KUMARAGURU
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B.E DEGREE EXAMINATIONS:MAY2017

(Regulation 2015)

Fourth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U15ECT403-Signals and Systems

COURSE OUTCOMES

CO1: Understand different types of signals- continuous and discrete, odd and even, periodic and aperiodic etc.

CO2: Analyze continuous time signals and systems by using appropriate mathematical toolslike Fourier Transform.

CO3: Analyze sampling process and sampling of discrete time signals

CO4: Analyze discrete time signals and systems by using appropriate mathematical tools likeFourier Transform.

CO5: Utilize standard signals such as sine, ramp, exponential to characterize systems

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code   CO3   [K$_2$]

List I	List II
A. Continuous and aperiodic signal	i. Fourier representation is continuous and aperiodic
B.Continuous and periodic signal	ii.Fourier representation is discrete and aperiodic
C.Discrete and aperiodic signal	iii. Fourier representation is continuous and periodic
D. Discrete and periodic signal	iv.Fourier representation is continuous and periodic

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

2. $u(t-a)=0$, if   CO1   [K$_3$]

a) $t-a=0$ b) $t-a<0$

c) $t-a>0$ d) $t>a$

3. Which among the following are the stable discrete time systems?   CO1 [K$_2$]

   1. y(n) = x(4n)
   2. y(n) = x(-n)
   3. y(n) = ax (n) + 8
   4. y(n) = cos x(n)

   a) 1,3   b) 2,4

   c) 1,3,4   d) 1,2,3,4

4. The trigonometric Fourier series representation of and odd number consists of   CO2 [K$_2$]

   a) Cosine terms only   b) Sine terms only

   c) Both cosine and sine terms   d) Neither cosine nor sine terms

5. Which among the below assertions is precise in accordance to the effect of time scaling   CO2 [K$_2$]

   Inverse relationship exists between the time and frequency domain representation of signal

   B : A signal must be necessarily limited in time as well as frequency domains

   a) A is true & B is false   A is false & B is true

   c) Both A & B are true   Both A & B are false

6. Which property of periodic signal in DTFS gets completely clarified / identified by the   CO4 [K$_2$]
   equation x (n – n0)?

   a) Conjugation   b) Time Shifting

   c) Frequency Shifting   d) Time Reversal

7. When is the system said to be causal as well as stable in accordance to pole/zero of ROC   CO5 [K$_2$]
   specified by system transfer function?

   a) Only if all the poles of system transfer   b) Only if all the poles of system transfer
       function lie in left-half of S-plane   function lie in right-half of S-plane
   c) Only if all the poles of system transfer   d) if all the poles of system transfer
       function lie at the Centre of S-plane   function lie in both halves of S-plane

8. Which one is the ROC of a sequence x(n)=a^{n}u(n)-b^{n}u(-n-1), where a>b?   CO5 [K$_3$]

   a) $|z| > a$ b) $|z| < b$

   c) $b < |z| < a$ d) none

9. Which among the following assertions represents a necessary condition for the existence of   CO4 [K$_2$]
   Fourier Transform of discrete time signal (DTFT)?

   a) Discrete Time Signal should be   b) Discrete Time Signal should be
       absolutely summable   absolutely multipliable

   c) Discrete Time Signal should be   d) Discrete Time Signal should be
       absolutely integrable   absolutely differentiable

10. A signal of maximum frequency 20kHz is sample at Nyquist rate. The time interval between two successive samples is   CO3 [K$_3$]

   a) 25µs   b) 2.5µs

   c) 50µs   d) 20ms

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

11. Compare CT and DT signal.   CO1 [K$_2$]
12. Check whether x(n) = Sin(n) + Cos(n) is odd or even signal.   CO1 [K$_3$]
13. Find the Fourier transform of unit impulse signal.   CO2 [K$_3$]
14. Mention the time scaling property of Fourier transform.   CO2 [K$_2$]
15. Find the DTFT of x(n) = {1, -1, 2, -2}   CO4 [K$_3$]
16. How will you check the stability of the DT system?   CO4 [K$_2$]
17. What is sampling?   CO3 [K$_1$]
18. Explain Nyquist rate and Nyquist interval?   CO3 [K$_1$]
19. Find the Z-transform of x(n) = a^{n}u(n)   CO5 [K$_3$]
20. Plot poles and zeros if H(z) = z/(z-0.5)   CO5 [K$_4$]

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

Q.No. 21 is Compulsory

21. Explain the various standard CT signals and the different operations on CT signals with examples.   CO1 [K$_3$]

22. If y(t) = Cos(x(t)), check for linearity, time invariance, causality and stability.   CO2 [K$_4$]

23. Find the Fourier transform of (i) x(t) = A Sin(2*pi*fc*t)u(t) and   (7+7) CO2 [K$_3$]
    (ii) x(t) = A Cos(2*pi*fc*t)u(t)

24. State and prove the following properties of DTFT — CO4 [K4]
    i) Convolution property
    ii) Time shift property
    iii) Linearity property
    iv) Multiplication property.

25. i) State and prove Sampling Theroem. (7) — CO3 [K4]

    ii)A signal x(t) = 2 cos 400πt + 6 cos 640πt is ideally sampled at f_s= 500 Hz. If the (7) sampled signal is passed through an ideal low pass filter with a cut-off frequency of 400 Hz, what frequency components will appear in the output? Sketch the output wave form. Also find the output signal

26. Prove that the sequences (8) — CO5 [K4]

    i) x(n) = a^nu(n) and (b) x(n) = -a^nu(-n-1) have the same X(z) and differ only in ROC. Also plot their ROCs.

    ii) An LTI system is described by: (6)

    y(n-2) -5y(n-1)+6y(n)=x(n)

    Determine the h(n).

27. Using a long Division, determine the inverse Z-transform of — CO5 [K3]

$$\frac{z^3+z+2}{z^3-2z^2+3z+4}; \text{ROC}; |z| < 1$$

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