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SEAT No. :

P3689

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**Engg.-27**  
**T.E (E & TC) (Semester-I)**  
**DIGITAL SIGNAL PROCESSING (In Sem.)**  
**(2012 Pattern)**

*Time :1 Hour]*

*[Max. Marks :30*

*Instructions to the candidates :*

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary*

**Q1) a) An analog signal contains frequencies upto 10KHz. [6]**

i) What range of sampling frequencies allows exact reconstruction of this signal from its samples?

ii) If this signal is sampled with a sampling frequency  $F_s = 8$  KHz.

What is the folding frequency?

Examine what happens to the frequency  $F_1 = 5$  KHz.

Examine what happens to the frequency  $F_2 = 9$  KHz.

b) State the advantages of digital signal processing over analog signal processing. [4]

**OR**

**Q2) a) Draw the block diagram of a digital signal processing system and explain the operation of each block. What additional component is required to prevent aliasing? [4]**

b) Determine the fundamental period of the following sinusoidal signals.[6]

i)  $\cos 0.01\pi n$     ii)  $\cos(62\pi n / 10)$     iii)  $\sin(2\sqrt{2}\pi n / 5)$

**Q3) a)  $x(n) = \{1 \ 2 \ 1 \ 2\}$                        $h(n) = \{1 \ -1 \ 2 \ 1\}$  [6]**

Compute circular convolution using DFT-IDFT method.

b) State and prove the time shifting property of DFT. [4]

**OR**

**P.T.O.**

- Q4)** a) Compute 8 - point DFT of the following sequence using radix 2 DIT-FFT algorithm. [8]

$$x(n) = \{1 \ 2 \ 3 \ 4 \ 4 \ 3 \ 2 \ 1\}$$

- b) State the DFT symmetry property for a real sequence. [2]

- Q5)** a) Compute the Z transform and ROC of following sequence. [4]

$$x(n) = (1/2)^n u(n+2) + (3)^n u(-n-1)$$

- b) State the different sequences having Z transform given by [6]

$$X(z) = \frac{1 - 2z^{-1}}{1 - \frac{7}{12}z^{-1} + \frac{1}{12}z^{-2}}$$

Also state the ROC of each sequence.

**OR**

- Q6)** a) A causal discrete-time LTI system has an input  $x(n]$  and output  $y(n]$  given by: [6]

$$x(n) = \left(\frac{1}{2}\right)^n u(n) - \left(\frac{1}{4}\right) \left(\frac{1}{2}\right)^{n-1} u(n-1)$$

$$y(n) = \left(\frac{1}{3}\right)^n u(n)$$

Determine the impulse response  $h(n]$  and the system function  $H(z)$  of the system.

- b) A discrete- time LTI system is characterized by [4]

$$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$

Determine  $h(n]$  for

- i) Causal system
- ii) Stable system
- iii) Anti-causal system

