

**B.Tech. SEM -III Electronics / Bio Medical / E & TC) 2014 Course
(CBCS) : WINTER - 2018**

SUBJECT : SIGNALS AND SYSTEMS

Day : Wednesday
Date : 28/11/2018

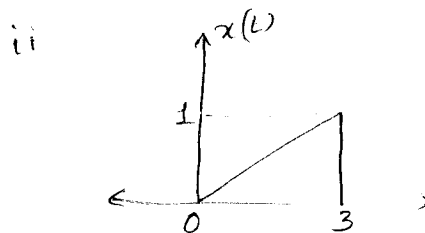
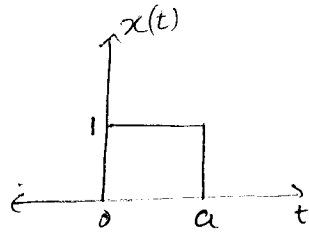
W-2018-2302

Time : 10.00 AM TO 01.00 PM
Max. Marks : 60

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labeled diagram **WHEREVER** necessary.
- 4) Assume suitable data, if necessary.

Q.1 a) Sketch even and odd parts of the following signals: (06)



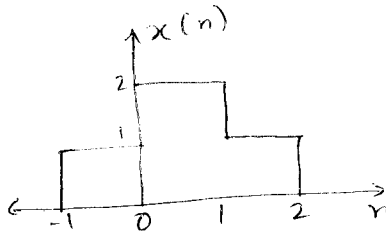
b) Determine the fundamental period of the following signals: (04)

- i. $x(t) = 2 \cos(10t + 1) - \sin(4t - 1)$
- ii. $x(n) = 1 + e^{j4\pi n/7} - e^{j2\pi n/5}$

OR

a) Prove that $\delta(at) = \frac{1}{|a|} \delta(t)$. (06)

b) If $x(n)$ is given as below, find $x(-n)$, $x(\frac{3}{2}n - 1)$, $x(2 - n)$. (04)



Q.2 a) Find $y(n) = x(n) * h(n)$, by graphical method where $x(n) = \{7, 3, 4, 1\}$ and $h(n) = \{1, 4, 2\}$. (07)

b) Draw the block diagram representation of causal LTI system given as (03)

$$x(t) = \frac{dy(t)}{dt} + 3y(t).$$

OR

a) Which of the following system is static, linear, causal and time invariant: (08)

- i. $y(t) = x(t^2)$
- ii. $y(t) = x^2(t)$
- iii. $y(n) = 3^n u(-n + 10)$
- iv. $y(t) = t^2 x(t)$

b) What is stability and time invariance? (02)

P. T. O.

- Q.3 a)** Find the Fourier constant a_0 for the continuous time signal, defined as (06)
- $$x(t) = kt \quad \text{for } 0 \leq t \leq \frac{T}{2}$$
- $$= k(T-t) \quad \text{for } \frac{T}{2} \leq t \leq T$$

- b)** For Fourier Transform, state and prove Parseval's Theorem. (04)

OR

- a)** Find the IFT of $X(j\omega) = \frac{1}{(4+j\omega)^2}$ using convolution property. (05)

- b)** Elaborate how complex exponential signal respond to LTI system. (05)

- Q.4 a)** Find Inverse LT of $\frac{1}{s^2(s^2-a^2)}$ using convolution theorem. (07)

- b)** What the types of ROC? Explain in brief (03)

OR

- a)** Find the Laplace Transform of $x(t) = e^{-5t}u(t) + e^{-\beta t}u(t)$ and draw ROC. (07)

- b)** If $x(t)$ and $X(s)$ are Laplace Transform pair, find Laplace Transform of $\frac{1}{t}x(t)$. (03)

- Q.5 a)** Determine the Z-transform and sketch the ROC of following signals (08)

i. $x(n) = -0.4^n u(n-1)$

ii. $x(n) = 0.4^{|n|}$

- b)** If $Z\{x(n)\}=X(z)$, then find $Z\{x^*(n)\}$. (02)

OR

- a)** Using residual method, find $x(n)$, if (07)

$$X(z) = \frac{(1 - e^{-a})z}{(z - 1)(z - e^{-a})}$$

- b)** Determine Z-transform and ROC of $x(n)=\{1,3,5,6\}$. (03)

- Q.6 a)** Find the R_{xy} by graphical method if $x(n)=\{1,2,3\}$ and $y(n)=\{1,4,2\}$. (08)

- b)** State the sampling theorem. (02)

OR

- a)** What is ESD? Prove autocorrelation and ESD are Fourier Transform pair. (05)

- b)** State and prove properties of correlation. (05)

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