

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/Objective type questions (10 questions @ 1 mark)

10

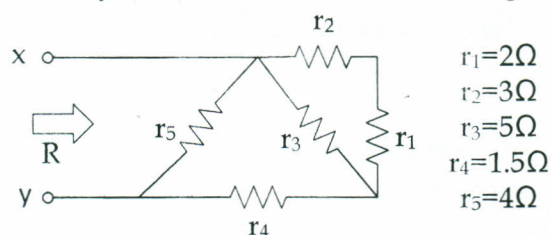
- i. The condition for validity of Ohm's law is that the
 - (a) temperature should remain constant.
 - (b) current should be proportional to voltage.
 - (c) resistance must be wire wound type.
 - (d) all of the above.
- ii. Three parallel resistive branches are connected across a dc supply. What will be ratio of branch currents $I_1:I_2:I_3$ if the branch resistances are in the ratio $R_1:R_2:R_3 :: 2:4:6$?
 - (a) 3: 2: 6
 - (b) 2: 4: 6
 - (c) 6: 3: 2
 - (d) 6: 2: 4
- iii. The circuit having same properties in either direction is known as ____ circuit.
 - (a) bilateral
 - (b) unilateral
 - (c) irreversible
 - (d) reversible
- iv. The graph of an electrical network has N nodes and B branches. The number of links L, with respect to the choice of tree, is given by
 - (a) $B-N+1$
 - (b) $B+N$
 - (c) $N-B+1$
 - (d) $N-2B-1$
- v. Superposition theorem is not applicable to networks containing
 - (a) nonlinear elements.
 - (b) dependent voltage sources.
 - (c) dependent current sources.
 - (d) transformers.
- vi. A series R-L-C circuit will have unity power factor if operated at a frequency of
 - (a) $1/LC$
 - (b) $1/(\omega\sqrt{LC})$
 - (c) $1/(\omega^2LC)$
 - (d) $1/(2\pi\sqrt{LC})$
- vii. A source having internal impedance of $(9 + j 12)\Omega$ is to deliver maximum power to a resistive load. The resistive load should be
 - (a) 9Ω
 - (b) 12Ω
 - (c) 15Ω
 - (d) 21Ω
- viii. Which one of the following will act as open circuit at $t = 0^+$ with zero initial conditions?
 - (a) capacitor
 - (b) inductor
 - (c) resistor
 - (d) none of these

- ix. Two-port networks are connected in cascade. The combination is to be represented as a single two-port network. The parameters of the network are obtained by multiplying the individual
- (a) z-parameter matrices.
 - (b) h-parameter matrices.
 - (c) y-parameter matrices.
 - (d) ABCD-parameter matrices.
- x. For determining the network functions of a two-port network, it is required to consider that
- (a) all initial conditions remain same.
 - (b) all initial conditions are zero.
 - (c) part of initial conditions are equal to zero.
 - (d) initial conditions vary depending on nature of network.

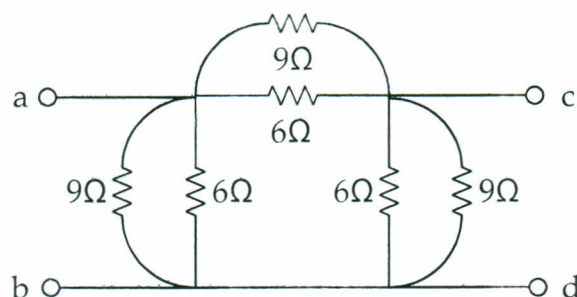
Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- i. Find the resistance R across x-y in the network shown in figure below.



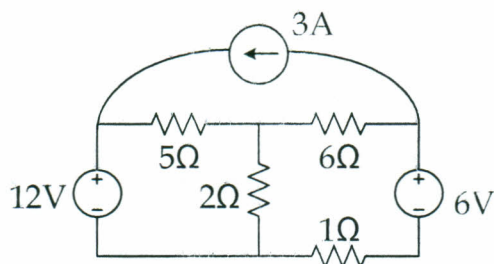
- ii. In the given figure below, find the equivalent star network.



- iii. Two parallel connected 100 W, 220 V bulbs are required to be connected across a 400 V supply. Find the value of the resistance to be inserted in the line so that the voltage across the bulbs does not exceed 220 V.
- iv. What do you mean by sources with periodic waveforms? Also mention what peak factor is?

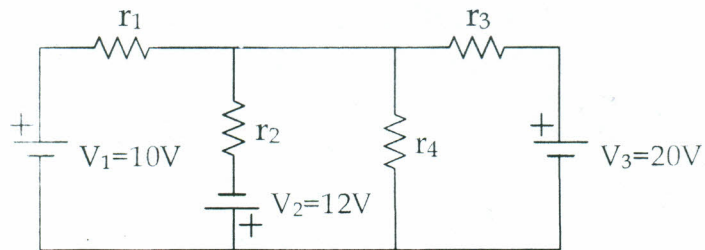
Q.3A Determine the current through the resistors using mesh method for the network shown in figure below.

05



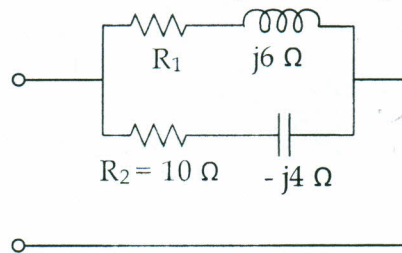
Q.3B Give the statement of Thevenin's theorem and find the current through the 10Ω resistor utilizing the same theorem.

01 +
05

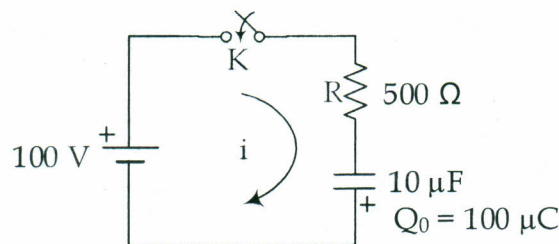


$$[r_1 = 2\Omega, r_2 = 5\Omega, r_3 = 1\Omega, r_4 = 10\Omega]$$

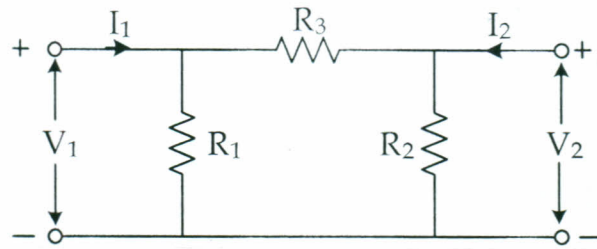
- Q.4A Define Resonance. By making vector diagram and writing appropriate equations explain Parallel Resonance. 01 + 04
- Q.4B Find the value of R_1 such that the circuit given in figure below is resonant. 05



- Q.5A Give the expression of transient response in series RL circuit when excited by sinusoidal input. 05
- Q.5B The $10\mu\text{F}$ capacitor in RC circuit of figure shown below has initial charge of $100\mu\text{C}$ with polarities as shown. At $t = 0$, the switch being closed. A d.c. voltage of 100V is applied. Find the expression for the circuit. 05

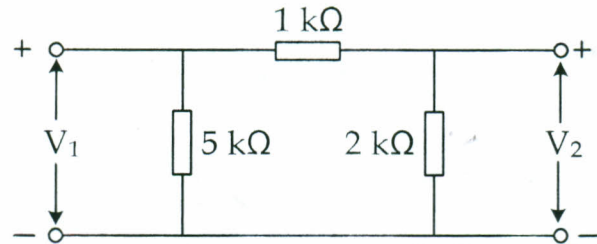


- Q.6A Provide the laplace transform of the following forcing functions: 01 +
- (1) Unit Ramp function 02 +
 - (2) Cosinusoidal function 02
 - (3) Unit Impulse function
- Q.6B Give the expression for step response of RL parallel circuit. 05
- OR**
- Q.6B Give the expression for step response of RC parallel circuit. 05
- Q.7A Discuss the following network configuration: 1.5 +
- (1) T-section 1.5 +
 - (2) π -section 02
 - (3) Lattice section
- Q.7B Determine the Z-parameters for a π -type attenuator section (as shown below). 05



OR

Q.7B An π -type attenuator has shown in figure given below. Find the Y-parameters and draw the equivalent Y-parameter circuit. 05

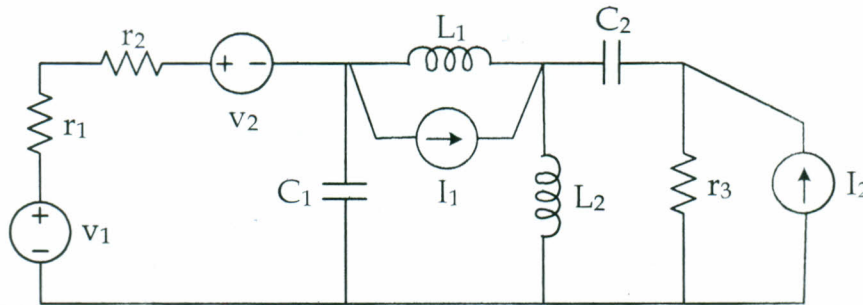


Q.8A Define the following terms:

10

- (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 Check whether the following polynomials are Hurwitz or not:

03 +

(a) $s^4 + 7s^3 + 4s^2 + 18s + 6$

03 +

(b) $s^4 + s^3 + 6s^2 + 3s + 6$

04

(c) $s^4 + s^3 + 2s^2 + 4s + 1$

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

5+5

OR

Q.9B Classify the following types of systems:

2.5 +

(1) Continuous and discrete-time systems

2.5 +

(2) Fixed and time-varying systems

2.5 +

(3) Linear and non-linear systems

2.5

(4) Lumped and distributed systems