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G.R. No.	
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PAPER CODE	U221-243(ESE)
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May 2022 (ENDSEM) EXAM
T.Y. B. TECH. (SEMESTER - II)
COURSE NAME: Digital Signal Processing
COURSE CODE: ETUA32183
(PATTERN 2018)

Time: [1Hr]

[Max. Marks: 30]

(*) Instructions to candidates:

- 1) Figures to the right indicate full marks.
- 2) Use of scientific calculator is allowed
- 3) Use suitable data where ever required

Q.1 a) a) A digital filter has the following impulse response: [4]
 $h(n) = \{1, 2, 2, 1\}$. Is it linear phase filter? Justify.

b) Design LPF using frequency sampling method, [6]
Passband = 0- 5 KHz
 $F_s = 18\text{Ksamples/second}$
 $M=9$.

OR

b) Design BPF of unity gain to pass frequencies in the [6]
range $1 - 2 \text{ rad/sample}$ using Hanning window.
Take $M=5$. Draw direct form 1 filter structure.
 $w(n) = 0.5 - 0.5\cos((2\pi n)/(M-1))$

Q2 a) A digital filter with 3 dB bandwidth of 0.2π is to be [4]
designed from analog filter whose system response is

$$H(s) = \frac{\Omega_c}{s + \Omega_c}$$

Use bilinear transformation and compute $H(z)$.

- b) Design IIR LPF using BW approximation and bilinear transformation.

[6]

$$\begin{aligned} 0.9 \leq |H(\omega)| \leq 1 & \quad 0 \leq \omega \leq 0.5\pi \\ |H(\omega)| \leq 0.2 & \quad 0.75\pi \leq \omega \leq \pi \end{aligned}$$

Assume $T = 1$ sec.

OR

- b) Design and draw cascade and parallel realization of

$$H(z) = \frac{3z^2 + 3.6z - 0.6}{z^2 + 0.1z - 0.2}$$

[6]

Q.3

- a) STFT is to be calculated for a signal with 10000 samples. Frame size is 1000 and hop size is 500. Calculate number of frequency bins and number of frames required.

[4]

- b) Sketch the analysis filter bank of Haar wavelet and generate the approximation and detailed sequence from the original sequence given by $x[n] = \{4, 7, 10, 16, 14, 11, 3, -1\}$ using this analysis filter bank.

[6]

OR

- b) Sampling frequency is to be brought down by the factor of 96. The original sampling frequency is 96KHz. frequency of interest is 450 Hz. Pass band attenuation is 0.01 and stop band attenuation is 0.001. Design a two stage decimator with decimation factors 12 and 8 respectively.

[6]