Question Paper

Exam Date & Time: 20-Jan-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.TECH END SEMESTER EXAMINATIONS, JAN 2023

NETWORK ANALYSIS AND SIGNALS [ICE 2154]

Marks: 50 **Duration: 180 mins.**

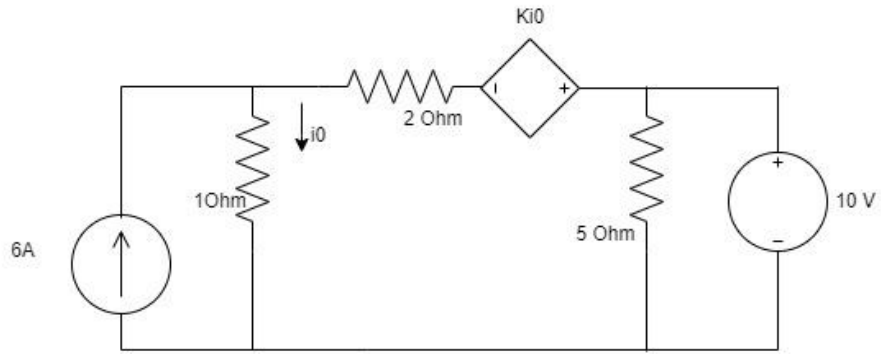
A

Answer all the questions.

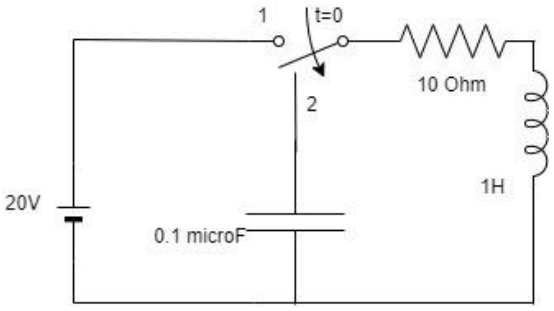
Instructions to Candidates:
Answer ALL questions
Missing data may be suitably assumed

1) In the network shown in the figure, if the power consumed in one Ohm resistor is 25 Watts, find the value of K. [CO1, P01,2, BL3] (3)

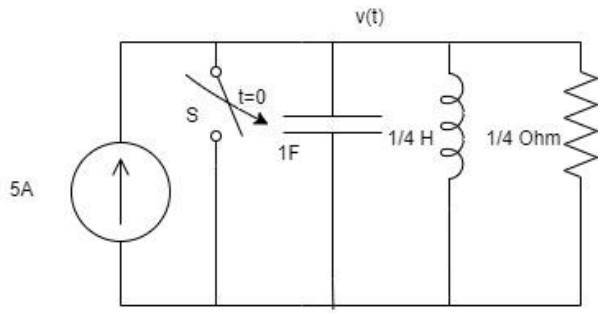
A)



B) In the circuit shown, the switch is put from position 1 to 2 at t=0. With the switch at 1 for t< 0, the circuit is in a steady state at t=0 Determine $i(0^+)$, $di/dt(0^+)$ and $d^2i/dt^2(0^+)$. Assume the capacitor Is uncharged at t=0.[C02, PO1,2, BL2] (2)



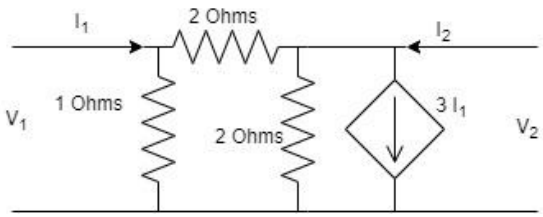
C) In the network shown, the switch S is opened at t=0. Solve for the voltage v(t) for t ≥ 0, using the classical time domain approach. Assume all initial conditions are zero. [CO2, PO 1,2, BL3] (5)



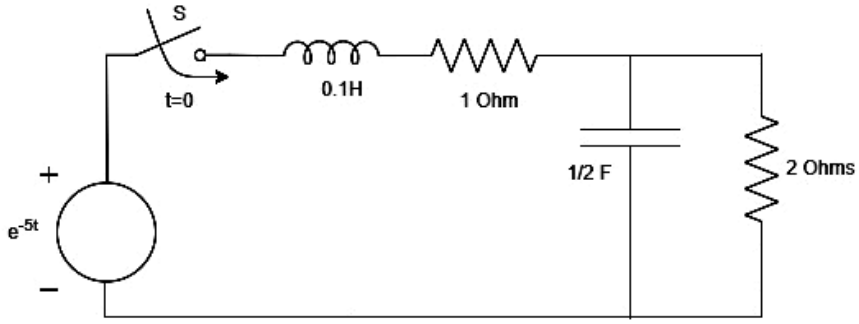
2) Derive ABCD parameters in terms of z Parameters. [CO3, PO1,2, BL2] (2)

A)

B) Derive y parameters of the network shown. [CO3, PO1,2, BL3] (3)

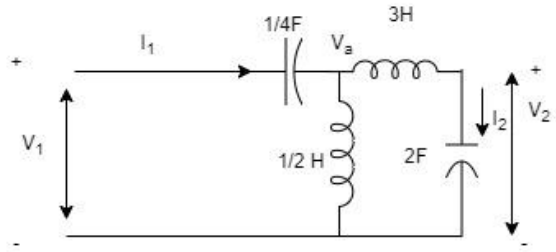


C) In the network shown in Figure, the switch S is closed at t=0. It is given that $v(t)=e^{5t}$ and all initial currents and voltages are Zero. Find current i_2 (t) in 2 Ohms load resistor by Norton's theorem. Use Transformed network approach for the solution[CO3, PO1,2, BL3] (5)

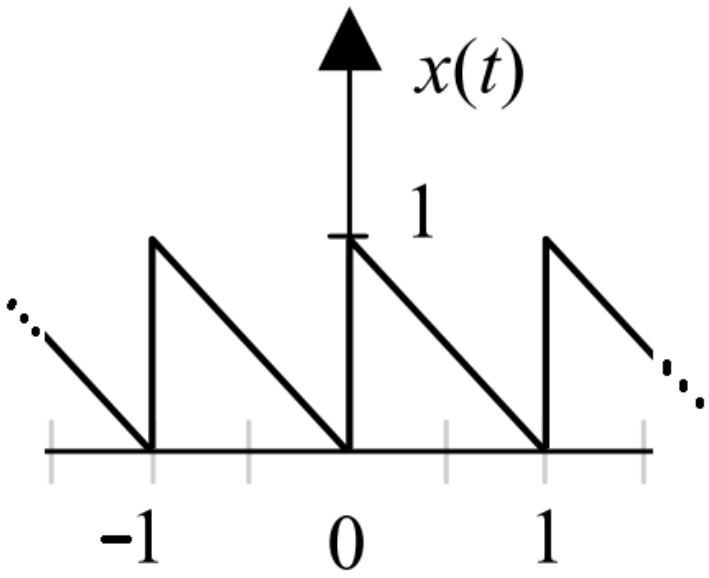


3) Determine voltage ratio $V_2(s)/V_1(s)$, Current ratio $I_2(s)/I_1(s)$, and input impedance $V_1(s)/I_1(s)$ for the following circuit using transform method. Assume all initial conditions are zero. [CO3, PO1,2, BL3] (3)

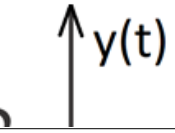
A)

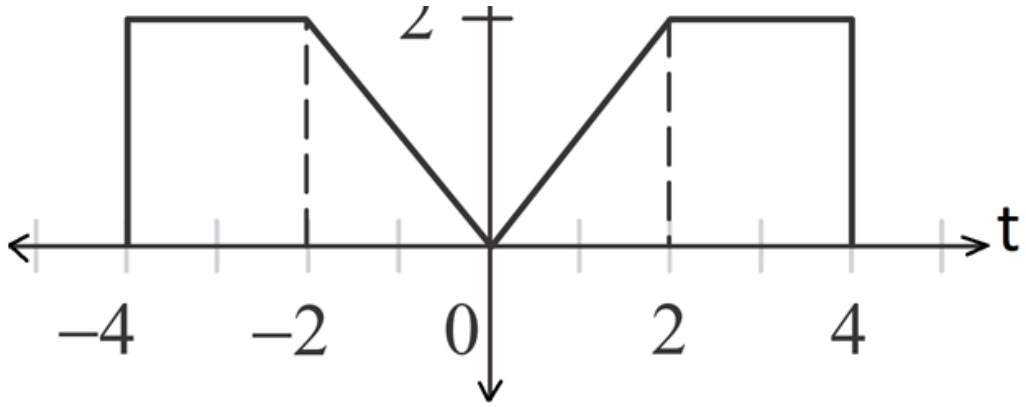


B) Obtain the continuous-time Fourier Series exponential coefficients for the following periodic signal x(t) within the given periodicity. [CO5, PO1-2, BL3] (4)



C) Consider the following signal y(t). Sketch the function for y(2t + 4). [CO4, PO1-2, BL3] (3)

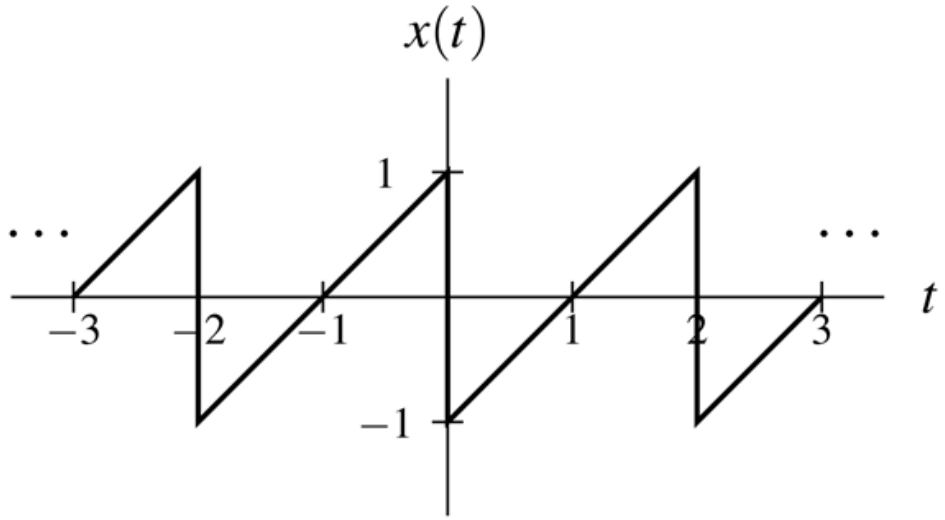




4) Determine whether the following system (i.e. *input* x(t) and *output* y(t)) is: (i) A causal system (ii) A system with memory, and (iii) Invertible. Justify your answer. [CO4, PO 1-2, BL3] (2)

A) **y(t) = x(t) – x(t – 2)**

B) Find the time period for the following periodic signal x(t). Also, obtain the continuous-time Trigonometric Fourier Series representation of x(t) over this time period. [CO5, PO 1-2, BL2-3] (4)



C) Determine the Exponential Fourier series representation for the current i(t) passing through a circuit; given that **i(t) = 10 . {e^(-2t)} . sin(628t)**. [CO5, PO1-2, BL3] (4)

5) Compute and plot the signal corresponding to Ɗx(t) if the signal x(t) is given as follows. Here, Ɗ represents the derivative operator of x(t). [CO4, PO1-2, BL4] (3)

A)

$$x(t) = \begin{cases} t+1 & -1 \le t \le 0 \\ 1 & 0 \le t \le 2 \\ -t+3 & 2 \le t \le 3 \\ 0 & \end{cases}$$

$\begin{cases} \\ \end{cases}$ 0 elsewhere,

B) Obtain the Fourier transform for the following signal f(t). [CO5, PO 1-2, BL3] (4)

$f(t) = 2e^{-at} . [u(t) - u(t -2)] , a > 0$

C) Determine f[n] = $x_1[n] * x_2[n]$. Note that the arrow indicates the value of the signal at n = 0. [CO4, PO1-2 , BL3] (3)

$$x_1[n] = \{ \ldots, 0, 2, \underset{\uparrow}{3}, 1, -2, -1, 0, \ldots \}$$

$$x_2[n] = \{ \ldots, 0, -1, \underset{\uparrow}{-1}, 2, 1, 0, \ldots \}$$

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