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

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
III–B.TECH -I-Semester End Examinations (Supply) - December- 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 $0.5^n u[n]+(-0.5)^n u[n]$ response for stability?	[2M]
	b)	Find the period of x(n) = cos [2πn/5 +3].	[2M]
	c)	Define Twiddle factor.	[2M]
	d)	How many multiplications & additions are involved in radix-2 FFT?	[2M]
	e)	Compare Butterworth with chebychev filters.	[2M]
	f)	List any two properties of Butterworth filter.	[2M]
	g)	What is Gibb's phenomenon?	[2M]
	h)	Write the equation for Hamming window.	[2M]
	i)	Difference between Round Off and Overflow Noise.	[2M]
	j)	How to prevent overflow in design of digital filters?	[2M]

PART-B **(50 Marks)**

2. Find the Natural response of the system described by the difference equation y(n)-3y(n+4)+2y(n-3) = x(4n)-x(n-2) with initial conditions y(-1) = y(-2) =1 [10M]

OR

3. Check for following systems is linear, causal, time in variant, stable, static [10M]
   i) y(n) = x(n+3) cos (x(n+2))
   ii) y(n) =x(5n) +x (2n-1)

4. Compute the DFT of the given data x(n)= (0,1,2,3) [10M]

OR

5. Explain the FFT Algorithms (DIT, DIF) in detail. [10M]

6. Design a digital Butterworth filter satisfying the constraints using bilinear transformations [10M]
   $0.707 \le |H(\omega)| \le 1.0$; $0 \le \omega \le \pi/2$
   $|H(\omega)| \le 0.2$; $3\pi/4 \le \omega \le \pi$.

OR

7. Convert the analog filter with system function $H(s)=(s+0.1)/((s+0.1)^2 +5)$ into a digital IIR filter by means of the impulse invariance method. [10M]

8. Filter is given by $H_d(\omega) = \{ e^{-j3\omega}$; $-3\pi/4 \le \omega \le 3\pi/4$ [10M]
   0 ; otherwise }
   Determine $H(e^{j\omega})$ for M= 7 using HAMMING window.

OR

9. Compare FIR and IIR filter and Explain the principle and procedure for designing FIR filter using rectangular window. [10M]

10. What are limit cycles? Explain in detail about finite word length effects in digital filters. [10M]

OR

11. Sampling rate conversion by a Rational Factor I/D. [10M]

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