

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Bachelor of Technology (Electronics Engineering) SEMESTER - 3 Winter 2025 (Supply.)

Course :Bachelor of Technology (Electronics Engineering) Branch : Engineering and Technology

Semester : SEMESTER - 3

Subject Code & Name: BTEXC304 - NETWORK THEORY

Time : 3 Hours]

[Total Marks : 60

Instructions to the Students:

1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No.6
4. Use of non-programmable scientific calculators is allowed.
5. Assume suitable data wherever necessary and mention it clearly.

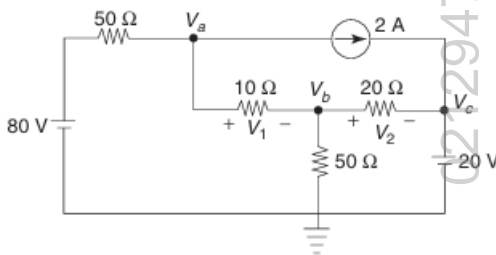
Q1. Objective type questions. (Compulsory Question) 12

- 1 Mesh analysis is best applied to circuits containing _____.
A. Many current sources B. Planar circuits
C. No voltage sources D. Nonlinear components only
- 2 Norton's theorem is a dual of _____.
A. Kirchhoff's Law B. Thevenin's theorem
C. Superposition D. Source transformation
- 3 Source transformation converts _____.
A. Voltage source in series with R ↔
Current source in parallel with R B. A resistor into a capacitor
B. A resistor into a capacitor D. Independent into dependent sources
- 4 The time constant of an RC circuit is _____.
A. R/C B. RC
C. 1/RC D. R²C
- 5 In s-domain, an inductor becomes _____.
A. 1/sC B. 1/sL
C. sL D. s/C
- 6 Laplace transform of unit step u(t) is _____.
A. 1 B. 0
C. 1/s D. s
- 7 Y-parameters are measured with _____.
A. Open circuits B. Short circuits
C. No loads D. Infinite voltage

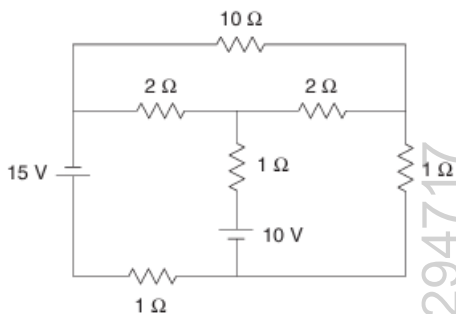
- 8 The determinant of ABCD parameters equals _____.
 A. 0 B. -1
 C. 1 D. Variable
- 9 The minimum number of state variables equals _____.
 A. Number of voltage sources B. Number of energy storage elements
 C. Number of resistors D. Node count
- 10 RL network synthesis deals with networks having _____.
 A. Only resistors B. Resistors and inductors
 C. Resistors and capacitors D. Inductors and capacitors
- 11 In network synthesis, Foster and Cauer forms are used for _____.
 A. Realizing LC filters only B. System stability
 C. Realization of one-port networks D. Power analysis
- 12 The simplest RC low-pass filter consists of _____.
 A. R in series, C in parallel B. R in series and C in shunt
 C. R and L in series D. C and L in shunt

Q2. Solve the following.

- A) State Kirchoff's law and find V_1 and V_2 for the network shown

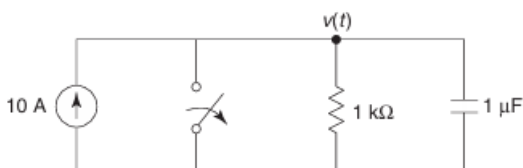


- B) Find the current through the 1 ohm resistor using Thevenin's Theorem



Q3. Solve the following.

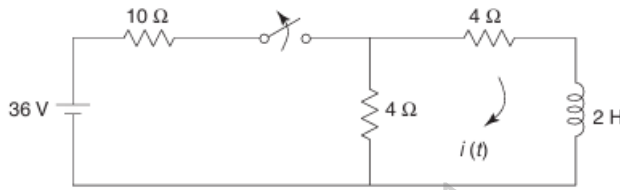
- A) In the given network, the switch is opened at $t = 0$. Solve for v , dv/dt , and d^2v/dt^2 at $t = 0^+$



- B) Obtain the domain (Laplace Transform) equivalent circuit diagram of an inductor and a capacitor with initial conditions.

Q4. Solve Any Two of the following.

- A) The network shown has acquired steady state with the switch closed for $t < 0$. At $t = 0$, the switch is opened. Obtain $i(t)$ for $t > 0$



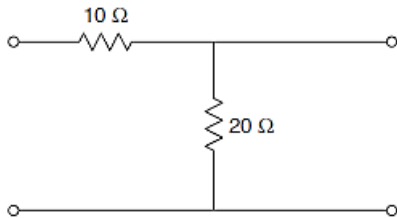
- B) Express the Laplace transforms of various standard network functions 6

- C) Define the Terms: 6

1. Voltage Transfer Function
2. Current Transfer Function
3. Transfer Impedance Function
4. Transfer Admittance Function

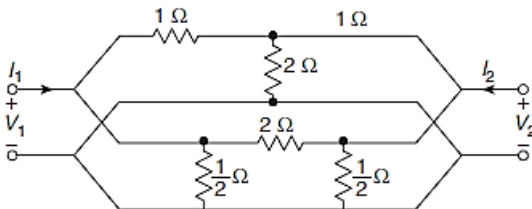
Q5. Solve Any Two of the following.

- A) Find the Z parameters of the circuit shown in Fig., and also comment on reciprocity and symmetry. 6



- B) Derive the Y parameter in terms of other parameters. 6

- C) Determine Y-parameters using interconnection of two-port networks for the network shown in Fig. 6



Q6. Solve Any Two of the following.

- A) Realise $Z(s)$ in Foster I form. 6

$$Z(s) = \frac{s(s^2 + 4)}{(s^2 + 1)(s^2 + 9)}$$

- B) Test whether the given polynomial is Hurwitz. 6

(i) $s^4 + 7s^3 + 6s^2 + 21s + 8$

(ii) $s^5 + s^3 + s$

- C) Synthesize in Cauer I, Cauer II forms. 6

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

*** End ***