



M.E DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2014)

Second Semester

EMBEDDED SYSTEM TECHNOLOGIES

P14EST205: DSP for Embedded System

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Which of the following are true for the given system $y[n]+12y[n-1]=3x[n+1]$ is a [K₂]
 - i) Causal system.
 - ii) Non- causal system
 - iii) static system
 - iv) Dynamic system.
 - a) i) and iii) b) i) and iv)
 - c) ii) and iii) d) ii) and iv)

2. The discrete-time signal $x(n) = (-1)^n$ is periodic with fundamental period n as [K₂]
 - a) 8 b) 4
 - c) 0 d) 2

3. Given $X(z) = 2z^2 + 1 + z^{-1}$. [K₂]
 Assertion (A): ROC of $X(Z)$ is entire Z plane except $Z=0$ and $z=\infty$
 Reason (R): $X(Z)$ is a two sided sequence
 - a) Both A and R are correct and R is correct explanation of A b) Both A and R correct but R is not correct explanation of A
 - c) A is correct but R is wrong d) A is wrong but R is correct

4. Matching type item with multiple choice code [K₃]

List I	List II
A. $u(-n)$	i. $Z / 1-Z^{-1}$
B. $u(n)$	ii. $1 / 1-Z$
C. $u(n+1)$	iii. $Z / Z-1$
D. $u(n-1)$	iv. $1 / Z-1$

- iii) one 16-bit hardware MACs, one 40-bit ALU, and a 40-bit barrel shifter
- iv) one 16-bit hardware MACs, two 40-bit ALUs, and a 20-bit barrel shifter

Which of the above is true in a blackfin processor?

- a) (i) and (iii)
- b) Only iii)
- c) (i) and (iv)
- d) Only (iv)

PART B (10 x 2 = 20 Marks)

- 11. Check whether the signal $x(n) = 2\cos 3\pi n + 7\cos 9n$ is periodic or not. [K₃]
- 12. Compute the energy and power of $x(n)=0.5^n u(n)$ [K₂]
- 13. Determine the Z transform and ROC of $x(n)= 0.5 u(-n-1)$ [K₂]
- 14. Find the odd parts of the sequence where arrow indicates the origin [K₃]

$$x(n)=\{2,-1,3,4,5,2,8\}$$

If odd numbered sequence in x(n) alone is multiplied by -1 what is the Z transform of new sequence?

- 15. Compute the linear convolution of $x(n) = \{1, 1, 2, 1\}$ and $h(n) = \{1, 1, 1\}$. [K₂]
- 16. Compute the number of additions and multiplications required to calculate DFT by applying FFT for N=512. [K₃]
- 17. Differentiate the characteristics of Butterworth and chebyshev filter . [K₂]
- 18. What is the need for frequency warping in bilinear transformation? [K₂]
- 19. What is the role of MOST (Media Oriented Systems Transport) peripheral device in an automobile? [K₃]
- 20. Mention the function of SPI peripheral device. [K₁]

PART C (10 x 5 = 50 Marks)

- 21. For the impulse response listed below determine if the corresponding system is i) linear ii) causal iii) Time invariant [K₂]

 - a) $y(n) = x(n) \cos (x(n))$
 - b) $y(n) =x(-n+2)$
 - c) $y(n) =x(n) +n x (n+1)$

- 22. Explain the working of sample and hold circuit with neat diagram. [K₁]
- 23. Find the Z transform and ROC of $x(n) = \{r^n \cos w(n)\}u(n)$ [K₂]
- 24. Obtain the inverse Z transform of $X(z) = 1/(1+az^{-1})$ where a is a constant [K₃]

25. Find 4 point DFT using DIF-FFT algorithm of $x(n) = \{0,1,2,3\}$ [K₂]
26. Find the system function and impulse response of the system described by the differential equation [K₂]
 $Y(n) = x(n) + 2x(n-1) - 4x(n-2) + x(n-3)$
27. Obtain the Direct form II realizations of the system [K₂]
 $y(n) = \frac{3}{4}x(n-1) - \frac{1}{8}y(n-2) + x(n) + \frac{1}{3}x(n-1)$
28. Convert the following analog transfer function $H(s)$ into digital transfer function $H(Z)$ using impulse invariant technique [K₂]
 $H(s) = \frac{0.4(s+4)}{(s^2+2s+3)}$
29. Elucidate the function of DMA peripheral interface and CAN interface in black fin processor [K₁]
30. Discuss the role UART in serial communication of a black fin processor. [K₂]

PART D (2 x 10 = 20 Marks)

31. Evaluate the DFT using DIT –FFT algorithm for [K₂]
 $x(n) = \begin{cases} 1 & \text{for } 0 \leq n \leq 5 \\ 0 & \text{otherwise} \end{cases}$
32. Design the Butterworth filter for the system with the constraints [K₂]
 $0.8 \leq |H(e^{j\omega})| \leq 1, \quad 0 \leq \omega \leq 0.4\pi$
 $|H(e^{j\omega})| \leq 0.2, \quad 0.6\pi \leq \omega \leq \pi$
 Convert the system function into $H(z)$ using Bilinear transformation with $T = 1$ sec
