UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B.Tech (EE) — **Semester – VI**
Subject (Course): Digital Signal Processing — **Max. Marks : 100**
Course Code : ELEG363 — **Duration : 3 Hrs**
No. of page/s: 02

S. No.		Marks	CO
	SECTION A		
Q 1	Discuss the need to truncate the impulse response of the ideal filter. What is the use of introducing delays in the impulse response of the ideal filter.	**5**	**CO4**
Q 2	Find the relation between Fourier transform and Z transform. Discuss the importance of a unit circle in Z domain	**5**	**CO4**
Q 3	Discuss the use of windowing. Compare the characteristics of the different window functions.	**5**	**CO2**
Q 4	Discuss stability of the system if the system has complex conjugate poles. Convert the analog filter with system function into a digital filter using bilinear transformation. The digital filter should have a resonant frequency of $\omega_r=\pi/2$. $$F(s)=\frac{3s}{(s+1)(s+3)}$$	**5**	**CO1**
	SECTION B		
Q 5	Use residue method to find Inverse Z transform of the following functions 1. $F(Z)=\frac{Z^2+3Z}{(Z-0.5)^3}$ 2. $F(Z)=\frac{1}{(Z+1)^2(Z-0.5)}$	**10**	**CO2**
Q 6	Design a low pass FIR filter that approximates $$H(f)=\begin{cases}1 \; for \; 0\le f\le 1000\,Hz \\ 0 \; Otherwise\end{cases}$$ The sampling frequency is 8000Hz. The impulse response duration is to be limited to 2.5mS. Plot resulting magnitude and phase response.	**10**	**CO3**
Q 7	Obtain the cascade and parallel realizations for the system function given by $H(Z)=[(1-1/2Z^{-1})]/[(1+1/8Z^{-1})(1+1/4Z^{-1})+1/6Z^{-2}]$	**10**	**CO1**
Q 8	Given x(n)=n+1 and N=8, find X(K) using Decimation in frequency fast Fourier	**10**	**CO3**

	transform(DIF FFT)		
	SECTION-C		
Q 9	Design an IIR Chebyshev Low pass filter using bilinear transformation method for satisfying the following constraints. Pass band cutoff frequency (f_p)=0-400Hz, Stop band cutoff frequency(f_s)=2.1 -4kHz, Pass band ripple (A_p)=2dB, Stop band attenuation ($A_{s)}$=40dB and sampling F=10kHz. **OR** Design a high pass filter for the given specifications α_p=3dB, α_s=15dB, Ω_P=1000 rad/sec and Ω_s=500rad/sec.	**20**	**CO4**
Q 10	Design a HPF with a frequency response $H_d(e^{jw})=\begin{cases} 1 \; for \; \pi/4 \le \vee W \vee \le \pi \\ 0 \; \lvert W \rvert \le \pi/4 \end{cases}$ Find h(n) and H(Z) for M=11 using (a) Hamming window (b) Hanning window and plot the magnitude response.	**20**	**CO3**