


9  
السؤال

<b>University</b> : <i>Menoufia</i> <b>Faculty</b> : <i>Electronic Engineering</i> <b>Department</b> : <i>Electronics and Communications</i> <b>Academic level</b> : <i>3<sup>rd</sup> Year</i> <b>Course Name</b> : <i>Digital Signal Processing</i> <b>Course Code</b> : <i>ECE 322</i>		<b>Date</b> : <i>13/06/2019</i> <b>Time</b> : <i>3 Hours</i> <b>No. of pages</b> : <i>2</i>  <b>Full Mark</b> : <i>60 Marks</i> <b>Exam</b> : <i>Final Exam</i>  <b>Examiner</b> : <i>Prof: Adel Abdel Masieh Saleeb</i>
--	---	---

**Answer all the following questions :**

**Question No 1 : Choose the right answer ( 20 Marks)**

- 1- The Sinc function is ..... (a) an energy signal (b) a power signal  
(c) an odd signal (d) a discrete signal
- 2- Almost all the periodic signals are ..... (a) energy signals (b) power signals  
(c) odd signals (d) discrete signals
- 3- The power of the signal  $z(t) = 2 \cos(3\pi t + 30^\circ) + 4 \sin(3\pi t + 30^\circ)$  is  
(a) 11 (b) 13 (c) 12 (d) 14
- 4- The signal  $y(t) = 2z(2t)$  is..... (a) expanded in amplitude  
(b) compressed in amplitude (c) expanded in time (d) compressed in time
- 5- When the signal  $z(t)$  becomes  $z(-t)$  it is ..... (a) reversed in time  
(b) reversed in frequency (c) reversed in amplitude (d) reversed in phase
- 6- The system  $y(t) = x(t) + x(t-1)$  is ..... (a) noncausal  
(b) causal (c) anti-causal (d) non of the above
- 7- The system  $y(t) = \sin[x(t)]$  is ..... (a) time variant  
(b) time reversal (c) time invariant (d) none of the above
- 8- The system  $y(n) = 2x(n) - 2x(n-1) + 0.5x(n-2)$  is..... (a) stable  
(b) not stable (c) critically stable (d) non of the above
- 9- The convolution of  $h(n) = \{1, 2, 1\}$  and  $x(n) = \{1, -1\}$  is ..... (a)  $\{1 \ 1 \ 0 \ 3\}$   
(b)  $\{0 \ 1 \ 1 \ 3\}$  (c)  $\{1 \ 1 \ 1 \ 0\}$  (d)  $\{1 \ 1 \ 1 \ 3\}$
- 10- The phase response of the system  $y(n) = x(n) - x(n-1)$  is .....  
(a)  $-\omega/2$  (b)  $\pi + \omega/2$  (c)  $(\pi - \omega)/2$  (d)  $\omega/2$

**Question No 2: ( 16 Marks)**

- 1- The filter  $y(n) = y(n-1) - 2y(n-2) + x(n)$  is .....  
(a) FIR (b) IIR (c) adaptive (d) non of the above
- 2- The transfer function of a LPF is  $H(s) = 1/(1+s)$ , the transfer function of the BSF is .....  
(a)  $s/(s+1)$  (b)  $BW/(s^2 + \Omega_m^2 + BW)$  (c)  $(s^2 + \Omega_m^2)/(s^2 + \Omega_m^2 + BW)$   
(d)  $(s^2 - \Omega)/(s^2 - \Omega_m^2 + BW)$

- 3- An IIR LPF with  $f_c=1000$  Hz and sampling frequency = 4000 Hz. The analog cut off frequency  $\Omega_c$  is ..... (a) 4000 (b) 6000 (c) 10000 (d) 8000
- 4- The transfer function of an FIR filter is  $H(z^{-1}) = 0.3 z^{-3} + 0.1z^{-5} + z^{-7}$ . The order of the filter is ....., and the length of the filter is ..... (a) 7, 8 (b) 6, 7 (c) 7, 6 (d) 8, 7
- 5- The transfer function of a filter is  $H(z^{-1}) = h(0) + h(1) z^{-1} + h(2) z^{-2} + h(3) z^{-3} + h(2) z^{-4} + h(1) z^{-5} + h(0) z^{-6}$ . The group delay is ..... (a) 2 samples (b) 3 samples (c) 4 samples (d) 5 samples
- 6- An FIR filter with order 7 and symmetrical coefficients. The phase response is ..... (a)  $3.5 \omega$  (b)  $4\omega$  (c)  $-3.5\omega$  (d)  $-4\omega$
- 7- Type III FIR filter with even order and anti-symmetric coefficients is suitable for designing ..... (a) BPF (b) LPF (c) BSF (d) non of the above
- 8- A LPF FIR filter with cut off frequency 1000 Hz and sampling frequency 8000 Hz, the impulse response is limited to 2.5 ms, the length of the filter is ..... (a) 18 (b) 19 (c) 20 (d) 21

**Question No 3 :**

**( 8 Marks)**

- (a) Show by diagram the components of the adaptive filter. (b) Explain how to use the adaptive filter to find the impulse response of an unknown linear system.

**Question No 4 :**

**(8 Marks)**

The transfer functions of two IIR filters are given by :

(a)  $H(z) = z (0.1z - 0.2) / (z^2 + z + 0.5)$  (b)  $5z / (z+1) + 2z / (z-2)$ .

Realize (a) using the cascade form and (b) using the parallel form.

**Question No 5 :**

**(8 Marks)**

The transfer function of an FIR filter is given by

$H(z) = h(0) + h(1) z^{-1} + h(2) z^{-2} + h(3) z^{-3} + h(4) z^{-4}$ , realize this filter using the polyphase form and find the transpose of the realization.