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**Question Paper Code: 56421**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2018

Sixth Semester

Electrical and Electronics Engineering

15UEC621 – SIGNAL PROCESSING

(Common to Electronics and Instrumentation Engineering)

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- For a system to be causal CO1- U  
(a)  $h(n) \neq 0$  for  $n < 0$     (b)  $h(n) = 0$  for  $n < 0$     (c)  $h(n) = 0$  for  $n \geq 0$     (d)  $\sum_{k=-\infty}^{\infty} |h(n)| < \infty$
- The system  $y(n) = x(2n)$  is CO1- App  
(a) Stable and non-causal    (b) Stable and causal    (c) Unstable    (d) Causal
- The z transform is a, CO2- R  
(a) finite series    (b) infinite power series  
(c) geometric series    (d) both a and c
- The direct evaluation of DFT requires \_\_\_ complex multiplications. CO2- R  
(a)  $N(N - 1)$     (b)  $N^2$     (c)  $N(N + 1)$     (d)  $N(N-1)/2$
- The direct evaluation DFT requires ----- complex multiplications CO3- R  
(a)  $N(N-1)$     (b)  $N^2$     (c)  $N(N+1)$     (d)  $\frac{N(N-1)}{2}$
- In DIT – FFT algorithm if M is the number of stages and m represents stage index then the number of sections of butterflies in each stage is CO3- R  
(a)  $2^{M+m}$     (b)  $2^{M-m}$     (c)  $2^{M-m/2}$     (d)  $2^{M-2m}$

7. In which window sequence, the width of the main-lobe can be adjusted by varying the length  $N$  of the window? CO4- R
- (a) Hamming                      (b) Hanning                      (c) Bartlett                      (d) Kaiser
8. In recursive realization of filter , the current output is a function of CO4-U
- (a) past outputs                      (b) past inputs                      (c) present inputs                      (d) all of the above
9. The factors affect the selection of DSP processor \_\_\_\_\_. CO5- R
- (a) Architectural features                      (b) Execution Speed  
(c) Arithmetic and word length                      (d) All of these
10. The addressing mode which makes use of in-direction pointers is CO5- R
- (a) Indirect addressing mode                      (b) 5 Index addressing mode and 7  
(c) Relative addressing mode                      (d) Offset addressing mode

PART – B (5 x 2= 10Marks)

11. What is linear time invariant system? CO1- R
12. Determine the convolution sum of two sequences  $x(n)=\{3,2,1,2\}$  and  $h(n) = \{1,2,1,2\}$  CO2- App
13. What is the disadvantage of direct computation of DFT? CO3- R
14. What are the various methods to design IIR filters? CO4- R
15. What types of memories are used in programmable DSP chips? CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) Check whether the following systems are linear, time – invariant, causal and stable system. CO1- App      (8)
- (a)  $y(n) = x(2n)$   
(b)  $y(n) = Ax(n)+B$   
(c)  $y(n) = e^{x(n)}$
- (ii) Determine whether the following signals are periodic or not. CO1- App      (8)  
If periodic find the fundamental period.
- (a)  $\cos (0.04\pi n)$   
(b)  $e^{j(\pi/3)n}$

Or

- (b) (i) Explain the process of quantization of discrete – time signals. CO1- U (8)
- (ii) Compute the Nyquist sampling frequency in rad/sec for the following signals. CO1- App (8)
- (a)  $x(t) = 3\cos 4t$
- (b)  $x(t) = 4\text{sinc}\left(\frac{3t}{\pi}\right)$
- (c)  $x(t) = \text{sinc}\left(\frac{4t}{\pi}\right) + \text{sinc}^2\left(\frac{3t}{\pi}\right)$
17. (a) (i) State and prove the convolution theorem of Z – transform. CO2- App (8)
- (ii) Find the inverse Z – transform of  $X(z) = \frac{z^3+z^2}{(z-1)(z-3)}$  CO2- App (8)
- ROC:  $|z| > 3$ .
- Or
- (b) Determine the unit step response of the system whose difference equation is CO2- Ana (16)
- $y(n) - 0.7y(n - 1) + 0.12y(n - 2) = x(n - 1) + x(n - 2)$
- If  $y(-1) = y(-2) = 1$ .
18. (a) Compute DFT using DIT-FFT algorithm CO3- Ana (16)
- $X(k) = \{0.5, 0.5, 0.5, 0.5, 1, 1, -1, -1\}$
- Or
- (b) Given  $x(n) = (1, 2, 3, 4, 4, 3, 2, 1)$  find  $X(K)$  using DIF FFT algorithm. CO3- Ana (16)
19. (a) Design a second order digital low pass Butterworth filter with a cut-off frequency 3.4 KHz at a sampling rate of 8 KHz using bilinear transformation. CO4- App (16)
- Or
- (b) Obtain cascade and parallel realization for the system having difference equation CO4- Ana (16)
- $y(n) + 0.1y(n-1) - 0.2y(n-2) = 3x(n) + 3.6x(n-1) + 0.6x(n-2)$
20. (a) (i) Explain the various addressing modes of C5x family with an example. CO5- U (10)
- (ii) Write note on VLIW architecture. CO5- U (6)
- Or
- (b) Discuss the features and architecture of TMS320C50 processor. CO5- U (16)

