KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2024

Marks Scored:

Level : B.E.
Year : II

Course : EEEG 213
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 19 DEC 2024

SECTION "A"

[20Q. × 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices. Symbols have their usual meaning.

1. Time constant of an inductive circuit
   a. increases with increase of inductance and decrease of resistance
   b. increases with increase of inductance and increase of resistance
   c. increases with decrease of inductance and decrease of resistance
   d. increases with decrease of inductance and decrease of resistance

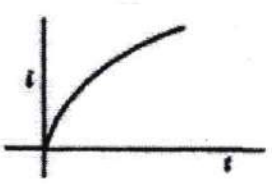
2. The expression of current in R-L circuit is?
   a. $i = (V/R)(1 + e^{(R/L)t})$
   b. $i = -(V/R)(1 - e^{(R/L)t})$
   c. $i = -(V/R)(1 + e(R/L)t)$
   d. $i = (V/R)(1 - e^{(R/L)t})$

3. Which is true for a network that reaches a steady state?
   a. Capacitor acts as closed circuit, inductor acts as open circuit
   b. Capacitor acts as open circuit, inductor acts as closed circuit
   c. Both capacitor and inductor acts as closed circuits
   d. Both capacitor and inductor acts as open circuits

4. The voltage and current in a capacitor are related as?
   a. $I = C dt/dv$
   b. $V = C dv/dt$
   c. $I = C dv/dt$
   d. $V = C dt/dv$

5. Which is true for a network that reaches a steady state?
   a. Capacitor acts as closed circuit, inductor acts as open circuit
   b. Capacitor acts as open circuit, inductor acts as closed circuit
   c. Both capacitor and inductor acts as closed circuits
   d. Both capacitor and inductor acts as open circuits

6. Which of the following is true for the accompanying figure?
   a. $i(0+) = 0,\ di/dt(0+) = 0,\ d^2i/dt^2(0+) = K > 0$
   b. $i(0+) = 0,\ di/dt(0+) = K > 0,\ d^2i/dt^2(0+) = 0$
   c. $i(0+) = K > 0,\ di/dt(0+) = 0,\ d^2i/dt^2(0+) = 0$
   d. $i(0+) = 0,\ di/dt(0+) = K_1 > 0,\ d^2i/dt^2(0+) = K_2 < 0$

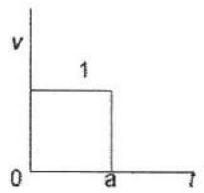


7. The damping coefficient of an parallel RLC circuit is given by
   a. ½*RC
   b. 1/2RC
   c. R/2L
   d. 1/2R

8. Laplace transform changes the ____ domain function to the _____ domain function.
   a. time, time
   b. time, frequency
   c. frequency, time
   d. frequency, frequency

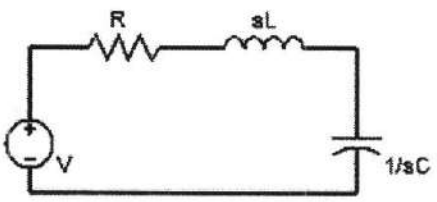
9. The integral of a step function varies linearly with time, which is also known as
   a. A doublet function
   b. A unit doublet function
   c. A ramp function
   d. An impulse function

10. The Laplace transform of a pulse shown is given as



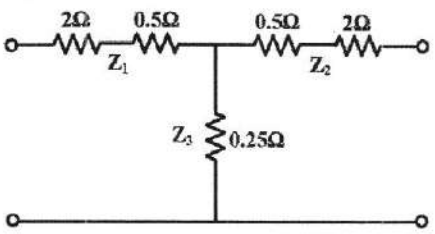
   a. $V(s) = 1/(s-a)$
   b. $V(s) = (1/s)e^{-as}$
   c. $V(s) = (1/s)(1-e^{-as})$
   d. $V(s) = (1/s)(1-e^{as})$

11. In the circuit shown below, if voltage across the capacitor is defined as the output signal of the circuit, then the transfer function is?



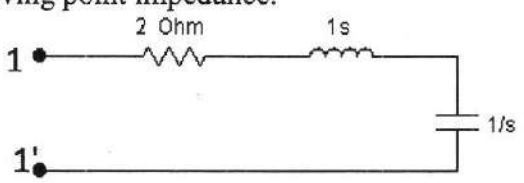
   a. $H(s)=1/(s^2\,LC - RCS + 1)$
   b. $H(s)=1/(s^2\,LC + RCS + 1)$
   c. $H(s)=1/(s^2\,LC + RCS - 1)$
   d. $H(s)=1/(s^2\,LC - RCS - 1)$

12. The impedance parameters Z_{11} and Z_{12} of the two-port network in the figure are



   a. $Z_{11} = 2.75\ \Omega$ and $Z_{12} = 0.25\ \Omega$
   b. $Z_{11} = 3\ \Omega$ and $Z_{12} = 0.5\ \Omega$
   c. $Z_{11} = 3\ \Omega$ and $Z_{12} = 0.2\ 5\Omega$
   d. $Z_{11} = 2.25\ \Omega$ and $Z_{12} = 0.5\ \Omega$

13. For the network shown in the figure, find the driving point impedance.



   a. $(s^2-2s+1)/s$
   b. $(s^2+2s+1)/s$
   c. $(s^2-2s-1)/s$
   d. $(s^2+2s-1)/s$

14. Transfer admittance function is the ratio of Laplace transforms of _____
   a. Current at one port to voltage at other port
   b. Voltage at one port to current at other port
   c. Current at one port to current at other port
   d. Voltage at one point to voltage at other port

15. Find the Laplace transform of ramp function $r(t) = t$.
   a. $1/s$ b. $1/s^2$ c. $1/s^3$ d. $1/s^4$

16. The integration of a square wave will result in
   a. Impulse function
   b. Ramp function
   c. Triangular wave
   d. Sinusoidal wave

17. The hybrid parameters of a two-port network h_{11}, h_{12}, h_{21} and h_{22} are respectively called
    a. Short-circuit input impedance, short-circuit current gain, open-circuit reverse voltage gain and open-circuit output admittance
    b. Short-circuit input impedance, open-circuit output admittance, short-circuit current gain and open-circuit reverse voltage gain
    c. Open-circuit reverse voltage gain, open-circuit output admittance, short-circuit input impedance and short-circuit current gain
    d. Open-circuit reverse voltage gain, short-circuit current gain, open-circuit output admittance and short-circuit input impedance

18. The system is said to be stable if
    a. Gain margin is positive, phase margin is positive
    b. Gain margin is positive, phase margin is negative
    c. Gain margin is negative, phase margin is positive
    d. Gain margin is negative, phase margin is negative

19. Bode plot of a network function consists of
    a. Magnitude vs phase plot, frequency vs phase plot
    b. Magnitude vs frequency plot, frequency vs phase plot
    c. Magnitude vs frequency plot, phase vs frequency plot
    d. Magnitude vs phase plot only

20. The magnitude plot of $G(s) = s^2$ will have a straight line with slope of
    a. +20 *db/decade* b. -20 *db/decade* c. +40 *db/decade* d. -40 *db/decade*

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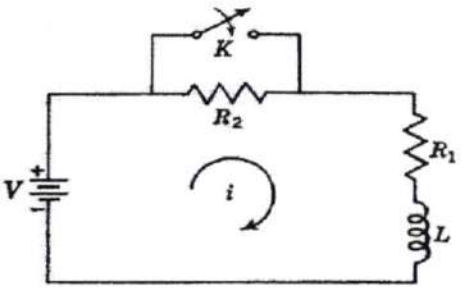
SECTION "B"
[4Q. × 10 = 40 marks]

Attempt ANY FOUR questions.

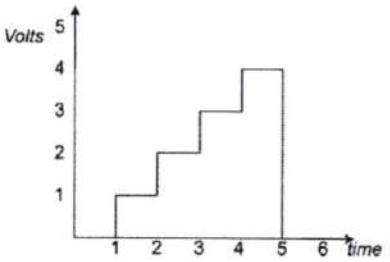
1.

a. What is a time constant? Explain briefly with an example. [2]
b. In the circuit shown in the figure below, the switch K is closed at t = 0, a steady-state having previously been attained. Solve for the current in the circuit as a function of time. [6]
c. Briefly explain the physical interpretation of the response of the circuit. [2]



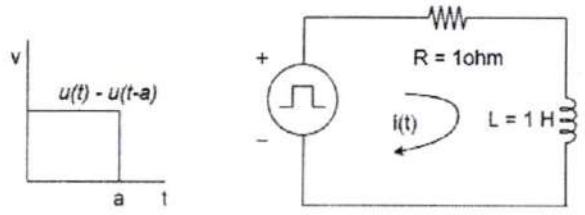
2.

a. What are natural response and forced response? [2]
b. Describe different types (or cases) of transient responses of a simple series or parallel RLC circuits. [5]
c. Write an equation for the staircase waveform shown in the figure below in terms of unit step functions. [3]



3.

a. At $t = 0$, a pulse of width a as shown in the figure below (left) is applied to the RL network shown in the figure below (right). Determine the expression for the current $i(t)$ by using Laplace transform method.



b. How are a ramp and an impulse function related to a step function? Define unit step, unit ramp and unit impulse function with a suitable figure

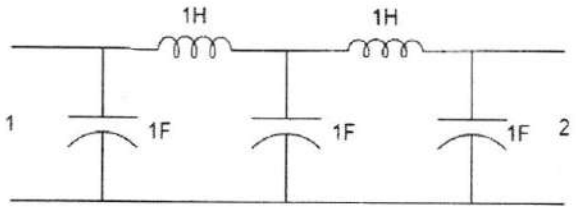
P.T.O.

4.

a. Expand the following functions as partial fractions: [4]

$$M(s) = \frac{(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$$

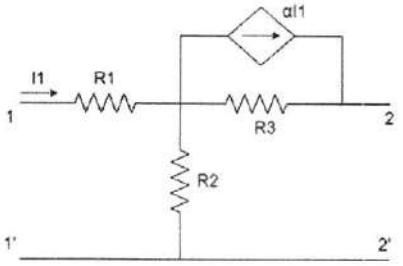
b. Determine the transfer function $G_{12}(s)$ of the given network. [4]



c. What are poles and zeros of a network? Explain with example. [2]

5.

a. The network on the given figure represents a certain transistor. For this network, determine *h* parameters [4]



b. For the network shown in the figure below, determine the *y*-parameters. [6]