

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2018 - 19 Examination

Semester: 6

Subject Code: 03107354

Subject Name: Digital Signal Processing

Date: 11/05/2019

Time: 10:30am To 01:00pm

Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (All are compulsory) (Each of one mark)**(15)**

1. What is the kind of relationship between Ω and ω in Bilinear Transformations Method?

[a] Many-to-one	[b] One-to-many
[c] One-to-one	[d] Many-to-many
2. Which of the following is the auto correlation of $x(n)$?

[a] $r_{xx}(l) = x(l)*x(-l)$	[b] $r_{xx}(l)=x(l)*x(l)$
[c] $r_{xx}(l)=x(l)+x(-l)$	[d] None of the mentioned
3. What is the configuration of system for digital processing of an analog signal?

[a] Analog signal Pre-filter ->D/A Converter -> Digital Processor -> A/D Converter -> Post-filter.
[b] Analog signal Pre-filter ->A/D Converter -> Digital Processor -> D/A Converter -> Post-filter.
[c] Analog signal Post-filter ->D/A Converter -> Digital Processor -> A/D Converter -> Pre-filter.
[d] Analog signal Post-filter ->A/D Converter -> Digital Processor -> D/A Converter -> Pre-filter.
4. The z-transform $X(z)$ of the signal $x(n) = a^n u(n)$ has _____.

[a] One pole at $z = 0$ and zero at $z = a$.	[b] One pole at $z = 0$ and zero at $z = 0$.
[c] One pole at $z = a$ and zero at $z = a$.	[d] One pole at $z = a$ and zero at $z = 0$.
5. If all the poles of $H(z)$ are inside the unit circle, then the system is said to be _____.

[a] Only causal	[b] Only BIBO stable
[c] BIBO stable and causal	[d] None of the mentioned
6. If M and N are the orders of numerator and denominator of rational system function respectively, then _____ multiplications are required in direct form-I realization of that IIR filter.
7. If we reverse the directions of all branch transmittances and interchange the input and output in the flow graph, then the resulting structure is called as _____ form.
8. DIFFFT stands for _____.
9. The Impulse Invariance method is type of _____ filter.
10. The DTFT of Unit Impulse is _____.
11. Every causal system is static system. [TRUE OR FALSE]
12. DFT is applied to Finite discrete sequences. [TRUE OR FALSE]
13. In Bilinear Transformation, aliasing of frequency components is been avoided. [TRUE OR FALSE]
14. The unit sample response of Hilbert transform is infinite in duration and causal. [TRUE OR FALSE]
15. FFT algorithm is designed to perform complex operations. [TRUE OR FALSE]

Q.2 Answer the following questions. (Attempt any three) (15)

- A) Define DFT and IDFT. Also provide relationship between DTFT and DFT.
- B) Plot pole-zero pattern and determine given sequence is stable or not.
 $y(n) = 0.7 y(n - 1) - 0.1 y(n - 2) + 2x(n) - x(n - 2)$.
- C) Determine Auto correlation of $x(n) = \{1, 2, 1, 1\}$ using mathematical expression.
- D) Give comparison of General purpose Microprocessor with DSP processor.

Q.3 A) Obtain direct form I and II realization of a system described by, (07)

$$y(n) - \frac{3}{4} y(n - 1) + \frac{1}{8} y(n - 2) = x(n) + \frac{1}{2} x(n - 1)$$

- B) Explain "Approximation of Derivatives" method for IIR filter design method. (08)

OR

- B) Calculate 8 point DFT of $x(n) = \{1, 2, 1, 2\}$. (08)

Q.4 A) Design Low Pass FIR filter using rectangular window with pass band gain of unity, cutoff (07)
frequency of 200 Hz, sampling frequency of 1 KHz. Assume the length of impulse response as 7.

OR

- A) Design a second order DT Butterworth filter with cut-off frequency of 1 KHz and sampling (07)
frequency of 10^4 samples/sec. by bilinear transformation.

- B) Let $x(n)$ be a finite duration sequence of length eight such that $x(n) = \{-1, 0, 2, 0, -4, 0, 2, 0\}$. Find (08)
 $X(k)$ using Decimation In Time Fast Fourier Transform algorithm.