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Paper Id: 120615 Roll No: [redacted]

B TECH
(SEM VI) THEORY EXAMINATION 2017-18
FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

Time: 3 Hours *Total Marks: 100*

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.
2. Any special paper specific instruction.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a) What is the difference between discrete and continuous signal?
b) If the continuous –time signal x(t)=2cos(400πt)+5sin(1200πt)+6cos(4400πt)+2sin(5200πt) is sampled at 8kHz rate generating the sequence x[n], find x[n]?
c) What is the need for multi rate signal processing?
d) What is meant by aliasing?
e) What is meant by quantization?
f) What is all pass system?
g) What are the effects of windowing?
h) Compare the FIR system with IIR system?
i) What are the twiddle factors of the DFT?
j) How can you compute DFT using FFT algorithm?

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a) Prove and state the linear convolution properties of DFT?
b) Discuss the process of digital processing of analog signals?
c) Discuss minimum phase systems with suitable example?
d) Discuss FIRequiripple approximation in detail?
e) Explain Goertzel algorithm?

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

a) Derive the DFT of the sample data sequence x(n) = {1,1,2,2,3,3}.
b) Find the Fourier transform of the Gaussian pulse $f(t) = e^{-a^2t^2}$?

4. Attempt any *one* part of the following: 10 x 1 = 10

a) What are the advantages of multi rate processing and list the application of multi rate signal processing system?
b) State the sampling theorem and explain how reconstruct the signal?

5. Attempt any *one* part of the following: 10 x 1 = 10

a) A causal linear shift-invariant system is characterized by the difference equation
y(n) = (¼)y(n - 1) + (1/8)y(n - 2) + x(n) – x (n - 1)
Find the system function, H(z), and the unit sample response, h(n)?
b) Explain zero-input limit cycles in fixed point realizations of IIRdigital filters?

6. Attempt any *one* part of the following: 10 x 1 = 10

a) Explain the procedure for designing an FIR filter using the Kaiser window?

b) Discuss the design procedureof D-T IIR filters from continuous – time filters?

7. Attempt any *one* part of the following: 10 x 1 = 10

a) Compute the DFT coefficients of a finite duration sequence (0, 1,2,3,0,0,0,0).

b) Find the DFT of the following sequence x(n) = {1, -1, -1, -1, 1, 1, 1, -1} using DIT FFT?