CBCS SCHEME

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Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Signal Processing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find whether given signal is periodic or not.
$$x(n) = 3 \cos\left(\frac{4\pi n}{3} + \frac{\pi}{6}\right)$$
(10 Marks)

   b. $x(t) = \cos 4t + \sin \sqrt{6}\, t$, find whether the given signal is periodic or not. **(10 Marks)**

OR

2 a. Derive Continuous Time Period (T) and Discrete Time Period (N). **(10 Marks)**
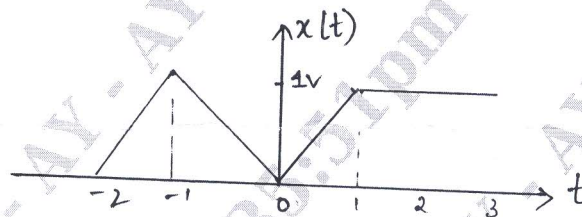   b. Sketch the even and odd components of the given signal x(t). (Refer Fig.Q.2(b)) **(10 Marks)**

Fig.Q.2(b)

Module-2

3 a. For the given signal x(n) = {0, 1, 5, 6} h(n) = {2, 2, 2} find output y(n) using convolution sum formula method. **(10 Marks)**
   b. Find y(t) for given signal x(t) = u(t + 1) and h(t) = u(t − 2). **(10 Marks)**

OR

4 a. Find y(t) for given signal
   x(t) = u(t − 2) − u(t − 4)
   h(t) = u(t + 1) − 2u(t − 1) + u(t − 3) **(10 Marks)**
   b. For the following s/m y(t), determine whether s/m is linear, Time Invariant, memory less, causal, stable.
   $y(t) = e^{x(t)}$ **(10 Marks)**

Module-3

5 a. The first fire point of 8 point DFT X(k) of real valued sequence are {0.25, 0.125-j0.3018, 0, 0.125-j0.518, 0}. Determine remaining three points. Estimate value of x(0). **(10 Marks)**
   b. For the given signal X(k) = {10, -2 + 2j, -2, -2-j2} find i) $x_1(n) = x((n + 2))_4$
   ii) $x_2(n) = x(4 − n)$. **(10 Marks)**

OR

6 a. Obtain 8pt DFT of following sequence using Radix-2 DIF-FFT algorithm. Show all results using signal flow graph $x(n) = \{2, 1, 2, 1\}$.   **(10 Marks)**

   b. For the signal,
       $x(n) = \{-2, +2, -2, +2, -2, +2, -1, +1, 0, 0, 5\}$
       $h(n) = \{0, -1\}$
       Find output signal $y(n)$ through overlap save method.   **(10 Marks)**

Module-4

7 a. Derive an expression for order and cut off frequency of Butterworth filter.   **(12 Marks)**

   b. For the given specification, pass band ripple $\leq$ 2db, stop band attenuation $\geq$ 20db pass band edge is 1 rad/sec. Stop band edge is 1.3 rad/sec. Find the order N and $\in$.   **(08 Marks)**

OR

8 a. Design the Chebyshev filter with following specification $A_p = 2.5\text{dB}$, $\Omega_p = 20$ rad/sec, $A_s = 30\text{dB}$, $\Omega_s = 50$ rad/sec.   **(14 Marks)**

   b. List out the difference between Butterworth filter and Chebyshev filer.   **(06 Marks)**

Module-5

9 a. Obtain direct form I and direct form II, cascade and parallel form realization for following system:
       $y(n) = 0.75\ y(n-1) - 0.125\ y(n-2) + 6x(n) + 7x\ (n-1) + x(n-2)$.   **(14 Marks)**

   b. Difference between FIR and IIR filters.   **(06 Marks)**

OR

10 a. Find the ladder and lattice coefficients for
        $$H(z) = \frac{0.5 + 0.32z^{-1} - 0.6z^{-2}}{1 + 0.8z^{-1} - 1.2z^{-2}}$$ **(12 Marks)**

    b. If $H(z) = 6 - 5z^{-1} - 2z^{-2} + z^{-3}$. Realize in cascade and draw the structure.   **(08 Marks)**

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