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**Question Paper Code: 46424**

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

Sixth Semester

Electrical and Electronics Engineering

14UEC624 - APPLIED DIGITAL SIGNAL PROCESSING

(Regulation 2014)

(Common to EIE and ICE branches)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- A ramp signal has
  - Infinite energy and zero power
  - Infinite energy and infinite power
  - zero energy and zero power
  - zero energy and infinite power
- Integration of step signal results in \_\_\_\_\_ signal.
  - ramp
  - delta
  - Sinusoidal
  - triangular
- The LTIDT system with system function  $h(n)=a^n u(n)$  is stable, only if
  - $a>1$
  - $1/a<\infty$
  - $a<\infty$
  - $a<1$
- Convolution in time domain is equal to \_\_\_\_\_ in frequency domain.
  - addition
  - multiplication
  - compression
  - expansion
- \_\_\_\_\_ multiplications are required to compute N-point DFT using radix-2 FFT.
  - $N/2 \log_2 N / 2$
  - $N/2 \log_2 N$
  - $1/N \log_2 1/N$
  - $N \log_2 N$
- Compute the  $X(0)$  of the sequence  $x(n)=\{1, 0, 1, 0, 1, 0, 1, 0\}$ 
  - 8
  - 4
  - 2
  - 1

7. The condition for linear phase characteristic in FIR filter is, the impulse  $h(n)=$ \_\_\_\_\_ where N is the duration of the sequence.
- (a)  $h(n+N-1)$                       (b)  $h(N+1-n)$                       (c)  $h(N-1-n)$                       (d)  $h(n-N-1)$
8. When  $s=$ \_\_\_\_\_ LPF is converted to HPF in analog domain.
- (a)  $\frac{s}{\Omega_c}$                                       (b)  $\frac{\Omega_c}{s}$                                       (c)  $s\Omega_c$                                       (d)  $s^2$
9. The pipeline depth of TMS320C50 is
- (a) 6    (b) 4    (c) 2    (d) 0
10. The function of wait-state generator is
- (a) To insert wait-state in internal and external bus cycles  
 (b) To insert wait-state in data memory cycles  
 (c) To insert wait-state in program memory cycles  
 (d) To insert wait-state in external bus cycles

PART - B (5 x 2 = 10 Marks)

11. Check Whether the system  $y(t) = 3x^2(t) + 5$  is linear or not.
12. State and Prove Initial Value theorem of Z-transform.
13. What are the differences and similarities between DIF and DIT algorithms?
14. What is the necessary and sufficient condition for linear phase characteristic in FIR filter?
15. What is the operation blocks involved in C5x processors?

PART - C (5 x 16 = 80 Marks)

16. (a) Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invariant, Causal or Non-causal, Stable or unstable
- (i)  $y(t) = x(t - 2) + x(2 - t)$
- (ii)  $y[n] = x[-n]$ . (16)

Or

- (b) State and prove sampling theorem for low pass band limited signal and explain the process of reconstruction of the signal from its samples. (16)

17. (a) Solve  $y[k + 2] - 5y[k + 1] + 6y[k] = 3f[k + 1] + 5f[k]$  if the initial conditions are  $y[-1] = \frac{11}{6}$ ,  $y[-2] = \frac{37}{36}$ , and the input  $f[k] = (2)^{-k}u[k]$ . (16)

Or

- (b) State and prove the time shifting and convolution property of Z-transform. (16)

18. (a) Evaluate 8-point DFT of the following sequence using DIT-FFT

$$x[n]=\{ 2, 1, 2, 1, 1, 2, 1, 2\}. \quad (16)$$

Or

- (b) Derive the butterfly diagram of 8 point radix-2 decimation in frequency FFT algorithm. (16)

19. (a) Design a digital low-pass Butterworth IIR filter using bilinear z-transform with a 3dB cut-off frequency of 2kHz and minimum attenuation of 30dB at 4.25kHz for a sampling rate of 10kHz. (16)

Or

- (b) Realize the following transfer function in parallel and cascade form

$$H(z)= \frac{0.44z^{-1} + 0.362z^{-2} - 0.02z^{-3}}{(1+0.4z^{-1}+0.18z^{-2}-0.2z^{-3})}. \quad (16)$$

20. (a) With a neat block diagram explain in detail about the architecture of TMS320C50. (16)

Or

- (b) (i) Draw the block diagram of Harvard architecture of a DSP and explain its blocks. (8)

- (ii) Explain various addressing modes of TMS processor. (8)

