

Con. 3491-11.

(REVISED COURSE)

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions from the remaining **six** questions.
 (3) Assume **suitable** data if **required** and **justify** it.

1. (a) Find the number of complex additions and complex multiplications required to find DFT for 16 point signal. Compare them with the number of computations required if FFT algorithm is used. 20

- (b) Determine whether or not following signal is periodic.

$$x(n) = \cos\left(\frac{\pi}{3} \cdot n\right) + \sin\left(\frac{\pi}{3} \cdot n + \frac{1}{5}\right)$$

- (c) A periodic function $x_p(n)$ having samples over one period is given below

$$x_p(n) = \{ 1, -4, 2, -6 \}$$

Find Z.T. of this periodic function.

- (d) For the system $y(n) = \sum_{k=n_0}^n x(k)$

Examine Causal/Noncausal, Linear/Nonlinear, Static /Dynamic, Time Variant/ Time invariant classification.

- (e) What is the need for DSP processor when high speed Pentium processors are available ?

2. (a) A Casual DT system has Transfer function $H(z)$ such that, it is a cascade connection of two systems $H_1(z)$ and $H_2(z)$. $H_1(z)$ has one pole at $Z = \frac{1}{5}$ and one zero at $z = \frac{1}{4}$.

$H_2(z)$ has one pole at $z = 0$ and zero at $z = \frac{-1}{3}$.

- (i) Find T.F. of the system. 3
 (ii) Find Difference equation of the system. 3

- (iii) Find response of the system to i/p $x(n) = \left(\frac{-1}{3}\right)^n u(n)$. 3

- (iv) Draw pole-zero diagram of the overall system and comment on stability. 3

- (b) Develop DIT-FFT algorithm for $N = 6$ and draw the flow graph. 8

[TURN OVER

3. (a) Given the 8 point DFT of the sequence : 8
 $x(n) = 1, 0 \leq n \leq 3$
 $= 0, 4 \leq n \leq 7$
- (i) Find its DFT using D I F F T algorithm using this result $(X(k))$ and DFT property (Not otherwise) find DFT of $x_1(n)$ and $x_2(n)$. 8
- (ii) Where $x_1(n) = 1, \text{ for } n = 0$ 3
 $= 0, \text{ for } 1 \leq n \leq 4$
 $= 1, \text{ for } 5 \leq n \leq 7$ 3
- (iii) Where $x_2(n) = 0 \text{ for } 0 \leq n \leq 1$ 3
 $= 1 \text{ for } 2 \leq n \leq 5$
 $= 0 \text{ for } 6 \leq n \leq 7$

- (b) Perform convolution operation between given function in time domain if 6

$$x(n) = \begin{cases} (-2)^n & \text{for } n = 0, 1, 2, 3 \\ 0 & \text{otherwise} \end{cases}$$

and

$$h(n) = u(n) + u(n-1) - u(n-2) - u(n-3)$$

4. (a) A second order discrete time system is characterized by the difference equation. 12
 $y(n) - 0.1y(n-1) - 0.02y(n-2) = 2x(n) - x(n-1)$. Determine the O/p response when I/P $x(n) = u(n)$ and initial conditions are $y(-1) = -10, y(-2) = 5$.
- (b) Using DFT/IDFT method find the response of the system with impulse response $h(n) = 5\delta(n) - 2\delta(n-1)$, if the I/P to the system is $x(n) = 3u(n) - 2u(n-2) - u(n-3)$. 8

5. (a) Determine the Inverse Z.T. of $X(z)$ for all possible ROC conditions if :— 10

$$X(z) = \frac{(z+1)}{(2z^2 - 7z + 3)}$$

also comment on stability in each ROC condition.

- (b) Draw a block diagram TMS320C54XX series architecture and discuss its function and capabilities. 10
6. (a) State and prove convolution property of Z-Transform. 7
 (b) Describe minimum phase, maximum phase and mixed phase system with example. 6
 (c) Explain autocorrelation and crosscorrelation with example. Also state properties of autocorrelation. 7
7. (a) Discuss application of DSP to Biomedical area. 20
 (b) Derive the relationship between DTFT and Z.T.
 (c) Write short notes on DTFS and properties of DTFS.
 (d) Explain block convolution using overlap Add OR overlap save method.