

**B.TECH. SEM -III ELECTRONICS / BIO MEDICAL / E & TC) 2014**  
**COURSE (CBCS) : WINTER - 2017**  
**SUBJECT: SIGNALS AND SYSTEMS**

Day: **Wednesday**  
 Date: **17/01/2018**

**W-2017-2038**

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) Use of non-programmable **CALCULATOR** allowed.
- 4) Assume suitable data wherever necessary.

- Q.1** Determine the energy of the following signal. **(10)**  
 $x(t) = e^{-2t} u(t)$  Is  $x(t)$  an energy signal or a power signal?
- OR**
- Q.1** Is  $e^{j\omega n}$  always a periodic signal? Justify your answer. **(10)**
- Q.2** Find the convolution of  $x(t)$  and  $h(t)$  where **(10)**  
 $x(t) = u(t)$   
 $h(t) = e^{-2t} u(t)$
- OR**
- Q.2** Prove the commutative property of convolution **(10)**
- Q.3** Draw  $x(t)$  and find the Fourier transform of **(10)**  
 $x(t) = u(t+1/2) - u(t-1/2)$
- OR**
- Q.3** If  $x(t)$  and  $X(f)$  Form Fourier transform pair, what is the Fourier transform **(10)**  
 of  $x(at)$
- Q.4** Find the Laplace transform and the ROC for **(10)**  
 $x(t) = e^{-t} u(t) + te^{-2t} u(t)$  .
- OR**
- Q.4** Given that  $x(t)$  and  $X(s)$  are Laplace transform pairs, prove that **(10)**  
 $-tx(t) \leftrightarrow \frac{d}{ds} X(s)$  form Laplace transform pair.
- Q.5** Find the  $z$  - transform and the ROC, **(10)**  
 $x[n] = (\frac{1}{2})^n u[n] + n (\frac{1}{3})^n u[n] \quad |z| > 1/2$  .
- OR**
- Q.5** Find the inverse  $z$ - transform of **(10)**  

$$H(z) = \frac{\frac{1}{6}z}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)}, |z| > 1/2$$
- Q.6** Prove the following relation about the autocorrelation function **(10)**  
 $|R_x(\tau)| \leq E$   
 where  $E$  is the energy of the signal.
- OR**
- Q.6** What is the purpose of the antialiasing filter? How is it used? **(10)**

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