

**B.TECH SEM - III (2007 COURSE) (BIOMEDICAL ENGG.) :**  
**SUMMER - 2018**  
**SUBJECT: SIGNALS & SYSTEMS**

Day: **Thursday**  
Date: **24/05/2018**

**S-2018-2594**

Time: **02.30 PM TO 05.30 PM**  
Max. Marks: 80

**N.B.:**

- 1) **Q. No. 1 and Q. No. 5** are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SPEARATE** answer book.
- 4) Use of non programmable **CALCULATOR** is allowed.

**SECTION -I**

- Q.1 a)** Find and sketch the even and odd parts of  $x(n) = u(n) - u(n-4)$  **(06)**
- b)** Define the time invariant system. Also give one example. **(04)**
- c)** Obtain Fourier Transform of  $x(t) = \delta(t)$  **(04)**
- Q.2 a)** Prove the following: **(07)**
- i) The power of the energy signal is zero over infinite time
  - ii) The energy of the power signal is infinite over infinite time.
- b)** Draw the waveforms represented by following functions **(06)**
- i)  $f_1(t) = (t-1)u(t-1)$
  - ii)  $f_2(t) = -(t-2)u(t-2)$
  - iii)  $f_3(t) = f_1(t) + f_2(t)$
- Q.3 a)** Determine whether the following discrete time systems are linear or non-linear. **(06)**
- i)  $y(n) = x(n^2)$
  - ii)  $y(n) = x^2(n)$
- b)** Determine if the following system described by  $y(n) = x(2-n)$  is memory less, causal, linear, time invariant, stable. **(07)**
- Q.4 a)** State and prove following properties of Fourier transform. **(07)**
- i) Multiplication in time domain
  - ii) Integration in time domain
- b)** Determine the Laplace transform and ROC of **(06)**
- $$x(t) = 3e^{-2t}u(t) - 2e^{-t}u(t)$$

**P. T. O.**

## SECTION-II

- Q.5** a) Compute auto correlation of the following signal (06)  
 $x(n) = \{2, 3, 1, 4\}$   
          ↑
- b) Define probability. Explain conditional and joint probability. (05)
- c) What is mean /average or expected value of a random variable? How it is calculated for continuous and discrete random variable? (03)
- Q.6** a) Define cross correlation function for energy signals and state and prove all its properties. (06)
- b) State and prove sampling theorem in time domain. (07)
- Q.7** a) From a well shuffled pack of cards three cards are drawn at random. Find the probability that they form a King, Queen, Jack combination. (07)
- b) What is PDF? Define and prove the properties of PDF. (06)
- Q.8** a) Find the mean, standard deviation, variance of the X, uniformly distributed between  $0 \leq x \leq 2$  where X is a random variable. (06)
- b) Compare various probability models on the basis of their PDF, CDF, and mean and variance values. (07)

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