KUMARAGURU
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M.E DEGREE EXAMINATIONS: JUNE 2017

(Regulation 2015)

Second Semester

EMBEDDED SYSTEM TECHNOLOGIES

P15EST205**:** DSP for Embedded System

<u>COURSE OUTCOMES</u>

CO1: Learn the various types of signal and signal conversion techniques.

CO2: Acquire the knowledge of transformation of signal and analyze the spectrum.

CO3: Describe the architecture of DSP and design analog and digital filter circuits.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The system having input $x(n)$ related to output $y(n)$ as $y(n) = Ax(n^2-1)+B$ .Which of the following statements regarding the system is/are true?   CO1   [K_2]

     i)   Non linear

     ii)   Non-causal

     iii) Time invariant

a)   Both ii) and iii)   b)   Both i) and ii)

c)   Both i) and iii)   d)   Only i)

2. In an experiment a signal is first converted from analog to digital form. DSP processor is employed for computation. Then the signal is again converted into real world analog signal. Arrange the following procedure in appropriate sequence for performing the above task.   CO1   [K_2]

A .sample and hold circuit

B. R-2R conversion

C. flash type or successive approximation conversion

D. signal processing

a)   A,B,D,C   b)   A,C,D,B

c)   A,C,B,D   d)   A,D,C,B

3. The ROC of the signal $x(n) = n$ for $-5<n<5$ is/are :   CO2   [K_2]

  i) entire Z plane

  ii) entire Z plane except z=0

iii) entire Z plane except z=∞

 iv) 1

a)   Both i) and iii)   b)   Both i) and ii)

c)   Both ii) and iii)   d)   Only iv)

4.   Match the following systems with its Z transform   CO2   [K$_2$]

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

a)   A – i , B – iii , C- ii, D- iv   b)   A – i , B – iii , C- iv, D- ii

c)   A – iii , B – i , C- ii, D- iv   d)   A – iii , B – i , C- iv, D- ii

5.   The value of W_8^3 is

a)   0.707-j0.707   b)   -0.707+j0.707

c)   -0.707-j0.707   d)   0.707+j0.707

6.   Arrange in proper sequence the process involved in DIF- FFT computation :   CO2   [K$_1$]

A .Perform multiplication and addition operation

B. Multiply by the twiddle factor

C. Arrange numbers in bit reversal order

D. Divide by N

a)   A,B,C   b)   B,A,C

c)   A,B,D   d)   B,A,D

7.   Match the following filter design techniques with its properties   CO3   [K$_2$]

A. FIR filter design	i. employs order of the filter
B. IIR filter design	ii. windowing technique
C. Bilinear transformation	iii. one to one mapping
D. Impulse invariant	iv. Many to one mapping[1]

a)   A – i, B – ii , C- iii, D- iv   b)   A –ii , B – i , C- iii, D- iv

c)   A – i , B – ii , C- iv, D- iii   d)   A – ii , B – i , C- iv, D- iii

8.   Assertion (A) : Windowing technique is used to avoid gibb's oscillations   CO3   [K$_2$]

Reason (R) : Multiplying by window increases the number of coefficient of the filter

a)   Both A and R are correct and R is correct   b)   Both A and R correct but R is not

   explanation of A   correct explanation of A

c)   A is correct but R is wrong   d)   A is wrong but R is correct

9. Blackfin processor is a   CO3   [K_1]

    a) Analog DSP processor with RISC instruction set
    b) DSP processor with RISC instruction set

    c) Analog DSP processor with CISC instruction set
    d) DSP processor with CISC instruction set

10. The Real time is clocked by a frequency of _____ in the blackfin processor   CO3   [K_1]

    a) 64.42kHz
    b) 128.42kHz

    c) 32.76 kHz
    d) 256.76 kHz

PART B (10 x 2 = 20 Marks)

11. Define linear and non-linear system.   CO1   [K_1]

12. A discrete time signal is represented by x(n) = {-1,2,5 (at n=0) , -2, 3} . Express in Graphical form x(n) and x(-n).   CO1   [K_2]

13. State the properties of ROC.   CO1   [K_1]

14. State and prove the following properties of z-transform. i) Time shifting ii) Time reversal.   CO2   [K_2]

15. Differentiate DIT and DIF algorithm.   CO2   [K_2]

16. Find the values of twiddle factor WNk ,When N=8, k=2 and also for k=3.   CO2   [K_2]

17. Compare the characteristics of chebyshev and butterworth filer.   CO3   [K_1]

18. What is gibb's oscillation? How to overcome it?   CO3   [K_2]

19. What is the role of MOST (Media Oriented Systems Transport) peripheral device?   CO3   [K_2]

20. Mention the function of dynamic power management module.   CO3   [K_1]

PART C (6 x 5 = 30 Marks)

21. Determine the values of power and energy of the following signals. Find whether the signals are power signals or energy signals.   CO1   [K_2]

    $x(n) = (1/3)^n u(n)$

    $x(n) = \sin(n\pi/4)$

22. Find the linear and circular convolution of the following sequences   CO2   [K_2]
    x1(n)={1,2,-1,1}   x2(n)={1,0,1,1}

23. Find the inverse z-transform of $x(z) = (Z^2+Z) / ((Z-1)(Z-3))$, using Partial fraction method for ROC: z > 3.   CO2   [K_2]

24. Explain the procedure to compute the DFT using DIF- FFT algorithm and compute the DFT of x(n)={1,0,1,0}   CO3   [K_2]

25. Convert the following analog transfer function H(s) into digital transfer function H(Z) using impulse invariant technique (T=1 sec)   CO3   [K$_2$]

H(s)= (s+4) ∕ (s^2+7s+12)

26. Describe the function of watch dog timer in blackfin processor.   CO3   [K$_1$]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27. Determine if the system described by the following input-output equations are linear , causal ,time variant and dynamic   CO1   [K$_2$]

(i) y(n) = x(n) + (1 / (x(n-1))

(ii) y(n) = x (n^2)

(iii) y(n) = n x(n)

(iv) y(n) = log(x(n+1))

28. A discrete time system is defined by the differential equation.   CO2   [K$_3$]

y(n) - 12y(n-1) + 36 y(n-2) = x(n) - 2 x(n-1).

Determine the system function H(Z) and plot the pole zero pattern. Also find inverse Z transform of H(Z).

29. Compute the DFT for the sequence {1, 2, 0, 0, 0, 2, 1, 1} using radix -2 DIT- FFT algorithm.   CO2   [K$_2$]

30. A discrete system is described by the following equation. Realize in direct form-I and direct form-II.   y(n) -(3/4)y(n-1)+(1/8)y(n-2)=x(n)+(1/3)x(n-1).   CO3   [K$_3$]

31. Explain the architecture and various features of Blackfin Digital Signal Processor along with its general purpose I/O ports.   CO3   [K$_1$]

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