

**END TERM EXAMINATION**

THIRD SEMESTER [B.TECH] FEBRUARY 2023

Paper Code: EEC-213

Subject: Circuits &amp; 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:-

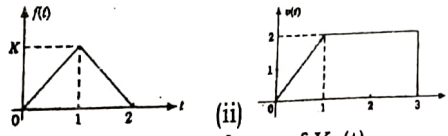
(5x5=25)

- (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)

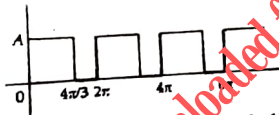


- (i) Find the laplace transform of  $Kr(t)$   
 (c) solve the differential Equation;  
 $x'' + 3x' + 2x = 0$ ,  $x(0^+) = 2$ ,  $x'(0^+) = -3$

(2.5)

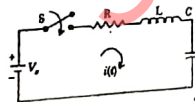
(4)

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

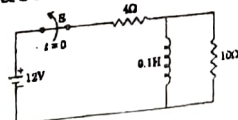
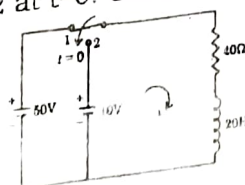


(6.5)

- (b) Define LTI system and discuss its properties.

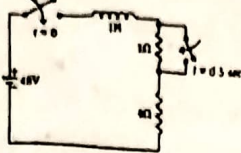
**UNIT-II**Q4 (a) In RLC series circuit given below given that  $V_s = 2V$ ,  $R = 6\Omega$ ,  $L = 2H$ ,  $C = 0.25F$ . Find  $i(0^+)$ ,  $\frac{di}{dt}(0^+)$ ,  $\frac{d^2i}{dt^2}(0^+)$  and  $i(t)$  (8)

- (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)

P.T.O.

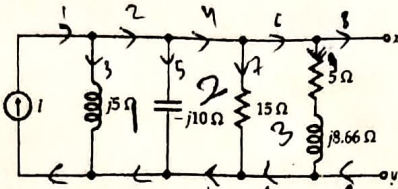
- (b) Fig. below shows first order R-L series circuit with  $R=5\Omega$ ,  $L=1H$ ,  $V_s = 48V$ . Find: (7.5)



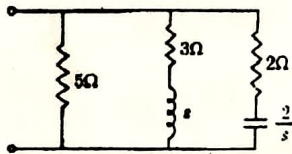
- a) The expression for  $i(t)$ ,  $V_R(t)$ ,  $V_L(t)$  and  $\frac{di}{dt}$  for  $t \geq 0$  b)  $\frac{di}{dt}$  at  $t = 0$   
 c) The time at which  $V_R = V_L$  (d) The resistance is decreased from 5 to  $4\Omega$  at  $t=0.5\text{sec}$  determine  $i(t)$ .

### UNIT-III

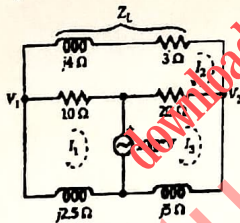
- Q6 (a) Define Thevenin's theorem for ac circuits. (9)  
 If  $I = 33\angle -13^\circ A$ , find the Thevenin's equivalent circuit to the left of terminals x-y in the network shown below



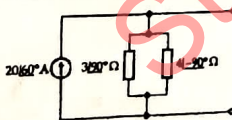
- (b) Find transform admittance  $Y(s)$  of the network given below; (3.5)



- 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)

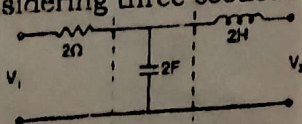


### UNIT-IV

- 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)

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

- 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.