Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Digital Signal Processing **Semester: V**
Program: B .Tech ASE AVE **Time : 03 hrs.**
Course Code: ECEG3040 **Max. Marks: 100**
Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1.	Find the even and odd components of the following signals: (a) $x(n)$= {5, 4, 3, 2,1} (b) $x(n)$={5, 4, 3, 2, 1}	**4**	**CO1**
Q2.	Check whether the following systems are causal or not: (a) $y(n) = \sin[x(n)]$ (b) $y(n) = x(-n)$	**4**	**CO1**
Q3.	List the advantages of Digital Signal Processing.	**4**	**CO2**
Q4.	Define twiddle factor.	**4**	**CO2**
Q5.	Find the DTFT of the sequences (a)x(n) = δ(n) (b) x(n) = u(n –4)+u(n+4)	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q6.	Determine whether the following systems are time-invariant or not (a) $y(n) = x(n/2)$ (b) $y(n) = x(n)$ (c)$y(n)= x^2 (n- 2)$ (d) $y(n) = x(n) + n\,x\,(n - 2)$	**10**	**CO2**
Q7.	Compute the circular convolution of the following sequences and compare it with linear convolution $x(n) = \{1, 2,2, -1\}$; $h(n) = \{1, 2, 3, 4\}$	**10**	**CO3**
Q8.	Consider a discrete-time LTI system with impulse response $h(n)= (1/2)^n u(n)$ Use Discrete Fourier transform to determine the response to the signal $x(n)= (3/4)^n u(n)$.	**10**	**CO3**
Q9.	(a)Write a Matlab Code to plot the standard signals ramp, sinusoidal and time shifted impulse by 5 units (b)Find the 4-point DFT of $x(n) = \{1, -2, 3, 2\}$.	**5+5**	**CO4**
	SECTION-C **(2Qx20M=40 Marks)**		
Q10.	(a)Find the inverse Z-Transform of $X(z) = \frac{z^{-1}}{3-4z^{-1}+z^{-2}}$, ROC lzl >1	**8+12**	**CO3**

	(b)Find the input $x(n)$ of the system if the impulse response $h(n)$ and the output $y(n)$ are given as: $h(n) = \{2, 2, 0, -1, 2\}$; $y(n) = \{2, -5, 2, 1, 6, -11, 6\}$		
Q11.	(a)Write a Matlab Code to obtain a reconstructed waveform from sampled signal with the sampling rate of 0.1sec with the number of samples as 10. (b)Find the 8-point DFT of $x(n) = \{1, 1, 0, 0, 1, 0, 1, 1\}$. Use the property of conjugate symmetry. (or) (c)Implement the decimation-in-frequency FFT algorithm of N-point DFT where $N = 8$. Also explain the steps involved in this algorithm. Draw the butterfly line diagram for 8-point FFT calculation and briefly explain. Use decimation-in-frequency algorithm. (d) Find the 4-point DFT of the sequence $x[n] = \{1, 2, 1, 3\}$ by (i) DIT FFT algorithm (ii) DIF FFT algorithm. Plot the magnitude and phase for the same.	**10+10**	**CO4**