

JK Lakshmipat University, Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2022
B. Tech. (EEE), Semester VI, 2021-22

Roll No.....

EE1115: Digital Signal Processing

Time: 3 hours

Max. Marks: 30

Instructions to students: Answer ALL questions

1. Do not write anything other than your roll number on question paper
2. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever required are an integral part of the answer
3. Use of programmable calculator, class lecture notes/handouts, etc., are not allowed
4. Assume suitable data wherever required and mention it clearly

Q. 1 (i) Using Fourier spectral equations and applying the Nyquist sampling rate, reconstruct a bandlimited discrete time signal from its samples. 4
(CO 1, 2 & 7)

(ii) Determine Nyquist rate for the signal $x(t) = 3\cos 50\pi t + 10\sin 300\pi t - \cos 100\pi t$

Q. 2 (i) Give an example each for energy and power signals 2
(CO 1 & 7)

(ii) Give one example each for 2-D and 3-D signals

Q. 3 (i) Determine the z transform of the anti-causal signal $x(n) = -a^n U(-n-1)$ Sketch the ROC condition. 4
(CO 2, 4 & 5)

(ii) For an LTI system, obtain a relationship between transfer function and difference equation using z transform analysis.

Q. 4 (i) Using the differentiation property, calculate the z transform of $x(n) = na^n U(n)$ 4
(CO 5)

(ii) Calculate the inverse z transform of $X(z) = e^{1/z} + e^z$

Q. 5 Compute the DFT of the sequence $x(n) = \begin{cases} 1/5, & -1 \leq n \leq 1 \\ 0, & \text{otherwise} \end{cases}$ 3
(CO 2 & 3)

Q. 6 Using appropriate equations, establish a relationship between DTFT and z transform 2
(CO 2, 3, 4 & 5)

Q. 7 Compute the DIT - FFT (using bit reversal), of $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ 8
(CO 3 & 7)

Q. 8 Design DF-2, parallel form, digital filter structure for $H(z) = \frac{(1 - z^{-1})}{(1 - 0.5z^{-1})(1 + 0.3z^{-1})}$ 3
(CO 6 & 7)
