B.SC.ELECTRONICS
Third Semester
SIGNAL AND SYSTEMS
(BSE-13)

Duration: 3Hrs.

Full Marks: 70

Part-A (Objective) =20
Part-B (Descriptive) =50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

Answer any *five* of the following questions

1. (a) Define system. What are the different types of system?

(b) Define convolution. Find the convolution of the following signals.

$$i)\ x_1(t) = e^{-2t}\ u(t);\ x_2(t) = e^{-4t}\ u(t)$$

$$ii)\ x_1(t) = t\ u(t);\ x_2(t) = t\ u(t)$$

4+6

2. (a) Write short notes on (any two)

    i)   linear time invariant (LTI) system

    ii) discrete time system

    iii) unit step function

    iv) unit pulse function.

(b) Explain any two properties of LTI systems.

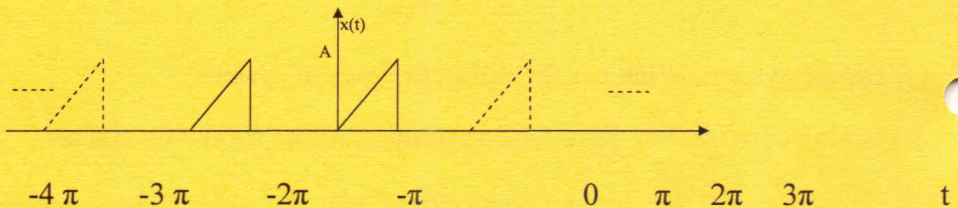**6+4**

3. (a) Define signal. Classify elementary signals.

(b) Explain with mathematical expression the unit ramp function.

6+4

4. (a) What is Fourier series? Write the mathematical expression of trigonometric form of

F.S. indicating values of coefficients.

(b) Obtain the trigonometric Fourier Series for the waveform shown in figure below

| -4π | -3π | -2π | -π | 0 | π | 2π | 3π | t |

5+5

5. (a) What are the types of symmetry that may be present in a waveform? Explain even

symmetry.

(b) State different properties of continuous time Fourier transform.

6+4

6. (a) State different properties of continuous time Fourier transform.

(b) Define exponential form of Fourier series. Derive the expressions for its coefficients.

5+5

7. (a) Define Laplace transform. Find the Laplace the transform of

$$i)\ f(t)=\cos at \qquad\qquad ii)\ f(t)=t$$

(b) Find

$$(i)\ \xi^{-1}\left\{\frac{3}{(s-2)^2+3^2}\right\} \qquad (ii)\ \xi^{-1}\left\{\frac{2(s+1)}{(s+1)^2+3^2}\right\}$$

5+5

8. (a) Find the Laplace's transform of

$$a)\ (6\sin 3t-4\cos 5t) \qquad b)\ (2\cosh 2\theta-\sinh 3\theta)$$

(b) Define periodic and aperiodic signals. What are the even and odd functions?

6+4

****

B.SC.ELECTRONICS
Third Semester
SIGNAL AND SYSTEMS
(BSE-13)

Duration: 20 minutes   **Marks – 20**

(PART A - Objective Type)

I. Choose the correct answer: 1×20=20

1. A signal can be represented by
        a) time domain   b) frequency domain
        c) both a) and b)   d)none of the above.

2. The fundamental period of a continuous- time complex exponential signal is T_0 =
        a) 2π b) $\frac{2\pi}{\omega_0}$

        c) T d) $2\pi\omega_0$.

3. $u(t-a) = 0,$ if
        a) $(t-a) = 0$ b) $(t-a) \langle 0$
        c) $(t-a) \rangle 0$ d) $t \rangle a$.

4. Signals can be classified as
        a) continuous- time signal   b) discrete- time signal
        c) both a) and b)   d) none of the above.

5. For the Fourier series $f(x) = a_0 + \sum\limits_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx),$ value of a_0 is

        a) $a_0 = \int\limits_{-\pi}^{+\pi} f(x)\,dx$ b) $a_0 = \frac{1}{2\pi}\int\limits_{-\pi}^{+\pi} f(x)\,dx$

        c) $a_0 = \frac{1}{\pi}\int\limits_{-\pi}^{+\pi} f(x)\,dx$ d) none of the above.

6. Laplace transform of the function $f(t)$ is defined by
        a) $\int_0^{\infty} e^{-st} f(t)\,dt$ b) $\int_0^{\infty} e^{st} f(t)\,dt$
        c) $\int_0^{\infty} e^{t} f(t)\,dt$ d) both a) and b).

7. If $f(t) = 1$, Laplace transform of $f(t)$ i.e. $\zeta\{1\} =$

    a) 1 b) $\dfrac{1}{s}$ c) s d) zero.

8. A function is $y = f(x)$ is said to be even if

    a) $f(x) = -f(x)$ b) $f(-x) = f(x)$

    c) $f(x) = f(x)$ d) all of the above.

9. $y = \sin x$ is a

    a) even function   b) odd function

    c) both a) and b)   d) none of the above.

10. Discrete time-signals can be represented by

    a) graphical representation   b) tabular representation

    c) functional representation   d) all of the above.

11. If a signal depends on only one independent variable, it is called a signal of

    a) one dimension   b) two dimension

    c) dimensionless   d) both a) and b).

12. Unit step function can be obtained by............. the unit impulse function

    a) integrating   b) differentiating

    c) both a) and b)   d) dividing.

13. A signal which cannot be represented by a mathematical equation is called a

    a) periodic signal   b) random signal

    c) continuous signal   d) both a) and b).

14. A system is a

    a) physical device   b) mathematical model

    c) linear model   d) ideal device.

15. A causal system is one whose output depends on .... values on input

    a) present and past   b) present and future

    c) present   d) all of the above.

16. Dynamic systems are also called as ....system

    a) memory   b) memory less

    c) stable   d) unstable.

17. A system is an entity that acts on an ....signal and transforms it into an......
signal

        a) input, output   b) output, input
        c) input, input   d) output, output.

18. Like signals, systems may also be divided as

        a) continuous- time systems   b) discrete- time systems
        c) both a) and b)   d) variable systems.

19. The capacitor c in time domain becomes......... in s domain

        a) $\frac{1}{Cs}$ b) $\frac{1}{s}$ c) $\frac{1}{C}$ d) s.

20. The inductor L in time domain becomes .... in s domain

        a) Ls b) $\frac{1}{Ls}$ c) $\frac{1}{L}$ d) $\frac{1}{s}$.

****