**18EI603**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | | | | | | | |
| **June, 2022** | | | | **Electronics and Instrumentation Engineering** | | | | | |
| **Sixth Semester** | | | | **Digital Signal Processing** | | | | | |
| **Time:** Three Hours | | | | | **Maximum: 5**0 Marks | | | | |
| *Answer Question No. 1 Compulsorily.* | | | | | | (10X1 = 10 Marks) | | | |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | | | | (4X10=40 Marks) | | | |
| 1. | a) | Compare Static and Dynamic Systems | | | | CO1 | |  |
|  | b) | Determine whether the given LTI system is causal or Non-causal?  h(n) = sin(nπ/2) | | | | CO1 | |  |
|  | c) | What is the ROC of a signal x(n) = δ(-n)? | | | | CO1 | |  |
|  | d) | Determine the number of complex multiplications required to find the 32-point DFT of a sequence using FFT algorithm. | | | | CO2 | |  |
|  | e) | If the DFT of x(n) is X(k) ={6, -2+j2, -2, -2-j2}. Find the DFT of x((-n))N? | | | | CO2 | |  |
|  | f) | What is Gibb’s Phenomenon in FIR filter design? | | | | CO1 | |  |
|  | g) | What are the advantages of FIR filters over IIR filters? | | | | CO3 | |  |
|  | h) | Realize the following FIR system with minimum number of multipliers.  H(z) = 2++ | | | | CO3 | |  |
|  | i) | What is the drawback of Impulse invariant Transformation Method? | | | | CO4 | |  |
|  | j) | What do you mean by Canonical form of Realization? | | | | CO4 | |  |
| **Unit - I** | | | | | | | | |
| 2. | a) | Determine whether the following system is Static, Linear, Time-invariant, Causal & Stable with appropriate test conditions.  y(n) = an x(n) + u(n+2) | | | | CO1 | **5M** | |
|  | b) | Determine the impulse response of the following causal system with difference equation y(n) = 0.6y(n-1) - 0.08y(n-2) + 2x(n) | | | | CO1 | **5M** | |
|  |  | **(OR)** | | | |  |  | |
| 3. | a) | Find the inverse z-transform of the function  X(z) = with ROC |Z| < 3 | | | | CO1 | **5M** | |
|  | b) | Consider an LTI system with system function  H(z) = with ROC |z| > 1   1. Is the system stable? 2. Determine the impulse response of the system | | | | CO1 | **5M** | |
| **Unit - II** | | | | | | | | |
| 4. | a) | Compute the DFT of the sequence x(n) = (-1) n for N = 4 and sketch its magnitude and phase spectrum. | | | | CO2 | **5M** | |
|  | b) | Determine the 8-point DFT of the following signal using radix-2 DIT FFT algorithm  x(n) = (2, 1, 3, 1, 4, 1, -2, -1) | | | | CO2 | **5M** | |
|  |  | **(OR)** | | | |  |  | |
| 5. | a) | State and Prove Circular convolution and Circular time shifting properties of DFT. | | | | CO2 | **5M** | |
|  | b) | Compute the inverse DFT of the function  X(k) = (20, -5.828-j2.414, 0, -0.172-j0.414, 0, -0.172+j0.414, 0, -5.828+j2.414) using radix-2 DIF FFT algorithm | | | | CO2 | **5M** | |
| **Unit - III** | | | | | | | | |
| 6. | a) | Derive the expression for frequency response of an FIR filter when the impulse response is symmetric & N is odd. | | | | CO3 | **5M** | |
|  | b) | Design a FIR LPF with a cutoff frequency of 2 KHz and sampling rate of 5 KHz with 7 samples using Hamming window. Also sketch the impulse response of the filter. | | | | CO3 | **5M** | |
|  |  | **(OR)** | | | |  |  | |
| 7. | a) | Compare various windows used in the windowing technique of FIR filter design. | | | | CO3 | **5M** | |
|  | b) | The desired response of a high pass filter is  H(ejω) = e-j3ω ; π/4 ≤ |ω| ≤ π  = 0 ; -π/4 ≤ ω ≤ π/4  Determine H(ejω) for N = 7 using Rectangular window. | | | | CO3 | **5M** | |
| **Unit - IV** | | | | | | | | |
| 8. | a) | For the analog transfer function H(s) = determine H(z) of the corresponding digital filter using impulse invariant method with T= 0.3 sec. | | | | CO4 | **5M** | |
|  | b) | Obtain cascade and parallel form realizations of the system with system function  H(z) = | | | | CO4 | **5M** | |
|  |  | **(OR)** | | | |  |  | |
| 9. | a) | Derive the relationship between s-plane poles and z-plane poles in impulse invariant method. | | | | CO4 | **5M** | |
|  | b) | Design a digital Butterworth filter that satisfies the following constraints using Bilinear transformation method with T= 1 sec.  0.707 ≤ H(ejω) ≤ 1 ; 0 ≤ ω ≤ π/2  H(ejω) ≤ 0.2; 3π/4 ≤ ω ≤ π | | | | CO4 | **5M** | |

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