

KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2025

Marks Scored:

Level : B.E.

Year : II

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : EEEG 213

Semester : I

F. M. : 10

Date :

13 APR 2025

SECTION "A"

[20Q. \times 0.5 = 10 marks]

Choose and encircle the most appropriate answer.

1. What does the time constant of an RC circuit represent?
 - a. The total energy stored in the capacitor
 - b. The time required for voltage to drop to 37% of its initial value
 - c. The maximum voltage that can be applied
 - d. The steady-state voltage level

2. What happens when a **series RLC circuit** is underdamped?
 - a. The response decays exponentially without oscillation
 - b. The response oscillates before settling
 - c. The response reaches steady state instantly
 - d. The response grows indefinitely

3. A **second-order circuit** consists of:
 - a. One energy storage element
 - b. Two energy storage elements
 - c. No energy storage elements
 - d. An inductor only

4. The transient response of an RL circuit dies out over time due to the inductor's ability to store energy.
 - a. True
 - b. False

5. A system is stable if all poles of the transfer function are located:
 - a. On the imaginary axis
 - b. In the right-half of the s-plane
 - c. In the left-half of the s-plane
 - d. Outside the unit circle

6. A transfer function is the ratio of the _____ to the _____ in the Laplace domain when initial condition is zero.

7. Which of the following is not a two-port network parameter?
 - a. Impedance parameter
 - b. Admittance parameter
 - c. Fourier parameter
 - d. Hybrid parameter

8. Which two-port parameter set is best suited for cascaded networks?
 - a. Z-parameters
 - b. Y-parameters
 - c. ABCD-parameters
 - d. Hybrid parameters

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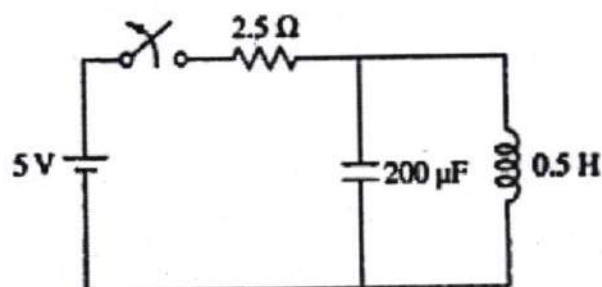
13 APR 2025

Course : EEG 213
Semester : I
F. M. : 40

SECTION "B"

Attempt **ANY FOUR** questions. Missing data may be suitably assumed.

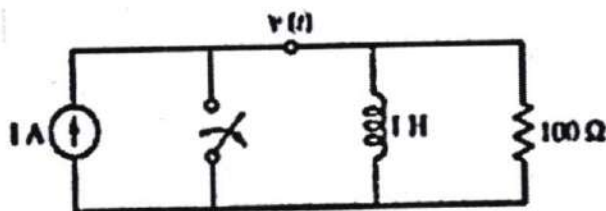
1. a. Explain the difference between the forced response and transient response in an RL circuit, supported by mathematical expressions, graphs, and real-world examples. [4]
- b. Find the current through the inductor at $t > 0$ for the electrical circuit shown. [6]



2. a. Consider a second-order series RLC circuit with a resistor R, inductor L, and capacitor C. Write the differential equation governing the current $i(t)$ in the circuit. [5]

OR

In the given circuit, switch is opened at $t=0$, then find the value of $v(0^+)$, $v'(0^+)$ and $V''(0^+)$.



- b. Demonstrate how the pole positions affect the stability of the system. Discuss the relationship between the pole locations and the system's time-t response. [5]

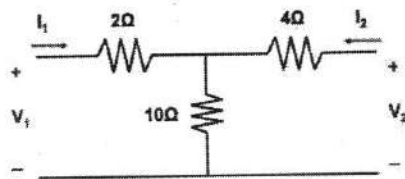
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3. a. The output voltage $V(s)$ of a network is given by $V(s) = \frac{4s}{(s+2)(s^2+2s+2)}$. Plot its pole-zero diagram and hence obtain $v(t)$. [2+3]

b. Can you convert the parameters of a two-port network? If so, given the hybrid parameters $[h_{11}, h_{12}, h_{21}, h_{22}]$ of a two-port network, convert these hybrid parameters into the Y- parameters (also known as transmission parameters). Show the necessary steps and explain the relationships between the two sets of parameters. [1+4]

4. a. Among the classical solutions and the Laplace transform method for solving differential equations, which one do you prefer and why? [2]

b. For the given circuit, find the t-parameters (transmission parameters) and also determine whether the given circuit is reciprocal or symmetrical. [6]



c. If you are given the g-parameters and asked to connect them in parallel, how would you proceed? Just mention the steps. [2]

5. a. How will you identify the stability of given system from bode plot? [2]

b. Draw the Bode Plot For [5+1+1+1]

$$G(s) = \frac{20}{s(s+2)(s+10)}$$

From the Bode plot, also determine i) phase-crossover frequency ii) gain- cross over frequency c) Stability