A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 94B04

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

Fourth Semester

Biomedical Engineering

19UBM404- SIGNALS AND SYSTEMS

(Regulation 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1.	Determine the even and odd parts of a complex exponential signal.	CO2-App
2.	Check whether the following signal is periodic or not. If periodic, determine the fundamental period x(t)=3cost+4cos(t/2)	CO2-App
3.	State and prove the Parseval's theorem in Fourier series.	CO1-U
4.	Write the Drichlet's conditions for existence of Fourier series.	CO1-U
5.	Derive the L.T. of the signal u(t)* u(t-1) using the convolution property.	CO3-App
6.	State the initial and final value theorem of the Laplace transform.	CO1-R
7.	State sampling Theorem.	CO1-R
8.	Determine the convolution sum of two sequences x(n) = {3, 2, 1, 2} and h(n) = {1, 2, 1, 2}	CO5-App
9.	Define ROC**.** Illustrate the Z-transform pair.	CO1-R
10.	Find the unilateral z-transform of $x(n) = \cos(\omega_o n)$.	CO4-App

PART – C (5 x 16= 80 Marks)

11.	(a)	Describe the properties of CT and DT systems in detail with neat sketch.	CO1- U	(8)

Or

(b) Check all the system properties for the given CO2- App (8)

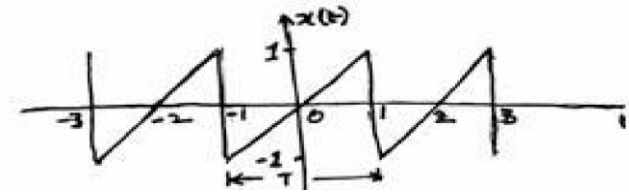
$(i)\ y(n) = x(n+1) - x(n-1)$

$(ii)\ \frac{dy(t)}{dt} + 5ty(t) = x(t)$

12. (a) Obtain the trigonometric Fourier series for the half wave rectified Cosine function. CO3- App (16)

Or

(b) Find the trigonometric Fourier series for the periodic signal x(t) shown in figure. CO3- App (16)



13. (a) An LTI system is defined by differential equation $\frac{d^2y(t)}{dt^2} - 4\frac{dy(t)}{dt} + 5y(t) = 5x(t)$. Find the response of the system y(t) using L.T. for an input x(t)=u(t) , if the initial conditions are *y(0)=1; y'(0)=2.* CO3- App (16)

Or

(b) Obtain the convolution of the given two signals using the convolution property of the Laplace transform and evaluate the results also with the conventional method of convolution. CO5- Ana (16)

$x(t) = e^{-3t}\,u(t)$ and $y(t) = e^{-2t}\,u(t)$

14. (a) A Causal system is represented by the following difference equation CO4- App (16)

$y(n) + \frac{1}{4}\,y(n-1) = x(n) + \frac{1}{2}\,x(n-1)$

Derive the system transfer function, the impulse response and frequency response of the system.

Or

(b) Consider a discrete time LTI system described by the difference equation CO4- App (16)

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = 2x(n)$$

$$x(n) = \left(\frac{1}{4}\right)^{n} u(n)$$

(a) Determine the frequency response of the system

(b) Find the impulse response of the system

(c) Determine its response to the input is .

15 (a) Determine the unit step response of the system whose difference equation is CO4- App (16)

y(n) - 0.7y(n-1) + 0.12y(n-2) = x(n-1) + x(n-2)

Or

(b) (i) Determine the inverse z-transform of $X(Z) = \frac{1 + 3z^{-1}}{(1 + 3z^{-1} + 2z^{-2})}$ for |z| > |3| CO4- App (8)

(ii) Find the z-transform and ROC of the anti causal sequence *x(n)* = {-3,-2,-1,0,1,2,1,-1,1} CO4- App (8)