

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), Nov.-Dec. 2015

B. Tech in Electrical Engineering, Semester III

Roll No.....

EE301: Network Analysis & Synthesis

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Short answer type questions (10 questions @ 1 mark), 10

- i. The flow of electric current in a conductor is due to flow of
(a) electrons. (b) protons.
(c) electrons and ions. (d) charged particles.
- ii. Correct form of Ohm's law
(a) $I = VR$ (b) $V \propto I$
(c) $V = IR$ (d) both (b) and (c)
- iii. Constant voltage source is
(a) active and bilateral. (b) passive and bilateral.
(c) active and unilateral. (d) passive and unilateral.
- iv. The graph of a network has 6 branches with 3 tree branches. The minimum number of equations required for the solution of the network is
(a) 2 (b) 3 (c) 4 (d) 5
- v. In a linear circuit, the superposition principle can be applied to calculate the
(a) voltage and power. (b) voltage and current.
(c) current and power. (d) voltage, current and power.
- vi. In a series RLC circuit with $R = 2k\Omega$, $L = 1H$ and $C = \frac{1}{400} \mu F$. The resonant frequency is
(a) $2 \times 10^4 Hz$ (b) $\frac{1}{\pi} \times 10^4 Hz$
(c) $10^4 Hz$ (d) $2\pi \times 10^4 Hz$
- vii. An independent voltage source in series with an impedance $Z_S = R_S + jX_S$ delivers a maximum average power to a load impedance Z_L when
(a) $Z_L = R_S + jX_S$ (b) $Z_L = R_S$
(c) $Z_L = jX_S$ (d) $Z_L = R_S - jX_S$
- viii. Which one of the following has the ability to act as an open circuit for dc and a short circuit for ac of high frequency?
(a) An inductor (b) A capacitor
(c) A resistor (d) None of these

- ix. A two-port network has the ABCD parameters $\begin{bmatrix} 7 & 8 \\ 3 & 4 \end{bmatrix}$. Two such identical networks are cascaded. The ABCD parameters of the overall cascaded network will be

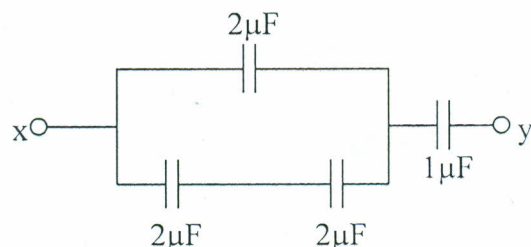
- (a) $\begin{bmatrix} 14 & 16 \\ 6 & 8 \end{bmatrix}$ (b) $\begin{bmatrix} 77 & 88 \\ 33 & 44 \end{bmatrix}$
 (c) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 49 & 64 \\ 9 & 16 \end{bmatrix}$

- x. For determining the network functions of a two-port network, it is required to consider that
- all initial conditions remain same.
 - all initial conditions are zero.
 - part of initial conditions are equal to zero.
 - initial conditions vary depending on nature of network.

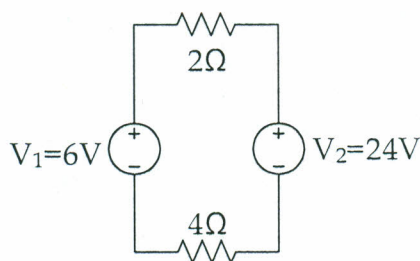
Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- i. Find the equivalent capacitance of the combination shown in figure below.



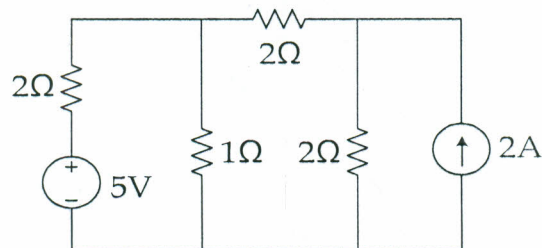
- ii. Provide equations for converting networks from Star to Delta and Delta to Star.
 iii. Find the power loss in the resistors and the power delivered by two d.c. constant voltage sources as shown in figure below.



- iv. What do you mean by sources with periodic waveforms? Also mention what form factor is?

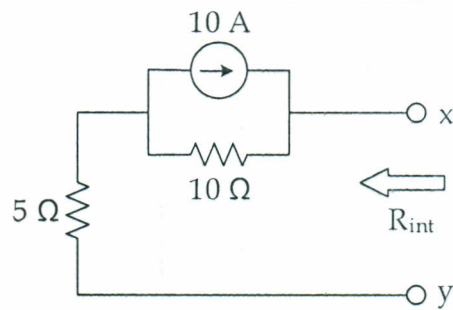
Q.3A In the circuit shown in the figure below, find the current in 1Ω resistor.

05



Q.3B Give the statement of Norton's theorem and find the Norton's equivalent circuit to the left of terminals x-y in the network shown below.

01 +
04



Q.4A Define Resonance. By making vector diagram and writing appropriate equations explain Series Resonance. 01 + 04

Q.4B A coil has a resistance of 20Ω and inductance of 80mH and is connected in series with a 100pF capacitor. Determine, at resonance, the circuit impedance and also find the resonant frequency. If the supply to the circuit is a 50V source having an internal impedance of 2Ω , find also the circuit current and the voltage across the capacitor. 05

Q.5A Give the expression of transient response in series RLC series circuit when excited with D.C. input. 05

Q.5B A 50Hz 400V (Peak value) sinusoidal voltage is applied at $t = 0$ to a series RL circuit having resistance of 5Ω and inductance of 0.2H . Obtain an expression of current at any instant " t ". Calculate the value of the transient current 0.01 sec after switching on. 05

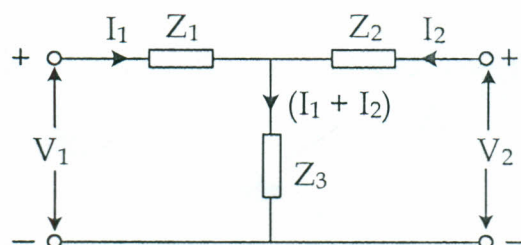
Q.6A Provide the laplace transform of the following forcing functions: 01 +
 (1) Unit Step function 02 +
 (2) Exponential function 02
 (3) Sinusoidal function

Q.6B Give the expression for step response of RL series circuit. 05

OR

Q.6B Give the expression for step response of RC series circuit. 05

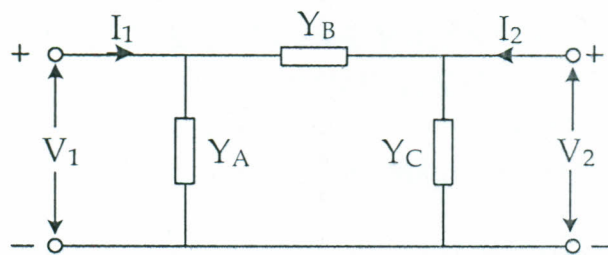
Q.7A Write the equations representing Z-parameters. Also find the Z-parameters for the following network. 02 + 03



Q.7B Discuss the following network configuration: 1.5 +
 (1) T-section 1.5 +
 (2) π -section 02
 (3) Bridged T-section

OR

Q.7B Write the equations representing Y-parameters. Also find the Y-parameters for the following network. 05

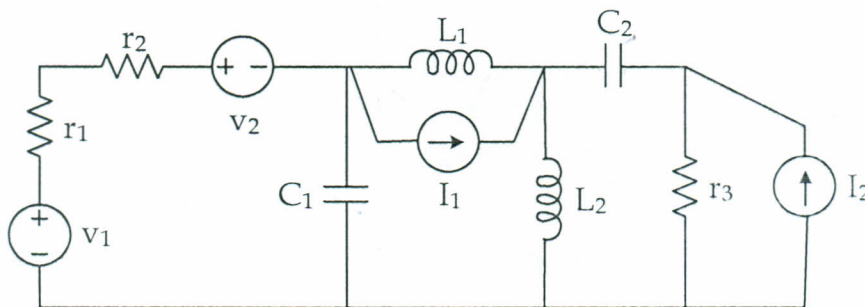


Q.8A Define the following terms:

05 +
05

- (i) Branch
- (ii) Node
- (iii) Tree
- (iv) Loop
- (v) Path

Draw the oriented graph of the network shown in figure and write the incidence matrix by inspection.



Q.9A Provide the necessary conditions of stability of a network function $F(s)$. indicate with proper reasoning which of the following polynomials are Hurwitz:

2.5 +
2.5 +
2.5 +
2.5

- (a) $s^2 + 4s + 10$
- (b) $s^4 + s^3 + 2s^2 + 3s + 2$
- (c) $s^4 + 11s^3 + 39s^2 + 51s + 20$

Q.9B Classify the following types of systems:

2.5 +
2.5 +
2.5 +
2.5

- (1) Continuous and discrete-time systems
- (2) Fixed and time-varying systems
- (3) Linear and non-linear systems
- (4) Lumped and distributed systems

OR

Q.9B There are different types of interconnections of two port networks. Explain any two of those.

05 +
05