Register Number:……………..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV / DEC 2024

(Regulation 2018)

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U18EII6202**:** Digital Signal Processing and Deep Learning

COURSE OUTCOMES

CO1: Understand the characteristics of discrete-time signals and discrete systems
CO2: Analyse signal / system properties using mathematical tools
CO3: Apply and develop algorithms for digital systems
CO4: Illustrate efficient computation of DFT
CO5: Discuss advanced features and architecture of generic P-DSP
CO6: Design FIR and IIR filters

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

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1. Define sampling theorem.   CO1 [K_1]

2. Find the linear convolution of the sequences x(n) = {1,2,2,2} and h(n) = {1,2,3,4}   CO1 [K_2]

3. List the properties of ROC.   CO2 [K_1]

4. Interpret initial value and final value theorem of z transform   CO2 [K_2]

5. What is zero padding? Why is it needed?   CO3 [K_2]

6. How many multiplications and additions are required to compute 8-Point DFT using radix – 2 algorithms?   CO4 [K_2]

7. Illustrate the block diagram of modified Harvard architecture of DSP.   CO5 [K_2]

8. Outline about usage of block chain in DSP.   CO5 [K_2]

9. Distinguish between IIR and FIR filter   CO6 [K_2]

10. Define pre – warping. Why is it employed?   CO6 [K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Identify whether the following is energy or power signals.   8   CO1 [K_3]

    i. $x1(n)=(1/2)^n u(n)$

    ii. $x2(n)= \sin(\Pi n/6)$

b) Examine the following system & verify whether it is   8   CO1   [K_3]

     i.   Static or Dynamic

     ii.   Linear or non-linear

     iii.   Time variant or not

     iv.   Causal or not

y(n)=x(n)+nx(n-1)

12. a) Find inverse Z transform with ROC (i) $|z|>|1|$ (ii) $|z|<|1/3|$ (iii) $|1/3| < |z| < |1|$ 10   CO2   [K_3]

$$X(Z) = \frac{z}{3z^2 - 4z + 1}$$

b) Obtain Z-transform of the sequence $x[n]=(\frac{1}{2})^n\, u(n)$ 6   CO2   [K_3]

13. a) Summarize the properties of DFT   8   CO3   [K_2]

    b) Find 4 point DFT of the sequence x(n)={1,1,0,0}   8   CO3   [K_3]

14. Find the DFT of the sequence. x(n)= {1,2,2,1,1,2,2,1} using radix-2 DIT   16   CO4   [K_3]
algorithm. Calculate the no of addition & multiplication required for this
computation

15. a) Explain down sampling of the multirate system with an example.   12   CO5   [K_2]

    b) Discuss the importance of pipelining in DSP architecture   4   CO5   [K_2]

16. a) Change the given analog transfer function into a digital IIR filter using impulse   10   CO6   [K_3]
invariance method. (T=1Sec) $H(s) = \dfrac{s + 0.2}{(s + 0.2)^2 + 9}$

    b) Construct the linear phase structure of system for the following transfer function.   6   CO6   [K_3]

$H(z) = 1+1/3z^{-1}+1/4z^{-2}+1/4z^{-3}+1/3z^{-4}+z^{-5}$

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