KATHMANDU UNIVERSITY
End Semester Examination [C]
April/May, 2023

Marks Scored:

Level : B.E.
Year : II

Course : EEEG 213
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 30 APR 2023

SECTION "A"
[20Q. × 0.5 = 10 marks]

Encircle the most appropriate option.

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-exp((R/L)t))
   c. i=-(V/R)(1+exp((R/L)t))
   d. i=(V/R)(1-exp((R/L)t))

3. If a differential equation is said to be homogeneous, what would be the value of a forcing function?
   a. 0
   b. 1
   c. ∞
   d. -1

4. The voltage and current in a capacitor are related as _____.
   a. i=Cdt/dv
   b. v=Cdv/dt
   c. i=Cdv/dt
   d. v=Cdt/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 1 ?
   a. i(0+)= 0, di/dt(0+) = 0 d2i/dt2(0+) = K>0
   b. i(0+) = 0, di/dt(0+) = K>0, d2i/dt2(0+)= 0;
   c. i(0+) = K>0, (0+) = K>0, di/dt(0+) = 0, d2i/dt2 d2i/dt2(0+) = 0; (0+) = 0;
   d. i(0+) = 0, di/dt(0+) = K1>0 d2i/dt2(0+) = K2<0

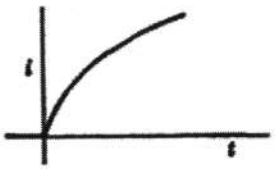

Figure 1

7. If the roots of an equation are real and unequal, then the response will be _____.
   a. critically damped
   b. under damped
   c. over damped
   d. damped

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

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

10. The Laplace transform of $f_1(t) + f_2(t)$ is _____.
    a. $F_1(s) + F_2(s)$ b. $F_1(s) - F_2(s)$ c. $F_1(s) - 2F_2(s)$ d. $F_1(s) + 2F_2(s)$

11. In the circuit shown in Figure 2, 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. $H(s)=1/(s^2\ LC-RCS-1)$

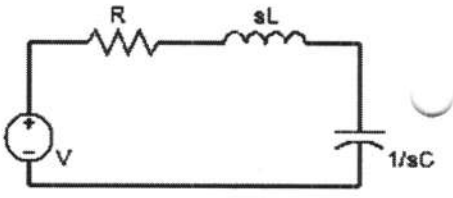

Figure 2

12. A network function can be completely specified by _____.
    a. Real parts of zeros b. Poles and zeros
    c. Real parts of poles d. Poles, zeros and a scale factor

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

14. The impedance parameters Z_{11} and Z_{12} of the two-port network in the Figure 3 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 $Z_{12} = 0.5\ \Omega$

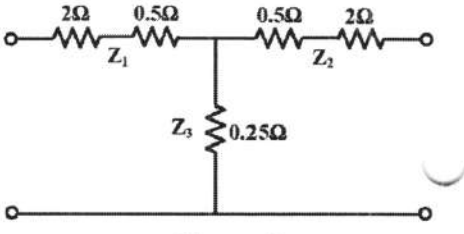

Figure 3

15. For the network shown in the Figure 4, find the driving point impedance.
    a. $(s^2-2s+1)/s$ b. $(s^2+2s+1)/s$
    c. $(s^2-2s-1)/s$ d. $(s^2+2s-1)/s$

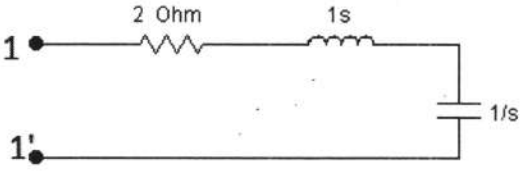

Figure 4

16. 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

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

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

19. The magnitude plot of G(s) = s2 will have a straight line with slope of
    a. +20 db/decade b. -20 db/decade
    c. +40 db/decade d. -40 db/decade

20. 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

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SECTION "B"
[4 Q. × 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 Figure 1, 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]

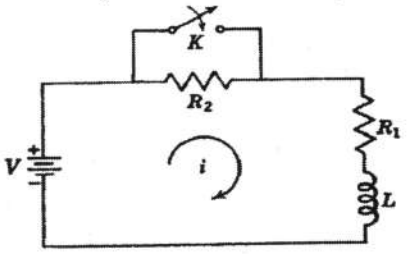

Figure 1

2.

a. In the circuit shown in Figure 2, the switch K is opened at t = 0. At t = 0+, solve for v, dv/dt, and dv^2/dt^2, when I = 10 amp, R = 1000 ohms, and C = 1 uF. [6]

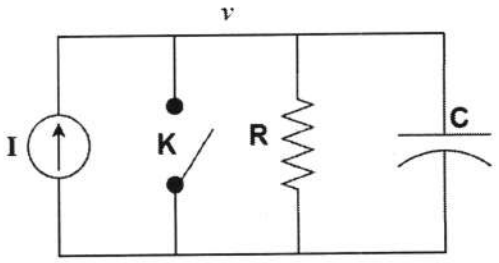

Figure 2

b. Synthesize the expression for the waveform shown in Figure 3. [4]

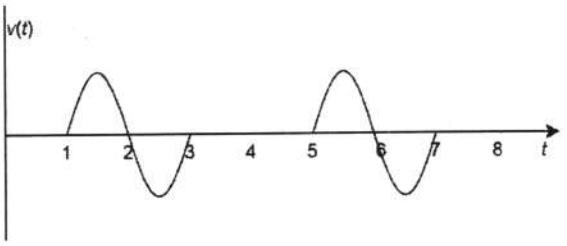

Figure 3

3.

a. In the network shown in Figure 4, the switch K is moved from position **a** to position **b** at t=0, a steady state having previously been established at position **a**. Solve for the current i(t), using the Laplace transformation method. [6]

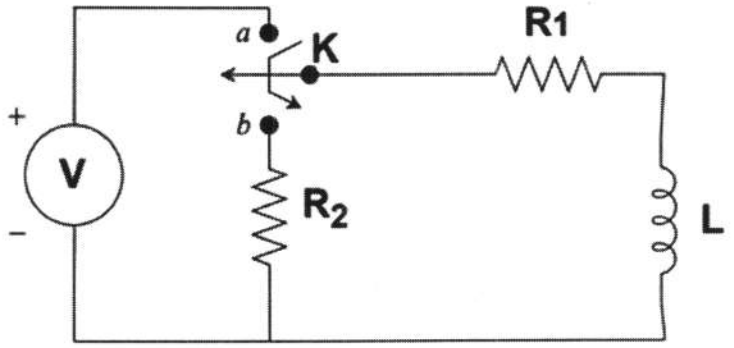

Figure 4

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

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

4.

a. 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. [5]

b. The network on Figure 5 represents a certain transistor. For this network, determine the h parameters. [5]

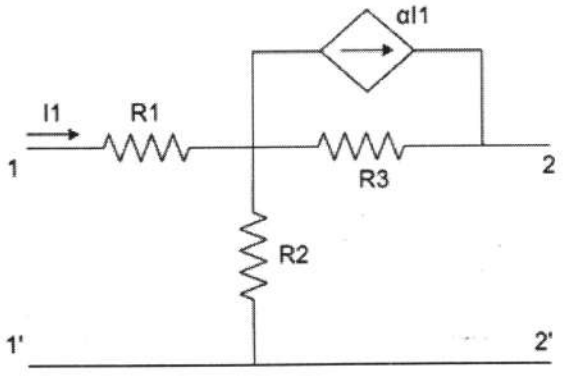

Figure 5

5.

a. What are poles and zeros of a network? Explain with a suitable example how poles and zeros are plotted on the complex s plane? [4]

b. Determine the transfer function $G_{12} = V_2/V_1$ for the network given below in Figure 6. [6]

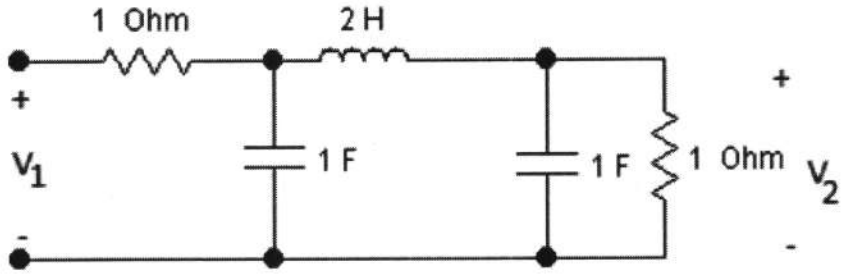

Figure 6