END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2025

Paper Code: EEC-208 **Subject: Circuits and Systems**

Time: 3 Hours **Maximum Marks:60**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Attempt any four of the following questions: (4×5=20)

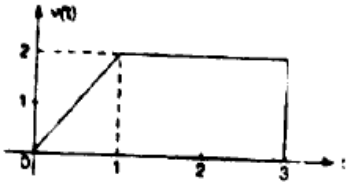
a) Define and classify signals with suitable examples.

b) State and explain Laplace Transform properties.

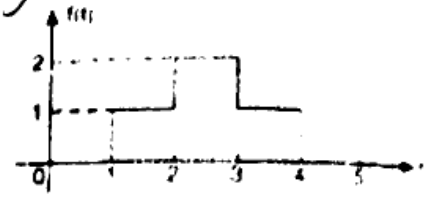
c) Derive the differential equation of an RLC series circuit.

d) Obtain the Laplace transform of $e^{-at}\sin\omega t$ and $1-e^{-at}$ where a is constant.

e) Synthesize the waveforms:



(a)



(b)

f) Define and explain two-port parameters.

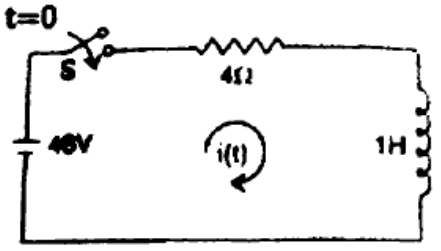
g) What are the key differences between z-Transform and Laplace Transform?

h) Explain any two properties of network functions.

UNIT-I

Q2 a) Define LTI systems and discuss their characteristics. (5)

b) Consider the R-L circuit with R=4Ω and L=1H excited by a 48V d.c. source as shown in figure. Assume the initial current through the inductor is 3A. Using the Laplace transform determine the current i(t); $t \geq 0$. Also draw the s-domain representation of the circuit. (5)



OR

Q3 a) Explain the concept of state space analysis with an example. (5)

b) Discuss the properties of z-Transform. (5)

UNIT-II

Q4 a) Find the transient response of an RLC circuit for a step input using Laplace Transform. (5)

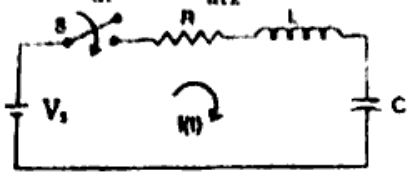
b) Determine f(0+) and f(∞) for the following function: (5)

$$F(s) = \frac{5s^3 - 1600}{s(s^3 + 18s^2 + 90s + 800)}$$

P.T.O

OR

Q5 a) Consider the RLC series circuit shown in figure. V_s= 2V; R= 6Ω; L=2H; C= 0.25F. Determine $i(0^+)$; $\frac{di}{dt}(0+)$; $\frac{d2i}{dt2}(0+)$ and i(t). (5)

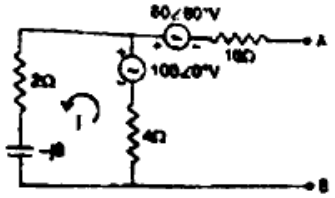


b) Without finding the inverse Laplace transform of F(s), determine f(0+) and f(∞) for each of the following functions: (5)

(i) $F(s) = \frac{4e^{-2s}(s+50)}{s}$ (ii) $F(s) = \frac{s^2+6}{s^2+7}$

UNIT-III

Q6 a) Find the Thevenin's equivalent circuit at terminals AB of the given circuit. (5)

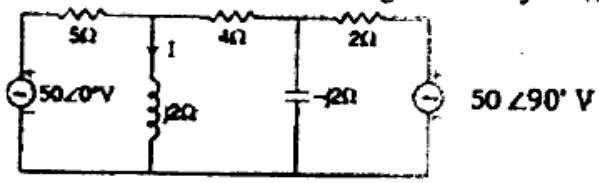


b) Explain the Y-Δ (Star-Delta) and Δ-Y (Delta-Star) transformations. Provide the formulas used for the conversion. (5)

OR

Q7 a) State and explain Thevenin's and Norton's theorems. How are these theorems applied to simplify complex AC circuits? (5)

b) Find current I in the circuit using mesh analysis. (5)



UNIT-IV

Q8 a) Define ABCD parameters and explain their significance. (5)

b) Derive the condition for reciprocity and symmetry in case of (a) T parameters and (b) h parameters (5)

OR

Q9 a) Obtain the Z parameters of the network in terms of ABCD and hybrid parameters. (5)

b) Explain how Hurwitz polynomial is used in network analysis. (5)

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