MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

THIRD SEMESTER BTECH. (E & C) DEGREE PROCTORED ONLINE EXAMINATION
JANUARY 2022
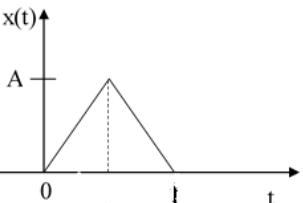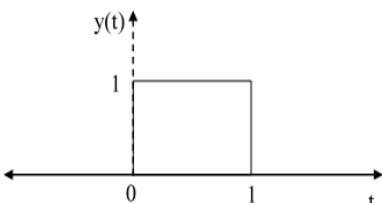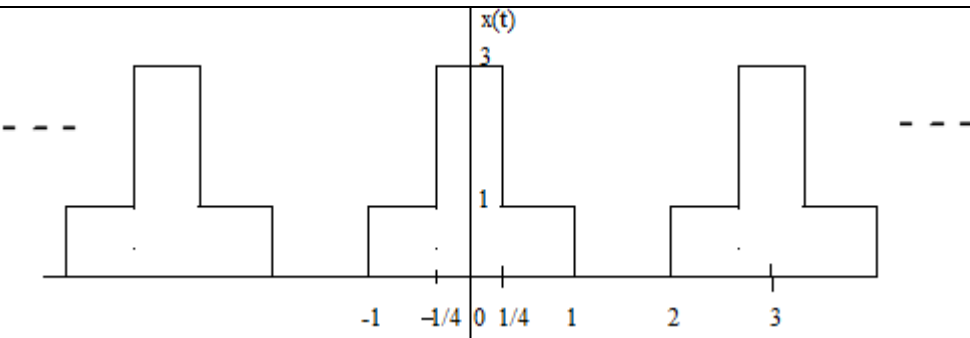### SUBJECT: SIGNALS AND SYSTEMS (ECE - 2155)

TIME: 75 min (9.20 AM to 10.35 AM)　　　　　　　　　　　　**MAX. MARKS: 20**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.
- Answer script must be a single pdf, good visibility of all texts and numbers.
- Name the file as: RegistrationNumber_SubjectCode_dd_JAN2022
- Upload correct pdf properly named well before 10.45 AM

Q. No.	Questions	M*	C*	A*	B*
1A	i) Using convolution sum, determine the output of causal 4-point moving averaging system if the input to the system is 10-length causal rectangular window sequence. ii) Using the relation between step response and impulse response, determine the step response of causal 4-point moving averaging system.	4	3		4
1B	Consider two signals x(t) and y(t) as shown below. i) Determine correlation r(τ) between x(t) and y(t) for $\tau \geq 0$ with A=1 ii) Sketch z(t) = $\sum_{k=1}^{3} y\left(\frac{t}{k}\right)$ and calculate the energy of z(t)	3	1		3, 4
1C	Is the signal x[n] = sin(πn/2).cos(πn/3) periodic? If so, determine the fundamental period. Find odd part of x[n].	3	1		1, 2
2A	The impulse response of an LTI system is given by $h(t) = cos(2\pi t)\left(\frac{sin(\pi t)}{\pi t}\right)$. Obtain and plot the frequency response. Determine the output of this system when the input is $x(t) = \sum_{m=-\infty}^{\infty}(-1)^m \delta(t-m)$.	4	3		3, 4
2B.	i) Using the defining equation, determine the appropriate Fourier representation of the following signal	3	2		3

ii) Use the table of transforms and properties, find the DTFT of

$$x[n] = n\left(\frac{1}{4}\right)^{n-3} \cos\left(\frac{\pi n}{4}\right) u[n-5]$$

| 2C. | Consider Z-transfer function $H(z) = \frac{z(z-1)}{\left(z+\frac{1}{2}\right)\left(z-\frac{1}{4}\right)}$. Determine the time domain signal x[n] such that it is causal and absolutely summable. Are there any other signals having same Z-transfer function? If so, determine all such signals. | 3 | 4 | | 2, 4 |

M*--Marks, C*--CLO, A*--AHEP LO, B* Blooms Taxonomy Level