Q.P. Code : 22818

(3 Hours) Total Marks : 100

Note : : 1) All questions are compulsory.
2) Make suitable assumptions wherever necessary and state the assumptions made.
3) Numbers to the right indicate marks.

Q. 1 Attempt ***any two*** of the following **10**
- a What is signal processing? Discuss the applications of DSP.
- b State and explain Laplace Transform and its inverse transform
- c Define z-Transform
- d What is convolution? What are the properties of convolution?

Q. 2 Attempt ***any three*** of the following **15**
- a Define & give the graphical representation of the following functions:
  - i. Unit ramp
  - ii. Unit step
  - iii. Unit impulse
- b Discuss the classification of Signals.
- c Draw and explain the block diagram of an analog – to – digital converter.
- d What is meant by sampling? State sampling theorem.
- e What is meant by quantisation and encoding?
- f Find the Fourier transform of Unit Step Function.

Q. 3 Attempt ***any three*** of the following **15**
- a Find the Laplace transform of Sine function
- b State any five properties of Laplace transform
- c Define the network transfer function & explain how to obtain output impulse & step response using transfer function
- d What is region of convergence? Explain
- e Find the Laplace transform of Unit step function
- f Find Laplace transform of the periodic rectangular wave form with period 2T

Q. 4 Attempt ***any three*** of the following **15**
- a How is z-Transform obtained from Laplace transform?
- b State and explain the properties of z-Transform.
- c Compare properties of two-sided z-transform with those of one-sided z-transform
- d What is the condition for z-Transform to exist?
- e With reference to z-Transform, state and the initial and final value theorem.
- f Obtain the Z-Transform of the sequence x(n)= {1,2,5,4,6}

Q. 5 Attempt ***any three*** of the following **15**
- a When a system is said to be linear? Explain
- b Simple problems to check the Linearity and Causality of the signals.
- c Explain briefly the Paley-Wiener criterion
- d Explain stability in Linear Time Invariant system. What is the condiction for a system to be BIBO stable?
- e What is frequency response? What are the properties of frequency response?
- f Check whether the system $F[x(n)]= n[x(n)]^2$ is Linear and Time-Variant

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Q. 6 Attempt ***any three*** of the following **15**

a State and explain the properties of Discrete Fourier Series.

b Define Discrete Fourier Transform (DFT) for a sequence x(n)

c Explain any 5 properties of DFT

d State the relationship between DFT and z-Transform

e Determine the Circular Correlation values of the two sequences x(n)={1,0,0,1} and h(n)={4,3,2,1}.

f What are the methods used to perform Fast Convolution. Explain any one method giving all the steps involved to perform Fast Convolution.

Q. 7 Attempt ***any three*** of the following **15**

a State the advantages of Digital filters.

b Explain the effects of windowing. Define Rectangular and Hamming window functions.

c Explain the procedure for designing an FIR filter using Kaiser window.

d What are the advantages of FIR filter over IIR filters?

e What is an IIR filter? Compare its characteristics with an FIR filter.

f Write note on Butterworth filters.

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