INTERNATIONAL CENTRE FOR APPLIED SCIENCES MAHE, MANIPAL B.Sc. (Applied Sciences) in Engg. Semester Theory Examinations – May 2021 –Repeaters -2018 Batch IV SEMESTER: SIGNALS AND SIGNAL PROCESSING [IEE 241] (BRANCH: CSE, E & E, MECHATRONICS)

Time: 3 Hours	Date: 20 May 2021	Max. Marks: 100
✓ Answer ANY 5 FULL	Questions.	
✓ Missing data, if any,	may be suitably assume.	



	(iv) Linear (v) Time invariant	
	y(n) = 2x(n)u(n)	10marks
3A	Find the response of the system $y(n)$ if the impulse response is $h(t) = u(t + 3)$ and the input is $x(t) = e^{-3t}$.	10marks
3B	Determine the Fourier Transform for the non-periodic signal $x(t)$ in Fig.3. Plot the spectrum of the signal $x(t)$.	
	$\begin{array}{c} x(t) \\ \hline \\ -1 \\ \hline \\ Fig.3 \end{array}$	
	-1	10marks
4A	A stable LTI system is specified by the frequency response $H(\omega) = \frac{1}{j\omega-2}$. Find the impulse response of the system if the input $x(t) = e^{-t}u(t)$.	6marks
4B	Using properties find the Fourier Transform of the following signals. a) $x(t) = e^{-t}u(t) + 2e^{-5 t }$ b) $x(t) = e^{-2(t-3)}u(t-3)$	4marks
4C	Find the inverse CTFT of $X(\omega) = \frac{j\omega+3}{(j\omega+1)^2}$.	10marks
5A	A first order discrete time system is characterized by the difference equation $y(n) = x(n) + 0.25y(n-1)$. Obtain the frequency response $H(\Omega)$ and plot the magnitude and phase response.	12marks
5B	Determine whether the following signals are periodic. If they are periodic find the fundamental period. (a) $r(t) = cos(6t) + sin(9t)$	
	(b) $x(n) = \cos\left(\frac{\pi n}{5}\right) \sin\left(\frac{\pi n}{3}\right)$	9marke
6A	What is sampling? Explain the Nyquist sampling theorem	omarks
		10marks
6B	Given the DTFS coefficients $X[k] = \cos \frac{4\pi k}{11} + 2j \sin \frac{6\pi k}{11}$. Find the time-domain signal.	10marks
7A	For the CTFT $X[j\omega] = \pi e^{- \omega }$, find the time-domain representation of the signal.	10marks
7B	Using the Z-transforms and inverse Z-transforms, find the frequency and impulse response of the DT-system described by the following difference equation y[n-2] + 5 y[n-1] + 6 y[n] = 18 x[n] + 8 x[n-1]	10marks

