Code No.: EC503PC	R20	H.T.No.			8	R						

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH–I–Semester End Examinations (Supply) – June - 2025
DIGITAL SIGNAL PROCESSING
(ECE)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks.

PART-A **(20 Marks)**

1.	a)	What is the necessary and sufficient condition on the impulse response for stability.	[2M]
	b)	Find the periodicity of the signal x(n) =sin (2πn / 3)+ cos (π n / 2).	[2M]
	c)	What are the properties of Twiddle factor.	[2M]
	d)	What are the advantages of FFT algorithm over direct computatio of DFT?	[2M]
	e)	Write the properties of the bilinear transformation.	[2M]
	f)	What are the limitations of impulse invariant mapping technique?	[2M]
	g)	What is Gibb's phenomenon?	[2M]
	h)	Compare Rectangular & Hamming window techniques.	[2M]
	i)	Differentiate between Round Off and Overflow Noise.	[2M]
	j)	How to prevent overflow in design of digital filters?	[2M]

PART-B **(50 Marks)**

2. Determine the Frequency response, Magnitude response and Phase response for the system given by the difference equation. [10M]

$$y(n) = -\frac{1}{2}y(n-1)+x(n) \; -\frac{1}{2}x(n-1) \quad \text{for } n\geq 0$$

OR

3. Check for following systems is linear, causal, time in variant, stable, static.
   a) $y(n) = x(n) \cos(x(n))$. [5M]
   b) $y(n) = x(n) + n\, x(n+1)$. [5M]

4. Find the 8 point DFT of the sequence x(n) = [1,2,3,4,4,3,2,1] using radix-2 DIT-FFT algorithm. [10M]

OR

5. Perform linear convolution for the input x(n) = [2,4,2,5,6,0,3,4,1,2,2,1] and Impulse response h(n)=[3,1,2],using Overlap add method. [10M]

6. Convert the analog filter H(s) = 0.5 (s+4) / (s+1)(s+2) using impulse invariant transformation. Consider T=0.31416 s [10M]

OR

7. For the constraints [10M]
   $0.8 \leq |H(e^{jw})| \leq 1,\ 0 \leq \omega \leq 0.2\pi$
   $|H(e^{jw})| \leq 0.2,\ 0.6\pi \leq \omega \leq \pi$ with T= 1 sec .
   Determine system function H(Z) for a Butterworth filter using Bilinear transformation.

8. Design Low pass filter with frequency response using Hanning window with N=7 [10M]

$$H_d(e^{j\omega}) = 1 \quad \text{for} \quad -\frac{\pi}{4} \le \omega \le \frac{\pi}{4}$$
$$= 0 \quad \text{for} \quad \frac{\pi}{4} \le |\omega| \le \pi$$

OR

9.a) Explain the principle and procedure for designing FIR filter using Hamming window [5M]
b) Compare FIR and IIR Digital Filters. [5M]

10.a) Explain zero input limit cycle oscillation. [5M]
b) How can overflow limit cycles be eliminated? [5M]

OR

11.a) Write a short note on Dead Band Effects. [5M]
b) Explain about Round Off noise in IIR filters. [5M]

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