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)

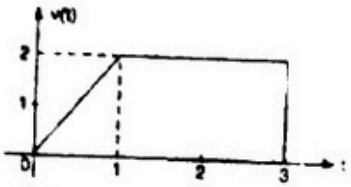
a) Define and classify signals with suitable examples.

b) State and explain Laplace Transform properties.

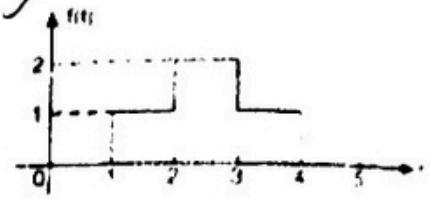
c) Derive the differential equation of an RLC series circuit.

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.

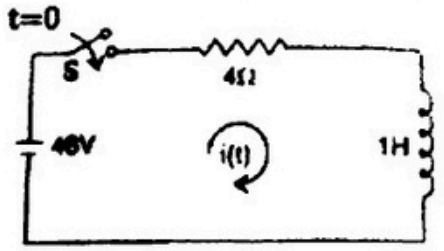
g) What are the key differences between z-Transform and Laplace Transform?

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)

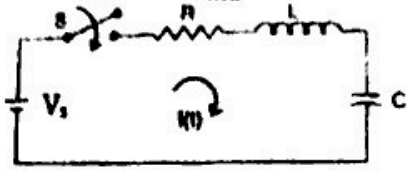
b) Determine f(0+) and f(∞) for the following function: (5)

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

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)**

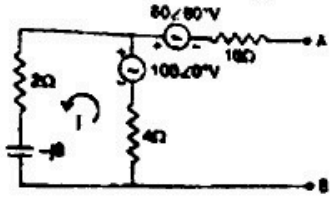


b) Without finding the inverse Laplace transform of F(s), determine f(0+) and f(∞) for each of the following functions: **(5)**

(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)**

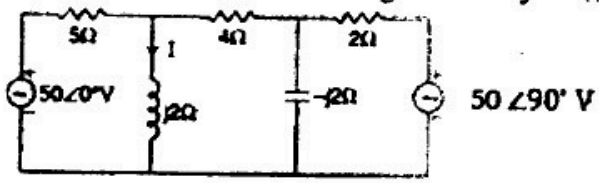


b) Explain the Y-Δ (Star-Delta) and Δ-Y (Delta-Star) transformations. Provide the formulas used for the conversion. **(5)**

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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