

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2016
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 Objective type questions (10 questions @ 1 mark)

10

- i. The v-i characteristic of a resistor is $i = 2v^2$. The resistor is
 - (a) linear, passive, bilateral
 - (b) non-linear, passive, bilateral
 - (c) non-linear, active, bilateral
 - (d) non-linear, active, unilateral
- ii. KCL is a consequence of law of conservation of
 - (a) energy
 - (b) flux
 - (c) charge
 - (d) all of these
- iii. Kirchhoff's law fails in case of
 - (a) linear networks
 - (b) non-linear networks
 - (c) dual networks
 - (d) distributed parameter networks
- iv. A component that opposes the change in circuit current is
 - (a) inductance
 - (b) capacitance
 - (c) resistance
 - (d) conductance
- v. For a dc voltage an inductor
 - (a) is an open circuit
 - (b) is virtually a short circuit
 - (c) depends on polarity
 - (d) depends on voltage value
- vi. A connected planer network has 4 nodes and 5 elements. The number of meshes in its dual network is
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
- vii. The internal impedance of a dependent voltage source is
 - (a) zero
 - (b) infinity
 - (c) fraction of ohm
 - (d) an unknown value
- viii. 2 resistances of equal value, when connected in parallel give an equivalent resistance of R. if these resistances are connected in series, the effective resistance will be
 - (a) 4R
 - (b) 2R
 - (c) R
 - (d) 0.5R
- ix. In a network containing only independent current sources and resistors, if the value of all resistors are doubled, the values of the node voltages



	(a) remain the same (c) are halved	(b) are doubled (d) change in some other way
x.	Two resistors R_1 and R_2 give combined resistance of $4.5\ \Omega$ when in series and $1\ \Omega$ when in parallel. The resistances are (a) $2\ \Omega$ and $2.5\ \Omega$ (c) $1.5\ \Omega$ and $3\ \Omega$	
	(b) $1\ \Omega$ and $3.5\ \Omega$ (d) $4\ \Omega$ and $0.5\ \Omega$	

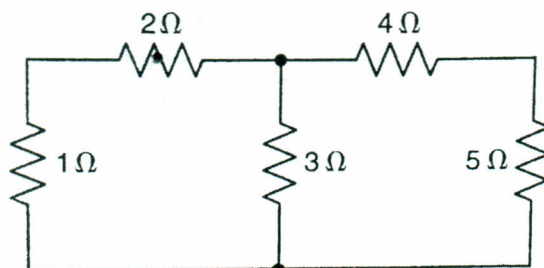
Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

- How can ideal voltage sources be converted into ideal current sources and vice-versa?
- Explain why an inductor is considered as a linear circuit element.
- List the properties of an incident matrix.
- Under what conditions network theorems are preferred over Kirchhoff's laws in analyzing electric circuits?

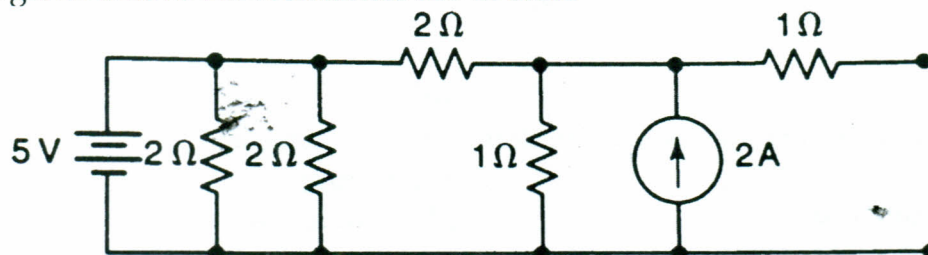
Q.3A Show that the determinant of the complete incident matrix of a closed loop is zero. 05

Q.3B Prove that in a linear graph, every cut-set has an even number of branches in common with every loop. 05

Q.4A Verify the reciprocity theorem for the network shown in figure given below using a current source and a voltmeter. 05



Q.4B Find both Thevenin's and Norton's equivalent circuit for the network shown in figure given below. All resistances are in ohm. 05



Q.5A Determine the current in a series RLC circuit consisting of $R=5\ \Omega$, $L=1\ \text{H}$ and $C=0.25\ \text{F}$ when the source voltage is given as 2.5
+2.5

- ramp voltage $12r(t-2)$
 - step voltage $3u(t-3)$.
- Assume that circuit is initially relaxed.

Q.5B What are the open-circuit impedance parameters of a two-port network? Why are they so called? 4+1

Q.6A Write a technical note on derivation of short-circuit admittance parameter y_{12} of a symmetrical and reciprocal two-port lattice network. 05

Q.6B Show that the Fourier series expansion of a periodic function with odd symmetry contains only the sine terms. 05

OR

Q.6B Show that the Fourier series expansion of a periodic function with even symmetry contains only the cosine terms plus a constant. 05

Q.7A A series RLC circuit consists of a resistance of $1\text{ k}\Omega$, an inductor of 10 mH and a capacitor of $100\text{ }\mu\text{F}$. For a supply voltage of 100 V , determine the following: 05

- (a) resonant frequency
- (b) maximum current in the circuit
- (c) Q-factor of the circuit and
- (d) half-power frequencies.

Q.7B What is resonance in an AC circuit? Discuss the applications of resonance in electrical systems. 2+3

OR

Q.7B Compare the properties of series and parallel resonance. 05

Q.8A Explain under what condition, an RC series circuit behaves as 2.5

- (a) Differentiator +2.5
- (b) Coupling network +2.5
- (c) Low-pass filter +2.5
- (d) Integrator

Q.9A Synthesize the first and second foster forms of networks for the following impedance function: 5+5

$$Z(s) = \frac{3(s+2)(s+4)}{s(s+3)}$$

Q.9B Briefly explain positive real function. Discuss the properties of positive real function. 4+6

OR

Q.9B Two networks have general ABCD parameters as shown: 10

PARAMETER	NETWORK-1	NETWORK-2
A	1.50	5/3
B	$11\text{ }\Omega$	$4\text{ }\Omega$
C	0.25 siemens	1 siemens
D	2.5	3.0

If the two networks are connected with their inputs and outputs in parallel, obtain the admittance matrix of the resulting network.

