JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2, EXAMINATIONS, DEC-2022

M.Tech-1 Semester (ECE-IOT)

COURSE CODE (CREDITS): 21M1WEC136 (3)   MAX. MARKS: 25

COURSE NAME: Intelligent Signal Processing

COURSE INSTRUCTORS: Dr. Sunil Datt Sharma   MAX. TIME: 1.5 Hour

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

Q1. If a sequence has N=1000 samples, then calculate the frequency resolution for the quality factor Q=10 of the following power spectral methods: (i) Blackman-Tukey method, (ii) Bartlett method, (iii) Welch method (50% overlap)   **[04 Marks, CO-1]**

Q2. Draw the discrete Fourier transform based magnitude spectrum of the signals $x_1(n) = \sin(2\pi 10n) + \sin(2\pi 20n) + \sin(2\pi 30n)$, and $x_2 = [\sin(2\pi 10n), \sin(2\pi 20n), \sin(2\pi 30n)$, and. Also, compare these spectrums and write your comment.   **[05 Marks, CO-2]**

Q3. Why do we need the time-frequency analysis techniques for signal processing? Justify your answer with an example.   **[03 Marks, CO-2, CO-3]**

Q4. Why do we need continuous wavelet transform (CWT) for signal processing instead of short-time Fourier transform? Justify your answer. Also, write the difference between CWT and discrete wavelet transform (DWT) other than discrete and continuous.   **[05 Marks, CO-2]**

Q5. Justify the usefulness of the short time Fourier transforms for spectrum hole sensing with an example? Also, write your comment for its importance to improve the spectrum utilization.

[05 Marks, CO-2,CO-3]

Q6. Justify the non stationary in the signal with the help of an example.   **[03 Marks, CO-2]**