

**Sample Questions**  
**Computer Engineering**

**Subject Name: Digital Signal and Image Processing**

**Semester: VI**

**Multiple Choice Questions**

|           |   |
|-----------|---|
|           | <b>Choose the correct option for following questions. All the Questions carry equal marks</b>                 |
| 1.        | If $x(n)$ is a discrete-time signal, then the value of $x(n)$ at non integer value of 'n' is:                 |
| Option A: | Zero  |
| Option B: | Positive  |
| Option C: | Negative  |
| Option D: | Not defined   |
| Answer    | Not defined   |
| 2.        | The function given by the equation $x(n)=1$ , for $n=0$ ; and $x(n) =0$ , for $n \neq 0$ is                   |
| Option A: | Step function   |
| Option B: | Ramp function   |
| Option C: | Triangular function   |
| Option D: | Impulse function  |
| Answer    | Impulse function  |
| 3.        | Which of the following should be done in order to convert a continuous-time signal to a discrete-time signal? |
| Option A: | Sampling  |
| Option B: | Differentiating   |
| Option C: | Integrating   |
| Option D: | None of the mentioned   |
| Answer    | Sampling  |
| 4.        | What is output signal when a signal $x(t)=\cos (2*\pi*40*t)$ is sampled with a sampling frequency of 20Hz?    |
| Option A: | $\cos(\pi*n)$   |
| Option B: | $\cos(2*\pi*n)$   |
| Option C: | $\cos(4*\pi*n)$   |
| Option D: | $\cos(8*\pi*n)$   |
| Answer    | $\cos(4*\pi*n)$   |
| 5.        | Which of the following is true regarding the number of computations requires to compute an N-point DFT?       |
| Option A: | $N^2$ complex multiplications and $N(N-1)$ complex additions  |
| Option B: | $N^2$ complex additions and $N(N-1)$ complex multiplications  |
| Option C: | $N^2$ complex multiplications and $N(N+1)$ complex additions  |
| Option D: | $N^2$ complex additions and $N(N+1)$ complex multiplications  |
| Answer    | $N^2$ complex multiplications and $N(N-1)$ complex additions  |
| 6.        | What is the DFT of the four point sequence $x(n)=\{0,1,2,3\}$ ?   |
| Option A: | $\{6,-2+2j,-2,-2j\}$  |
| Option B: | $\{6,-2-2j,2,-2+2j\}$   |
| Option C: | $\{6,-2+2j,-2,-2-2j\}$  |
| Option D: | $\{6,-2-2j,-2,-2+2j\}$  |

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| Answer    | {6,-2+2j,-2,-2-2j}   |
| 7.        | What is the order of the four operations that are needed to be done on h(k) in order to convolute x(k) and h(k)?<br>Step-1:Folding<br>Step-2:Multiplication with x(k)<br>Step-3:Shifting<br>Step-4:Summation   |
| Option A: | 1-2-3-4  |
| Option B: | 1-2-4-3  |
| Option C: | 2-1-3-4  |
| Option D: | 1-3-2-4  |
| Answer    | 1-3-2-4  |
| 8.        | An LTI system is said to be causal if and only if?   |
| Option A: | Impulse response is non-zero for positive values of n  |
| Option B: | Impulse response is zero for positive values of n  |
| Option C: | Impulse response is nonzero for negative values of n   |
| Option D: | Impulse response is zero for negative values of n  |
| Answer    | Impulse response is zero for negative values of n  |
| 9.        | If $x(n)=(0,0,1,1,1,1,1,0)$ then $x(3n+1)$ is?   |
| Option A: | (0,1,0,0,0,0,0,0)  |
| Option B: | (0,0,1,1,1,1,0,0)  |
| Option C: | (1,1,0,0,0,0,0,0)  |
| Option D: | None of the mentioned  |
| Answer    | (0,1,0,0,0,0,0,0)  |
| 10.       | Which function has a provision of determining the similarity between the signal and its delayed version?   |
| Option A: | Auto-correlation Function  |
| Option B: | Cross-correlation Function   |
| Option C: | Convolution Function   |
| Option D: | DFT function   |
| Answer    | Auto-correlation Function  |
| 11.       | Which property is exhibited by the auto-correlation function of a complex valued signal?   |
| Option A: | Commutative property   |
| Option B: | Distributive property  |
| Option C: | Conjugate property   |
| Option D: | Associative property   |
| Answer    | Conjugate property   |
| 12.       | In 4-neighbours of a pixel p, how far are each of the neighbours located from p?   |
| Option A: | one pixel apart  |
| Option B: | four pixels apart  |
| Option C: | alternating pixels   |
| Option D: | none of the Mentioned  |
| Answer    | one pixel apart  |
| 13.       | What is the technique for a gray-level transformation function called, if the transformation would be to produce an image of higher contrast than the original by darkening the levels below some gray-level m and brightening the levels above m in the original image. |
| Option A: | Contouring   |
| Option B: | Contrast stretching  |

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| Option C:  | Mask processing  |
| Option D:  | Point processing   |
| Answer     | Contrast stretching  |
| <b>14.</b> | What does the bilinear Interpolation do for gray-level assignment?   |
| Option A:  | Assign gray level to the new pixel using its right neighbor  |
| Option B:  | Assign gray level to the new pixel using its left neighbor   |
| Option C:  | Assign gray level to the new pixel using its four nearest neighbors  |
| Option D:  | Assign gray level to the new pixel using its eight nearest neighbours  |
| Answer     | Assign gray level to the new pixel using its four nearest neighbors  |
| <b>12</b>  | For pixels p(x, y), q(s, t), the Euclidean distance between p and q is defined as:   |
| Option A:  | $D(p, q) = [(x - s)^2 + (y - t)^2]^{1/2}$  |
| Option B:  | $D(p, q) =  x - s  +  y - t $  |
| Option C:  | $D(p, q) = \max( x - s  +  y - t )$  |
| Option D:  | None of the mentioned  |
| Answer     | $D(p, q) = [(x - s)^2 + (y - t)^2]^{1/2}$  |
| <b>16.</b> | Highlighting the contribution made to total image by specific bits instead of highlighting intensity-level changes is called as: |
| Option A:  | Bit-plane slicing  |
| Option B:  | Intensity Highlighting   |
| Option C:  | Byte-Slicing   |
| Option D:  | None of the Mentioned  |
| Answer     | Bit-plane slicing  |
| <b>17.</b> | Which of the following in an image can be removed by using smoothing filter?   |
| Option A:  | Sharp transitions of brightness levels   |
| Option B:  | Sharp transitions of gray levels   |
| Option C:  | Smooth transitions of gray levels  |
| Option D:  | Smooth transitions of brightness levels  |
| Answer     | Sharp transitions of gray levels   |
| <b>18.</b> | What is the full form of JPEG?   |
| Option A:  | Joint Photographs Expansion Group  |
| Option B:  | Joint Photographic Expansion Group   |
| Option C:  | Joint Photographic Experts Group   |
| Option D:  | Joint Photographic Expanded Group  |
| Answer     | Joint Photographic Experts Group   |
| <b>19.</b> | Which of the following is the first fundamental step in image processing?  |
| Option A:  | Filtration   |
| Option B:  | Image Restoration  |
| Option C:  | Image Enhancement  |
| Option D:  | Image Acquisition  |
| Answer     | Image Acquisition  |
| <b>20.</b> | What is the name of the tool that helps in zooming, shrinking, rotating, etc.?   |
| Option A:  | Filters  |
| Option B:  | Interpolation  |
| Option C:  | Sampling   |
| Option D:  | None of the above  |
| Answer     | Interpolation  |
| <b>21.</b> | Intensity levels in 8-bit image are:_____.   |
| Option A:  | 0—255  |
| Option B:  | 0—1024   |

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| Option C:  | 0—128   |
| Option D:  | 0--64   |
| Answer     | 0—255   |
| <b>22.</b> | The number of grey values are integer powers of:_____.                          |
| Option A:  | 3   |
| Option B:  | 4   |
| Option C:  | 8   |
| Option D:  | 2   |
| Answer     | 2   |
| <b>23.</b> | The Overlap Save and Overlap Add methods are used to compute DFT of __.         |
| Option A:  | Short data sequence   |
| Option B:  | Moderate data sequence  |
| Option C:  | Big sample value sequence   |
| Option D:  | Long data sequence.   |
| Answer     | Long data sequence.   |
| <b>24.</b> | D.I.T. is_____.   |
| Option A:  | Dissemination In Task.  |
| Option B:  | Degradation In Time.  |
| Option C:  | Dissemination In Time.  |
| Option D:  | Disadvantage in Time.   |
| Answer     | Dissemination In Time.  |
| <b>25.</b> | In FFT, how many complex multiplications are required to compute X(k)?          |
| Option A:  | $N(N+1)$  |
| Option B:  | $N(N-1)/2$  |
| Option C:  | $N^2/2$   |
| Option D:  | $N(N+1)/2$  |
| Answer     | $N(N+1)/2$  |
| <b>26.</b> | If $x(n)$ and $X(k)$ are an N-point DFT pair, then $X(k+N)=?$                   |
| Option A:  | $X(-k)$   |
| Option B:  | $-X(k)$   |
| Option C:  | $-X(-k)$  |
| Option D:  | $X(k)$  |
| Answer     | $X(k)$  |
| <b>27.</b> | What is the name of process used to correct the power-law response phenomena?   |
| Option A:  | Beta correction   |
| Option B:  | Alpha correction  |
| Option C:  | Gamma correction  |
| Option D:  | Pie correction  |
| Answer     | Gamma correction  |
| <b>28.</b> | Which of the following make an image difficult to enhance?                      |
| Option A:  | Narrow range of intensity levels  |
| Option B:  | High noise  |
| Option C:  | Dynamic range of intensity levels   |
| Option D:  | All of the mentioned above  |
| Answer     | All of the mentioned above  |
| <b>29.</b> | The circular convolution of two sequences in time domain is equivalent to_____. |
| Option A:  | Square of multiplication of DFTs of two sequences                               |
| Option B:  | Difference of DFTs of two sequences   |
| Option C:  | Summation of DFTs of two sequences  |

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| Option D:  | Multiplication of DFTs of two sequences  |
| Answer     | Multiplication of DFTs of two sequences  |
| <b>30.</b> | To convert a continuous sensed data into Digital form, which of the following is required? |
| Option A:  | Sampling   |
| Option B:  | Quantization   |
| Option C:  | Both Sampling and Quantization   |
| Option D:  | Neither Sampling nor Quantization  |
| Answer     | Both Sampling and Quantization   |
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### Descriptive Questions

|  |                                     |     |     |     |    |    |    |     |     |
|--|-------------------------------------|-----|-----|-----|----|----|----|-----|-----|
| <p>A particular digital image with eight quantization level has the following histogram perform histogram equalization. Give new equalized histogram.</p>  |                                     |     |     |     |    |    |    |     |     |
|  | Gray Levels                         | 0   | 1   | 2   | 3  | 4  | 5  | 6   | 7   |
|  | No. of Pixels belongs to gray level | 200 | 170 | 130 | 60 | 60 | 80 | 140 | 160 |
| <p>Perform the histogram stretching so that the new image have dynamic range [ 0 -7 ].</p>   |                                     |     |     |     |    |    |    |     |     |
|  | Gray Levels                         | 0   | 1   | 2   | 3  | 4  | 5  | 6   | 7   |
|  | No. of Pixels belongs to gray level | 100 | 90  | 85  | 70 | 0  | 0  | 0   | 0   |
| <p>Explain the procedure of Zooming an image using replication and interpolation with suitable example.</p>  |                                     |     |     |     |    |    |    |     |     |
| <p>Find the convolution of the following sequencesi)<br/> <math>x(n)=u(n)</math>, <math>h(n)=u(n-3)</math><br/>           ii) <math>x(n)=\{1,2,-1,1\}</math>, <math>h(n)=\{1,0,1,1\}</math></p>  |                                     |     |     |     |    |    |    |     |     |
| <p>For a periodic signal <math>v(t) = 30\sin(2\pi*100t) + 10\cos(2\pi*300t) + 6 \sin(2\pi*500t)</math>, find the fundamental frequency in rad/s and Nyquist sampling rate. Obtain the discrete signal <math>x(n)</math>.</p>           |                                     |     |     |     |    |    |    |     |     |
| <p>Determine the response of the relaxed system characterized by the impulse response <math>h[n]= 0.5^n u(n)</math> and input <math>x[n]=2^n u(n)</math>.</p>  |                                     |     |     |     |    |    |    |     |     |
| <p>If <math>x(n) = \{1,2,3,4\}</math> and <math>h(n) = \{1,2,3,2\}</math><br/>           a) Find Circular Convolution using DFT and IDFT?<br/>           b) Find Linear Convolution using Circular Convolution using DFT and IDFT?</p> |                                     |     |     |     |    |    |    |     |     |
| <p>Find the output <math>y(n)</math> of a filter whose impulse response is <math>h(n) = \{1, 1, 1\}</math> and input signal <math>x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}</math> using overlap save method?</p>                       |                                     |     |     |     |    |    |    |     |     |
| <p>Obtain the convolution for two D.T. sequences <math>x(n) = u(n)</math> and <math>y(n) = (0.5)^n u(n)</math>.</p>  |                                     |     |     |     |    |    |    |     |     |
| <p>Two discrete time systems are connected in cascade <math>h_1(n) = (0.5)^n u(n)</math> and <math>h_2(n) = (0.25)^n u(n)</math>. Determine unit sample response of cascade.</p>   |                                     |     |     |     |    |    |    |     |     |

The Impulse response of DT- LTI system  $h(n) = n (1/2)^n u(n)$ . Determine whether the system is stable and casual?

A system has unit impulse response  $h(n) = (1/3)^{n+1} u(n+1)$ . Find the response for unit step input?

Find the output  $y(n)$  of a filter whose impulse response is  $h(n) = \{1, 1, 1\}$  and input signal  $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$  using overlap save method?

Perform bit plane slicing and obtain all bit planes of following image

|   |   |   |   |
|---|---|---|---|
| 7 | 3 | 5 | 4 |
| 6 | 2 | 4 | 3 |
| 5 | 7 | 6 | 0 |
| 6 | 7 | 4 | 3 |

Show that a high pass filter can be obtained as High Pass = Original – Low Pass

What is zero padding? What are its uses?

List and explain any four properties of DFT.

How many multiplications and additions are required to compute N point DFT using Radix-2 FFT?

Explain the procedure of neighborhood processing technique?

Distinguish between linear convolution and circular convolution of two sequences.

Let  $x(n) = \cos(n.\pi/2) u(n)$ . Find D.F.T. of  $x(n)$ .

Compare the high pass and low pass filtering in spatial domain.

What are different applicators of DSP?

Distinguish between Discrete Signal and Analog signals.

What are different signals used for analysis of discrete time signals?

Obtain the autocorrelation of sequence  $x(n) = a^n u(n)$ ,  $0 < a < 1$

Find the signal energy of  $(1/2)^n u(n)$ ?

Obtain the digital negative of the 8 bpp image

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 23  | 206 | 244 | 72  | 130 |
| 163 | 79  | 47  | 69  | 122 |
| 201 | 247 | 100 | 80  | 39  |
| 48  | 77  | 111 | 211 | 121 |

What effect would set to zero the higher-order bit planes have on the histogram of an image in general?

The impulse response of a LTI system is  $h(n) = \{1, 2, 1, 1\}$ . What is the response of the signal to the input  $x(n) = \{1, 2, 3, 4\}$ ?