JAYPEE UNIVERSITY OF INFORMATRION TECHNOLOGY, WAKNAGHAT

T-3, Examination, December, 2017

B.Tech, V Semester

COURSE CODE: 10B11EC512   MAX. MARKS: 35

COURSE NAME: Digital Signal Processing

COURSE CREDITS: 04   MAX. TIME: 2 HRs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q.1   Write the advantage and disadvantage of digital filter.   03

Q.2   If the Fourier transform of signal $x(n)$ is $X(w) = \frac{1}{1-ae^{-jw}}$, then find the Fourier   04
transform of the following signals:
(i) $x(2n + 1)$ (ii) $e^{(\pi n/2)}x(n + 2)$

Q.3   Find the output sequence of a system with impulse response $h(n) = \left(\frac{1}{2}\right)^n u(n)$, when the   04
input is complex exponential sequence $x(n) = Ae^{(j\pi n/2)}$.

Q.4   Realize the IIR digital filter
$$H(z) = \frac{1 + 0.3z^{-1} - 0.6z^{-2} - 0.7z^{-3}}{(1 + 0.2z^{-1})^3}$$ 06
Using (i) Direct form-II   (ii) Cascaded forms

Q.5   Converts an analog filter $H_a(s) = \frac{0.5(s + 4)}{(s + 1)(s + 2)}$ into digital filter H(z) using impulse   04
invariance method. Assume T=1 Sec.

Q.6   Design a low pass Butterworth IIR digital filter using bilinear transformation method for   07
following specification: $\alpha_s = 15dB$, $\alpha_p = 1.25dB$, $w_p = 200Hz$, $w_s = 300Hz$ $F_s = 2kHz$ and assume T=1 Sec.

Q.7   Design an FIR digital filter for the following specification: 07
pass band gain =1, cutoff frequency=850 Hz, sampling Frequency=5000Hz, filter length
N=5 and window function $w(n) = 0.54 - 0.46\left\{\cos\left(\frac{2\pi n}{N-1}\right)\right\}$, where $n = 0: M - 1$