandwidth.
b) In a RLC series circuit, the resistance inductance and capacitances are $10\Omega$, 100mH and 10 $\mu$F. Calculate Resonance Band width and selectivity?

UNIT - IV

Q8) a) In a series LC circuit, a 50V DC is applied at $t = 0$. Find the voltage the capacitor at $t = \infty$. Assume zero initial condition in the circuit elements.
b) A d.c voltage of 100V is applied in the circuit and the switch K is open. The switch K is closed at $t = 0$. Find the complete expression for the current.

OR

Q9) a) Derive an expression for Transient Response in series RLC circuit with sinusoidal excitation.
b) Write the PSPICE program and get solution for the circuit shown in figure. $R_1 = 1\Omega$, $R_2 = 1\Omega$, $R_3 = 2\Omega$. 
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(First Semester)
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Circuit Theory

Time : 03 Hours
Maximum Marks : 70

Answer Question No. 1 compulsorily. (14 × 1 = 14)
Answer ONE question from each unit. (4 × 14 = 56)

Q1) a) Define the charge, power and energy.
b) State Norton’s Theorem.
c) Define Active Element and give an example.
d) Define Twig and Graph.
e) Write the condition for Resonance in series RLC circuit.
f) Define Q-factor.
g) Define Power factor and Quality factor.
h) State Final Value Theorem.
i) Write the Relation from Star to Delta for balance load Impedance?
j) Define selectivity.
k) Draw the phasor diagram of RL-series circuit.
l) Obtain the Laplace transform of \( f(t) = 1 + e^{-st} \).
m) Define Power Triangle.
n) Explain Transient Response.

UNIT - I

Q2) a) Use the Nodal Analysis to obtain a value for \( v_s \).

b) Explain the Kirchhoff’s voltage law and Kirchhoff’s current law?

OR

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P.T.O.
Q3) a) Find the power loss in 1Ω resistor of following figure.

![Diagram](image1)

b) Define the following terms with an example.
   (i) Branch  (ii) Link  (iii) Cut set  (iv) Loop matrix.

**UNIT - II**

Q4) a) State and Explain the Thevenin’s Theorem.
   b) Use the superposition theorem, to find the voltage across each source.

![Diagram](image2)

**OR**

Q5) a) Explain the instantaneous, peak, average and RMS values of a periodic function?
   b) In the following ckt, determine the values of the (i) Total Impedance (ii) Total line current and (iii) Phase angle.

![Diagram](image3)

**UNIT - III**

Q6) a) Explain about parallel Resonance with suitable diagrams?
   b) In following fig, R = R_1 = 1Ω, L = 1H, C = 0.5 F. Find the resonance frequency and the admittance at the resonant frequency?

![Diagram](image4)

N-2792  OR  -2-
Q7)  a) Find the response of a series R-L circuit to a step Input. Explain with suitable diagram.

b) \( V_s(t) = \sin(10^6t) \). The Inductors has zero current at \( t = 0 \)
   i) Determine \( i_L(t) \) for \( t > 0 \), using the V-i relationship of Inductors in time domain.
   ii) Determine \( i_L(t) \) using phasor analysis.

![Diagram of R-L circuit]

UNIT - IV

Q8) a) Explain about describing dependent and Independent current and voltage sources in “PSPICE”. Also give an example.

b) A series R-C circuit has \( R = 20\Omega \) and \( C = 100\mu F \). A voltage \( V = 200 \sin 314t \) is applied at \( t = 2.14\text{msec} \). Obtain an expression for \( i \). Also, find the value of current after time 1msec from the switching instant.

OR

Q9) a) Determine the Laplace Transform of a Half-wave rectified waveform.

b) Apply the initial value theorem to the following functions.
   i) \( H(s) = \frac{s(s + 5)}{(s + 4)(s + 6)} \)
   ii) \( H(s) = \frac{s^2 + 9}{s^2 + 16} \).
II/IV B. TECH. DEGREE EXAMINATIONS, NOVEMBER-2014

First Semester
EC/EE/EI
CIRCUIT THEORY

Time: Three Hours
Max. Marks: 70

Answer Question No. 1 compulsorily. 14x1=14
Answer ONE question from each unit. 4x14=56

1. a) Define R.M.S. value and write expression for sinusoidal wave.
   b) Define form factor?
   c) Define power factor?
   d) What is frequency domain representation.
   e) Write Tellegan's theorem?
   f) Define selectivity?
   g) State Initial value theorem?
   h) Draw the current response of series RC circuit excited with unit step?
   i) Write the condition for Resonance in parallel RLC circuit?
   j) Write the expression for Q factor in RLC series ckt.
   k) Define super node?
   l) Write the laplace transform of step input.
   m) Obtain the laplace Transform of \( f(t) = 1 - e^{-at} \).
   n) Define "DC sweep" statement in PSPICE.

UNIT - I

2. a) Define and explain Kirchoff's voltage and current laws.
   b) Determine the current drawn by the circuit shown in following figure.

P.T.O.
3. a) Write the mesh equation of circuit shown in figure from that.

b) Develop the graph of the network shown in following figure. Obtain the tie-set matrix selecting a tree.

UNIT - II

4. a) A capacitor is drawing a current of 5A and 230v, 50Hz. Determine the instaneous voltage and current. Also find the average and rms value also.

b) For the given circuit determine the total impedance, total current and phase angle?
5. a) Define terms
   (i) Power factor  (ii) Real Power  (iii) Complex power  (iv) Power triangle.

   b) Two impedences $Z_1 = 5 \angle -30^\circ \Omega$ and $Z_2 = 10 \angle +45^\circ \Omega$ are connected in parallel. The combination draws $(2+j4)A$ current from a voltage source. Determine the voltage source and the complex power for each branch.

UNIT - III

6. a) Define Maximum Power Transfer Theorem ? And derive the condition for maximum power transfer in A.C. Network.

   b) Using super position theorem. Find the current through '1W' Resistor shown in following figure.

(OR)

7. a) Derive an expression for Band width and Q factor for series RLC resonance circuit ?

   b) A series RLC circuit has $R = 2\Omega$, $L = 2.0 \text{ mH}$, $C = 10 \text{ mF}$. Calculate (i) Q factor (ii) Band width (iii) Resonance frequency (iv) half power frequencies $f_1$ and $f_2$.

UNIT - IV

8. a) Explain the Transient Response in series RC circuit having DC excitation ?

   b) Find the expression of discharging voltage of the capacitor at $t = 0+$ following switch at $t = 0$ from (1) to (2).
9. a) Function in -s- domain is given by \[ F(s) = \frac{s^2 + 3s + 1}{s(s^2 + 3s + 2)} \]

find (i) \( f(t) \) and (ii) the steady state solution using final value theorem.

b) Apply PSPIC program to find voltage at node \( x \) and \( y \).
II/IV B. TECH. DEGREE EXAMINATIONS, NOVEMBER-2014
First Semester
EC/EE/EI
CIRCUIT THEORY

Time: Three Hours
Max. Marks: 70

Answer Question No. 1 compulsory. 14x1=14
Answer ONE question from each unit. 4x14=56

1. a) What is the difference between Active and Passive Elements?
b) What is super node?
c) State the super position theorem?
d) State the Tellagan's Theorem?
e) Define Power factor?
f) State the Final Value Theorem?
g) Plot the step Response of an R-C circuit?
h) Define KCL and KVL?
i) Write the condition for Resonance in parallel RLC circuit?
j) Define Transient Response?
k) What is the Laplace Transform of delayed Impulse?
l) Define Complex power?
m) Draw the Phasor diagram of R-C series Circuit?
n) Define "DC Sweep" statement in PSPICE.

UNIT - I

2. a) Explain the following terms with an example
   (i) Graph (ii) Link (iii) Tree (iv) Cutset Matrix.
b) With help of nodal Analysis Find:
   (i) \( V_A \)
   (ii) Power dissipated in the 2.5\( \Omega \) Resistor.

P.T.O.
3. a) Explain about the star-delta transformation and vice-versa, with an example?

b) Find $i_A$ in the circuit, as shown in figure.

UNIT - II

4. a) State and explain the Maximum Power Transfer Theorem? Also give an example?

b) Use Thevenin's Theorem, to find the current through the $5\Omega$ resistor in the following figure.

5. a) Define the following terms

   (i) Average value  
   (ii) Rms value  
   (iii) Peak factor  
   (iv) Form factor.

b) For the given circuit, determine the total Impedance, total current and phase angle?
UNIT - III

6. a) Derive the relationship between quality factors and Bandwidth, for a RLC series circuit?
   b) The Q factor of a RLC circuit is '5', at its resonance frequency of 1 kHz. Assuming the power dissipation of 250w, when the current drawn is 1A, find the circuit parameters? Determine the B.W. of the circuit.
   (Or)

7. a) Explain about the series Resonance with suitable diagrams and examples?
   b) Determine all the currents in the circuit shown below.
   c) Calculate half-power frequencies of a series resonant ckt where the resonance frequency is 150 x 10³ Hz and the Band width is 75 kHz.

UNIT - IV

8. a) Explain DC Analysis and control statements in "PSPICE".
   b) Find the Laplace Transform of : \( f(t) = 1 + e^{-5t} + e^{-7t} \).
   (Or)

9. a) Obtain the current at t>0, if A.C. Voltage 'ν' is applied when the switch 'k' moved to '2' from '1' at t = 0. Assume a steady state current of 1 Amp in the LR circuit when the switch was at position '1'.
   b) Explain the Initial Value theorem and Final Value theorem?