

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3, EXAMINATIONS, DEC-2022

B.Tech-V Semester (ECE)

MAX. MARKS: 35

COURSE CODE (CREDITS): 18B11EC511 (4)

COURSE NAME: Principle of Digital Signal Processing

COURSE INSTRUCTORS: Dr. Sunil Datt Sharma

MAX. TIME: 2 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

- Q1. Calculate the filter order and cutoff frequency for the given specification of a Butterworth digital filter: 3 dB ripple in pass band: $0 \leq \omega \leq 0.2\pi$, and 25dB attenuation in stop band: $0.45\pi \leq \omega \leq \pi$ (Using bilinear transformation method) **[5 Marks, CO-3 &CO-5]**
- Q2. Converts the analog filter transfer function $H(s)$ into digital transfer function $H(z)$ using bilinear transformation, where $H(s) = \frac{2}{(s+3)^2} \cdot T=0.2$ s. **[03 Marks, CO-3 &CO-5]**
- Q3. Converts the analog IIR filter transfer function $H(s)$ into digital IIR filter transfer function $H(z)$ using impulse invariance method, where $H(s) = \frac{10}{s^2+7s+10}$, $T = 0.2$ Sec. **[05 Marks, CO-3 &CO-5]**
- Q4. Draw the direct form-II and cascaded structure of IIR digital $H(z) = \frac{1+0.3z^{-1}-0.6z^{-2}-0.7z^{-3}}{(1-0.2z^{-1})^3}$. Also, find out the number of delay elements, adders, and multipliers required for the cascaded and direct form-2 structure. **[05 Marks, CO-3 & CO-4]**
- Q5. Obtain the interpolated signal $y[n]$ by factor 2 for the given signal $x[n] = [1,1,1,1,1,1]$ **[03 Marks, CO-4]**
- Q6. If a sequence has $N=1000$ samples, then calculate the frequency resolution for the quality factor $Q=10$ of the following power spectral methods: **[04 Marks, CO-2]**
(i) Blackman-Tukey method, (ii) Bartlett method (iii) Welch method (50% overlap),
- Q7. Compute the 4-point IDFT of a sequence $x(n) = [2, 0, 2, 0]$ using radix-2 DIT FFT algorithm. **[05 Marks, CO-2]**
- Q8. Calculate the circular convolution of the sequences. $x(n) = [1, 1, 0, 1]$ and $y(n) = [1, 2, 2, 2]$. **[05 Marks, CO-1]**