Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

EVENING

[Total No. of Questions: 09] [Total No. of Pages: .2.]

Uni. Roll No. .....

30 JUN 2022

Program: B.Tech. (Batch 2018 onward)
Semester: 4th
Name of Subject: Signals and Systems
Subject Code: PCEE-108.
Paper ID: 16189

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) State conditions for the existence of Fourier transform.

b) Define aliasing of signal.

c) Differentiate causal and non causal systems with example.

d) Give Laplace transform and region of convergence of unit impulse signal.

e) Evaluate z-transform for a DC signal x(n), such that $x(n) = A_0$.

f) If Fundamental Time Period (FTP) of x(t) is 2 seconds then find the FTP of y(t), where $y(t) = x(10t+2)+5$.

Part – B **[Marks: 04 each]**

Q2. State initial value and final value theorem of Laplace transform.

Q3. Explain the methodology to test the linearity and non linearity of any system with example.

Q4. Discuss about state space modelling from differential equation with the help of example.

Q5. Consider a differential equation for Linear Time Invariant (LTI) system, where input is x(t) and output is y(t) :

$dy(t)/dt + 2y(t) = x(t)$

Find C_n for output y(t) if input $x(t) = 2\cos 4\pi t + 3\sin 6\pi t$

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Q6. $X(z) = 1-3z^{-1}$, $Y(z) = 1+2z^{2}$ are Z-transforms of two signals x[n], y[n] respectively. A linear time invariant system has the impulse response h[n] defined by these two signals as h[n] = x[n-1] * y[n] where '*' denotes discrete time convolution, Then find the output of the system for the input δ[n-1].

Q7. Propose the relation for avoiding overlapping in sampled signal spectrum with Nyquist rate. Calculate the Nyquist rate of signal $\cos 4\pi t + \cos 7\pi t$ in rad/sec

Part – C [Marks: 12 each]

Q8. Explain different types of signals with appropriate examples.

OR

Discuss about system representation through differential equations. Also calculate the value of dy/dt at $t = 0^{+}$ if $d^2y(t)/dt^2 + 2dy(t)/dt + y(t) = \delta(t)$ with $y(t) = -2$ at $t=0^{-}$ and $dy/dt = 0$ at $t=0^{-}$

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Q9. Explain the methodology to reconstruct a signal using zero order hold and first order hold with block diagram and graphical representation.

OR

Produce a plot for region of convergence $0.5<|z|<2$ with its properties followed in z-transform and differentiate z transform from Laplace transform.

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