MCQ's

1. A discrete standard Unit Step function is given by

   a) $u[n] = \begin{cases} 1, & n \geq 0 \\ 0, & n < 0 \end{cases}$ ✔

   b) $u[n] = \begin{cases} 1, & n \geq 2 \\ 0, & n < 0 \end{cases}$

   c) $u[n] = \begin{cases} 1, & n \geq 4 \\ 0, & n < 0 \end{cases}$

   d) $u[n] = \begin{cases} 1, & n \geq 6 \\ 0, & n < 0 \end{cases}$

2. A discrete standard Unit Impulse/Unit Sample is given by

   a) $\delta[n] = \begin{cases} 1, & n = 0 \\ 0, & n \neq 0 \end{cases}$ ✔

   b) $\delta[n] = \begin{cases} 1, & n = 1 \\ 0, & n \neq 0 \end{cases}$

   c) $\delta[n] = \begin{cases} 1, & n = 2 \\ 0, & n \neq 0 \end{cases}$

   d) $\delta[n] = \begin{cases} 1, & n = 3 \\ 0, & n \neq 0 \end{cases}$

3. What does the **stem()** command do
   a) Plots a continues time signal
   b) Plots a discrete time signal ✔
   c) Plots a symmetric signal
   d) does not plot the signal

4. The minimum sampling frequency for a 10 MHz signal would be
   a) 5 MHz
   b) 10 MHz ✔
   c) 15 MHz
   d) 20 MHz

5. Sampling a continuous time signals gives
   a) Digital Signal
   b) Analog Signal
   c) Discrete Time Signal ✔
   d) None of the above

6. The command used for Convolution is
   a) conv() ✔
   b) covn()
   c) con()
   d) conx()

7. The command used for Correlation is
   a) corr() ✔
   b) xcorr()
   c) coss()
   d) xcors

8. If "x" is a signal then what does the command **xcorr(x)** do
   a) Cross Correlation ✔
   b) Auto Correlation
   c) Convolution
   d) Nothing

9. s=[0 1 zeros(1,3)] is same as
   a) s=[0 1 1 1 1]
   b) s=[0 1 0 0 1]
   c) s=[0 1 1 0 1]
   d) s=[0 1 0 0 0] ✔

10.   s=[0 0 ones(1, 2)] is same as
   a) s=[0 0 1 0]
   b) s=[0 0 0 1]
   c) s=[0 0 1 1] ✔
   d) s=[0 0 0 0]

11.   Fourier series decomposes a _____ signal into a sum of simple sine/cosine functions
   a) Periodic ✔
   b) Aperiodic/Non-periodic
   c) Discrete
   d) None of the above

12.   axis([-10 10 -5 5]) means
   a) x-axis is from -10 to 10
   b) y-axis is from -10 to 10
   c) x axis from -5 to 5
   d) x-axis is from -10 to 10 and y-axis is from -5 to 5 ✔

13.   Which of the following command is the correct one
   a) Title('DSP')
   b) title('DSP') ✔
   c) Title("DSP")
   d) Title('DSP)

14. Which of the following is the correct one for sampling theorem
   a) fs<fmax
   b) fs=fmax
   c) fs≥2fmax ✔
   d) None of the above

15. Which of the following command is used to draw a continuous time signal
   a) stem()
   b) subplot()
   c) plot() ✔
   d) None of the above

16. Which property of delta function indicates the equality between the area under the product of function with shifted impulse and the value of function located at unit impulse instant?
   a) Replication

   b) Sampling ✔

   c) Scaling

   d) Product

17. A discrete standard Unit Impulse/Unit Sample is given by
   a) $\delta[n] = \begin{cases} 1, & n = 0 \\ 0, & n \neq 0 \end{cases}$ ✔
   b) $\delta[n] = \begin{cases} 1, & n = 1 \\ 0, & n \neq 0 \end{cases}$
   c) $\delta[n] = \begin{cases} 1, & n = 2 \\ 0, & n \neq 0 \end{cases}$
   d) $\delta[n] = \begin{cases} 1, & n = 3 \\ 0, & n \neq 0 \end{cases}$

18. What does the **stem()** command do
   a) Plots a continues time signal
   b) Plots a discrete time signal ✔
   c) Plots a symmetric signal
   d) Does not plot the signal

19. Which among the below specified conditions/cases of discrete time in terms of real constant 'a', represents the double-sided decaying exponential signal?
   a) a > 1
   b) 0 < a < 1
   c) a < -1
   d) -1 < a < 0 ✔

20. The command used to plot is
    a) plot() ✔
    b) draw()
    c) lot()
    d) None of the above

21. The command used for Convolution is
    a) conv() ✔
    b) covn()
    c) con()
    d) conx()

22. What is meant by diff (a) in Matlab?
    a) The difference between each consecutive element ✔
    b) The sum between each consecutive element
    c) The difference between each consecutive plot
    d) None of the above

23. An amplitude of sinc function that passes through zero at multiple values of an independent variable 'x':
    a) Decreases with an increase in the magnitude of an independent variable (x). ✔
    b) Increases with an increase in the magnitude of an independent variable (x).
    c) Always remains constant irrespective of variation in magnitude of 'x'
    d) Cannot be defined.

24. s=[0 1 zeros(1,3)] is same as
    a) s=[0 1 1 1 1]
    b) s=[0 1 0 0 1]
    c) s=[0 1 1 0 1]
    d) s=[0 1 0 0 0] ✔

25. Which block of the discrete time systems requires memory in order to store the previous input?
    a) Adder
    b) Signal multiplier
    c) Unit delay ✔
    d) Unit advance

26. _____ repeat statements an indefinite number of times until a condition is no longer satisfied.
    a) Periodic
    b) For
    c) While ✔
    d) None of the above

27. axis([-10 10 -5 5]) means
   a) x-axis is from -10 to 10
   b) y-axis is from -10 to 10
   c) x axis from -5 to 5
   d) x-axis is from -10 to 10 and y-axis is from -5 to 5 ✔

28. Which of the following command is the correct one
   a) disp(lengtha);
   b) disp(length(a)); ✔
   c) disp(length(a))
   d) None of the above

29. Matlab stands for:
   a) Matrix Laboratory ✔
   b) Matrix Function
   c) Math Laboratory
   d) None of the above

30. Which one of the following is true?
   a) Script files are sequences of any number of commands. ✔
   b) Scripts cannot operate on existing data in the workspace.
   c) Both a and b
   d) None of the above

Short Question Answers

Question#1: What is a system?

Ans: A set of components that are connected together to perform the particular task.

Question#2: What is periodic and non-periodic signal?

Ans: A signal is said to be periodic, if it exhibits periodicity i.e., $X(t + T) = x(t)$, for all values of t. Periodic signal has the property that it is unchanged by a time shift of T. A signal that does not satisfy the above periodicity property is called an aperiodic signal.

Question#3: Define impulse response of a DT system.

Ans: The impulse response is the output produced by DT system when unit impulse is applied at the input. The impulse response is denoted by h (n). The impulse response h (n) is obtained by taking inverse Z transform from the transfer function H(z).

Question#4: What are the properties of convolution?

Ans: The properties of convolution are:
- Commutative
- Distributive
- Associative

Question#5: What is amplitude scaling and time scaling?

Ans: The amplitude scaling if performed by multiplying the amplitude of the signal by constant. Similarly multiplying the variable time by constant performs time scaling.

Question#6: State superposition theorem.

Ans: "The response of the system to a weighted sum of signals will be equal to the corresponding weighted sum of the response i.e., output of the system to each of the individual system." Otherwise system will be nonlinear.

Question#7: What is a Matlab?

Ans: Matlab is a computer program that combines computation and visualization power that makes it particular useful tool for engineers.

Question#8: What are the applications of Matlab?

Ans: It is used for:
- Algorithm development
- Scientific and Engineering graphics
- Modelling, simulation and prototyping
- Math and computation

Question#9: What is meant by linearity of a system and how it is related to scaling and superposition?

Ans: If a system is linear, this means that when an input to a given system is scaled by a value, the output of the system is scaled by the same amount. A system that satisfies the property of superposition then the system is known as linear time invariant system. When 2 signals are scaled and added together and fed to the system, the system output is the same-scaled added version of two signals then the system satisfies the superposition principle.

Question#10: What is meant by causality?

Ans: It means that the output of the system does not depend on future inputs, but only on past input.

Question#11: What is meant by correlation

Ans: Correlation is the measure of similarity between two signals/waveforms. It compares the waveform at different time instants.

Question#12: State sampling theorem.

Ans: "A band limited signal can be reconstructed exactly if is sampled at a rate at least twice the maximum frequency component in it".

Long Question Answers

Question#1:
State convolution property in relation to Fourier transforms?
Solution:
The convolution theorem states that convolution in time domain corresponds to multiplication in frequency domain and vice versa.
$$F[x(t) * y(t)] = X(j\omega)Y(j\omega)$$

Question#2:
Given below is an incomplete and incorrect code which is used to draw a continuous time signal, remove the errors and complete the code:

```
t=0:.0005:1;
f=10;
ansc=cos(2*pif*t
plot();
grid on;
xlabel('Time');
ylabel('Amplitude');
title('Continuous Time');
axis([0 1 -2 2]);
```

Solution:

```
t=0:.0005:1;
f=10;
ansc=cos(2*pi*(f)*t);
plot(t,ansc);
grid on;
xlabel('Time');
ylabel('Amplitude');
title('Continuous Time');
axis([0 1 -2 2]);
```

Question#3:

Write a Matlab code to draw a discrete time signal?

Solution:

```
N=21;
A=1;
w=0.3;
p=1;
for n=1:N
x(n) = A*cos(w*(n-1)+p);
end
stem(x);
xlabel('Time axis n');
ylabel('Amplitude');
title('Discrete Time');
```

Question#4:

Given below is a code which performs cross correlation of two signals x1 and x2, make necessary changes to convert this cross correlation into auto correlation:

```
%cross correlation
x1=[5 4 3 2 1]; % first signal
x2=[1 2 1 1 1]; % second signal
[y,n]=xcorr(x1,x2); % correaltion result stored in variable 'y'
stem(n,y);
grid on;
```

Solution:

```
%Auto correlation
x=[5 4 3 2 1];
[y,n]=xcorr(x); % correaltion result stored in variable ‚Äòy‚Äô
stem(n,y);
grid on;
```

Question#5:

What is Aliasing and when does it occur?

Solution:

Aliasing is an effect that causes different signals to become indistinguishable when sampled. It is also refers to the distortion that results when the signal reconstructed from samples is different from the original continuous signal. Aliasing occurs when a system is measured at an insufficient sampling rate.

Question#6:

Given below is an incomplete and incorrect code, which is used to generate a discrete-time sinusoid of the form:

$$x[n] = A\cos(\omega n + \theta), n = 0,1, \dots, N - 1$$

With A=1, $\omega = 0.3, \theta = 1$ and N=21, which has duration of 21 samples.

Remove the errors and complete the code.

```
N=20:
A=1
w=0.3;
```

```
p=1;
for n=1;N
x (n) = Acos^ (w^ (n-1)+p);
```

Solution:

```
N=21;
A=1;
w=0.3;
p=1;
for n=1:N
x (n) = A*cos (w* (n-1)+p);
end
```

Question#7:
   Given below is a code which draws discrete time standard unit impulse signal at n=0, make necessary changes in this code to get an output at n=2.

```
n=-1:10;
s=[0 1 zeros(1,10)];
stem(n,s);
xlabel('n');
ylabel('Amplitude');
title('Unit Sample Sequence');
axis([-10 20 0 1]);
```

Solution:

```
n=-1:10;
s=[0 0 0 1 zeros(1,8)];
stem(n,s);
xlabel('n');
ylabel('Amplitude');
title('Unit Sample Sequence');
axis([-10 20 0 1]);
```