Total No. of Questions – [ 6] Total No. of Printed Pages: 2

| G.R. No. | |
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paper code : U239-131B (ESE)

**DECEMBER 2019/20E NDSEM**
**S. Y. B.TECH. (E&TC) (SEMESTER –III)**
**COURSE NAME: Signals & Systems**
**COURSE CODE: ETUA21181**
**(PATTERN 2018)**

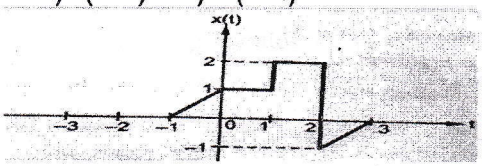
Time: [2 Hours] [Max. Marks: 50]

(*) Instructions to candidates:
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of scientific calculator is allowed.
4) Assume suitable data where ever required.

Q.1) Attempt any **one**

a) Find even and odd component of following signal 4
$x(t) = \cos(t) + \sin(t) + \sin(t)\cos(t)$

b) Carry out the following operations on signal shown in figure below with neat sketches: 4
i) $x(t-2)$ ii) $x(1-t)$




Q.2) Attempt any **one**

a) Determine if the following system described by 4
$y(t) = \sin[x(t+2)]$
is memory less, causal and linear

b) Determine if the following system described by 4
$y[n] = s[2-n]$
is causal, time invariant and stable

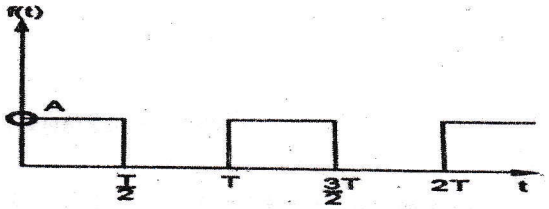
Q.3) Attempt any **one**

a) Evaluate continuous time convolution integral given below: 6
$y(t) = e^{-2t}\,u(t) * u(t+2)$

b) State and explain properties of convolution sum. 6

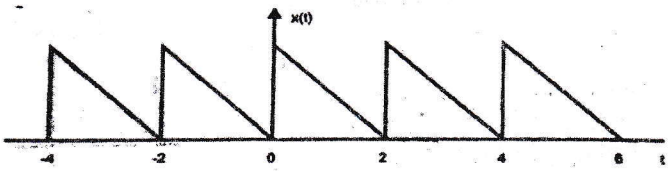
Q.4) Attempt any **one**

a) Find trigonometric Fourier series of the wave shown in figure below 6

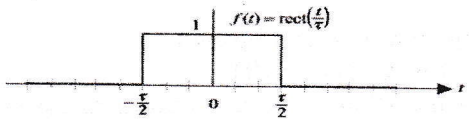



Explain how the knowledge of wave form symmetry is useful to reduce the labor work involved in calculation of Fourier series coefficients. 4

b) Find the exponential series for the wave form shown below 6




Calculate the CTFT of rectangular function given below 4




Q.5) Attempt any **one**

a) Find the inverse Laplace transform of the following 7

$X(s) = 2/(s+4)(s-1)$ if region of convergence is

1. Re(s) >1 2. Re(s)< -4

State and prove time differentiation and time shifting property of Laplace transform 6

b) What is ROC of Laplace transform? State its properties. 7

Find the Laplace transform X(s) and sketch the pole-zero plot with the ROC for the following signal.

$x(t) = e^{-4t}\,u(t) + e^{3t}\,u(-t)$

Find the output response of an LTI system with impulse response $h(t) = \delta(t-3)$ for input $x(t) = \cos 4t + \cos 7t$ 6

Q.6) Attempt any **one**

a) State properties of autocorrelation of CT power signal and prove any two properties. 7

Find cross-correlation of the following discrete time signal by graphical method: $x[n] = \{1,2,3,4\}$ $y[n] = \{3,2,1,0\}$ 6

b) For CT signal $x(t) = e^{-at}\,u(t)$, 7

find: (a)autocorrelation function(b)plot of autocorrelation and(c) ESD

Define Correlogram. Find correlogram of $\cos(\omega t)$ and $\sin(\omega t)$. Comment from diagram. 6