KUMARAGURU college of technology
character is life

Register Number:……..

B.E DEGREE EXAMINATIONS: NOV/DEC 2016

(Regulation 2015)

Third Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U15ECT403: Signals and Systems

COURSE OUTCOMES

CO1: Categorize different types of signals
CO2: Distinguish different types of systems
CO3: Determine the Fourier series representations of periodic signals
CO4: Examine Continuous Time signals and system by using Fourier Transform
CO5: Analyze Discrete Time signals and systems by using DTFT and Z Transform
CO6: Explain sampling of continuous time signals

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match the following: CO1 [K_2]

List I	List II
A. cos $(2\pi f_c t)$	i. energy signal
B. Periodic signals	ii. odd signal
C. sin $(2\pi f_c t)$	iii. even signal
D. $x(n) = (-1)^n, -2 \leq n \leq 1$	iv. power signal

	A	B	C	D
a)	ii	iii	i	iv
b)	iii	i	iv	ii
c)	iii	iv	ii	i
d)	iv	iii	i	ii

2. $x(t) * \delta(t-5)$ is CO2 [K_3]

a) $x(t+5)$ b) $x(5)$

c) $x(t)$ d) $x(t-5)$

3. $h[n] = \delta(t), H(\omega) = ?$ CO2 [K_2]

a) 1 b) $\delta(\omega)$

c) o d) $\frac{1}{2\overline{n}}$

4. $If\ y[t] = 2a(t) + 3b(t)\ , y(\omega) is$_____ CO2 [$K_3$]

a) $a(\omega) * b(\omega)$ b) $Za(\omega)\ +\ 3b(\omega)$

c) $\frac{2\ a(\omega)}{3\ b(\omega)}$ d) $2a(\omega) - 3b(\omega)$

5. What is the dc component present in $x(t) = \sin(0.2\pi n)$? CO3 [K_2]

a) 0 b) 1

c) 0.2π d) 0.2

6. For a integrator, $h(t) =$ CO4 [K_2]

a) $\delta(t)$ b) $\sum_{k=-\infty}^{\infty} \delta(t-k)$

c) $u(t)$ d) t

7. If $x(t) \leftrightarrow X(j\omega)$, what is the Fourier transform of $x(t-7)$? CO4 [K_2]

a) $X(j\omega)e^{-j14\pi\omega}$ b) $X(j\omega)e^{-j7\pi\omega}$

c) $X(j\omega)e^{-j7\pi\omega}$ d) $X(j\omega)e^{j14\pi\omega}$

8. The Region of Convergence is the entire z plane for CO5 [K_3]

a) $x(t) = t$ b) $x(t) = \delta(t)$

c) $x(t) = \{1,2,4,5\}$ d) $x(t) = 5$

9. Assertion (A): For a causal and stable system all the poles lie inside the unit circle CO5 [K_2]
Reason (R): ROC does not contain any poles.

a) Both A and R are true and R is the correct explanation of A b) Both A and R are true and R is not the correct explanation of A

c) A is true but R is false d) A is false but R is true

10. The reconstruction filter for a sampled signal is a CO6 [K_2]

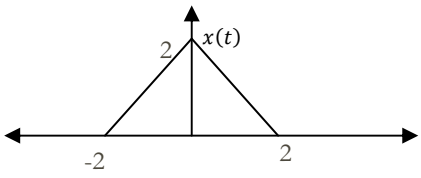
a) High pass filter b) equalizer

c) Band pass filter d) Low pass filter

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. Find the fundamental frequency of the signal $x(t) = 5\sin(24\pi t) + 7\sin(36\pi t)$. CO1 [$K_2$]

12. Consider the signal $x(t)$ shown in Figure. Sketch the signal $x(t)u(1-t)$. CO1 [K_2]



13. Find whether the following signals are energy or power signals: CO1 [K_2]

i) , ii)

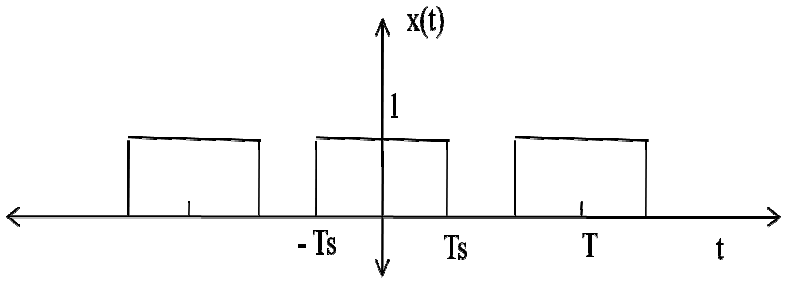
14.	Find the Fourier series coefficients of $x(t) = \sin(2t + \pi/4)$.	CO3	[K_2]
15.	Define Dirichlet's conditions for the existence of Fourier Transform.	CO4	[K_2]
16.	Find the FT of .	CO4	[K_2]
17.	Find the DTFT of	CO5	[K_2]
18.	Write the properties of Region of Convergence (ROC).	CO5	[K_2]
19.	Fine the z-transform of	CO5	[K_2]
20.	Determine the maximum bandwidth of the signal that can be sampled at the rate of 15,000 samples per second.	CO6	[K_2]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Find the inverse z-transform of the following using residue method.	CO5	[K_3]

22.	The impulse response of a certain system is . Find the output response of the system using convolution sum for the input .	CO2	[K_3]
23.	Determine the Fourier Series representation for the square wave given in the fig.	CO3	[K_3]



24.	A certain continuous linear time invariant system is described by the following differential equation —— Determine y(t), using FT for the following input signals: (8)	CO4	[K_3]

a)

b) $x(t) = 10u(t)$

c) $x(t) = \delta(t)$

25. i) Using long division method, find the inverse Z-transform of the $X(z) = \frac{4z}{z^2-3z+2}, ROC: |z| > 2$ (7) CO5 [K_3]

ii) State and prove any three properties of Discrete Time Fourier Transform (7)

26. ii) A discrete time LTI system is characterized by the difference equation CO5 [K_3]

$y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = 2x[n]$.

i) Find the system function H[z].

ii) Find the impulse response h[n]

iii) Find the output of the system for the input x[n]=$\left(\frac{1}{4}\right)^n u[n]$

Find whether the system is stable and causal.

27. i) State and prove sampling theorem (10) CO6 [K_2]

ii) Draw the spectrum of sampled $x(t) = \cos(2\pi 2000t)$, when it is samples at the rate 4000 samples per second. (4)

****