Code No: 153CJ **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, March - 2022
SIGNALS, SYSTEMS AND SIGNAL PROCESSING
(Electronics and Computer Engineering)

Time: 3 Hours **Max. Marks: 75**

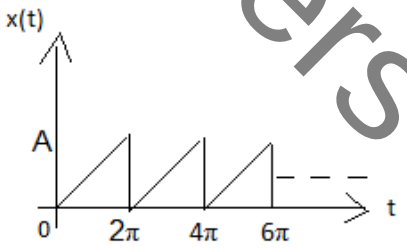
Answer any five questions
All questions carry equal marks

1.a) A rectangular function is given as $x(t)=\begin{cases}1 & 0<t<\pi\\ -1 & \pi<t<2\pi\end{cases}$. Approximate this function by a sinusoidal waveform $sint$ over the interval [0, 2π] such that the mean square error is minimum.

b) Represent the following functions graphically and mathematically.
i) Impulse function ii) Unit Step function iii) Signum function. [9+6]

2.a) What are Orthogonal vectors? Give example.
b) Obtain the expression for Mean Square Error used for Evaluation.
c) Define System bandwidth. [5+5+5]

3.a) Obtain the trigonometric Fourier series for the wave form shown below



b) What are Dirichlet's Conditions? State them. [10+5]

4.a) Find the Fourier transform of e^{-2t} cos 5t u(t).
b) Find the Fourier transform of an impulse function.
c) Highlight the relation between convolution and correlation. [5+5+5]

5.a) The transfer function of an LTI system is H(jw) = 16 / (4 + jw). Find the response y(t) for an input x(t) = u(t).
b) Find the graphical convolution between two signals graphically x(t)=u(t+2) and h(t)=u(t-3). [8+7]

6.a) Describe Causality and Paley Wiener criterion for physical realization of system.
b) Obtain the relationship between Bandwidth and rise time.
c) Find the Laplace transform and ROC of $x(t) = e^{-t} u(t) + e^{-2t} u(-t)$. [6+4+5]

7.a) Using properties of Z-Transform find the Z-Transform of $x(n) = n^2 u(n)$.

b) Find the Z-Transform of the signal $x(n) = n[(1/2)^n u(n) * (1/3)^n u(n)]$.

c) Determine the inverse Z-transform of $X(Z) = \frac{2 + z^3 + 3z - 4}{z^3 + 4z + 3}$ given ROC $|Z| > 0$. [5+5+5]

8.a) With the help of derivation explain the procedure to compute DFT using Radix-2 DIT FFT.

b) Design an analog Butterworth low pass filter that has a dB pass band attenuation at a frequency of 20 rad/sec and at least -10 dB stop band attenuation at 30 rad /sec. [6+9]

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