

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] FEBRUARY 2023

Paper Code: EEC-213

Subject: Circuits & Systems

Time: 3 Hours

Maximum Marks: 75

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 all questions:-

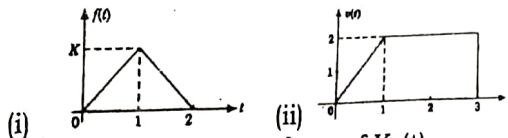
(5x5=25)

- (a) What are the different types of signals. Classify them?
 (b) Prove $f(0^+) = \lim_{s \rightarrow \infty} sF(s)$ and hence find $f(0^+)$ for $f(s) = \frac{2(s+1)}{s^2+2s+5}$
 (c) What are passive filters. Discuss their properties and uses.
 (d) Check whether the given polynomial is Hurwitz or not
 $P(s) = s^4 + s^3 + 5s^2 + 3s + 4$
 (e) Define z transform. Find the z transform of unit step function.

UNIT-I

Q2 (a) Synthesize the following signals:-

(3x2=6)

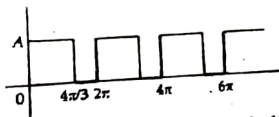


- (i) Find the laplace transform of $Kr(t)$
 (c) solve the differential Equation;
 $x'' + 3x' + 2x = 0$, $x(0^+) = 2$, $x'(0^+) = -3$

(2.5)

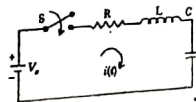
(4)

Q3 (a) Find the coefficient of exponential Fourier series of the given below figure: (6)

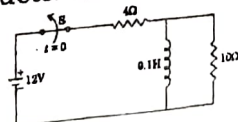
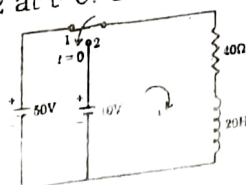


(6.5)

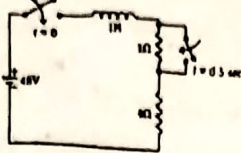
(b) Define LTI system and discuss its properties.

UNIT-IIQ4 (a) In RLC series circuit given below given that $V_s = 2V$, $R = 6\Omega$, $L = 2H$, $C = 0.25F$. Find $i(0^+)$, $\frac{di}{dt}(0^+)$, $\frac{d^2i}{dt^2}(0^+)$ and $i(t)$ (8)

(b) The 12V battery in fig. below is disconnected (opened) at $t=0$. Find the inductor current and voltage as a function of time. (4.5)

Q5 (a) The switch in figure below has been in position 1 for a long time; it is moved to 2 at $t=0$. Obtain the expression for i , for $t>0$. (5)

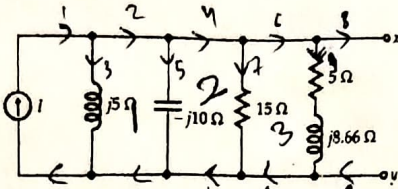
- (b) Fig. below shows first order R-L series circuit with $R=5\Omega$, $L=1H$, $V_s = 48V$. Find: (7.5)



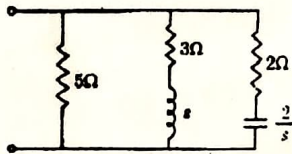
- a) The expression for $i(t)$, $V_R(t)$, $V_L(t)$ and $\frac{di}{dt}$ for $t \geq 0$ b) $\frac{di}{dt}$ at $t = 0$
 c) The time at which $V_R = V_L$ (d) The resistance is decreased from 5 to 4Ω at $t=0.5\text{sec}$ determine $i(t)$.

UNIT-III

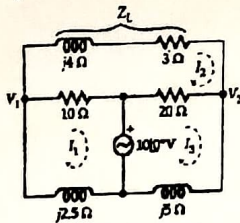
- Q6 (a) Define Thevenin's theorem for ac circuits. (9)
 If $I = 33\angle -13^\circ A$, find the Thevenin's equivalent circuit to the left of terminals x-y in the network shown below



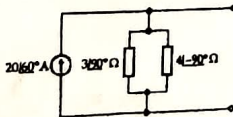
- (b) Find transform admittance $Y(s)$ of the network given below; (3.5)



- Q7 (a) Find the current through Z_L using mesh-analysis for the network shown below; (6.5)



- (b) Convert the below given current source to voltage source; (6)

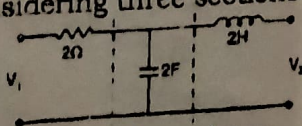


UNIT-IV

- Q8 The reduced incidence matrix of a graph is given. Draw the graph and obtain the f-loop and f-cut-set matrices. (12.5)

$$A = \begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \end{matrix} \\ \begin{matrix} a \\ b \\ c \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 & 1 & 0 & -1 \\ 0 & 1 & 0 & 0 & -1 & 1 & 1 \\ -1 & 0 & -1 & 0 & 0 & -1 & 0 \end{bmatrix} \end{matrix}$$

- Q9 (a) Find the condition of symmetry of Z-parameters. (4)
 (b) Determine transmission parameters of a T-network shown in fig. below considering three sections. Assuming connected in cascade manner. (6)



- (c) Define Image Impedance. (2.5)