

**SUBJECT CODE:- 449**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**T.E.(EC/ECT/IEC/E&C) Examination Nov/Dec 2015**  
**Digital Signal Processing**  
**(Revised)**

[Time: Three Hours]

[Max. Marks: 80]

“Please check whether you have got the right question paper.”

N.B i) Answer any three questions from each section.

ii) Q. No. 1 and Q No.6 is compulsory.

iii) Assume suitable data, if necessary.

**Section A**

- Q.1 Solve any five 10
- Write a formula for convolution of DT signal.
  - What is correlation?
  - What is ROC?
  - What is relation between & Fourier transform?
  - What is DFT?
  - Write a formula for calculation of DIT FFT butterfly structure.
  - Define system.
- Q.2 08
- Draw block diagram of digital processing system & explain its advantages and disadvantages.
  - Find auto-correlation of  $x(n)=\{1, 3, 4, 2\}$  07
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- Q.3 08
- Find z transform of
    - $x(n)=n.2^n u(n)$
    - $x(n)=n u (n-u)$
  - State and prove any two properties of z transform. 07
- Q.4 10
- What is meant by FFT? Give its application. And find DFT of following sequence using DIT radix-2 FFT algorithm.  
 $X(n)=\{1, 1, 1, 1, 0, 0, 0, 0\}$
  - Find inverse DFT of 05  
 $X(k)=\{17, -3, -2j, -3, -3+2j\}$
- Q.5 06
- Compare circular & linear convolution.
  - Find output of system using z transform having input  $x(n)=3^n u(n)$  and impulse response 09
- $$h(n) = \left(\frac{1}{2}\right)^n u(n)$$

**Section-B**

- Q.6 Solve any five 10
- What do you mean by finite impulse response filter?
  - State any two properties of IIR filter.
  - Write condition for symmetric linear phase FIR filter.
  - What are ideal filter requirement?
  - What is truncating error?
  - What is recursive system?

- g) What is quantization error?
- Q.7 a) Explain method of bilinear transformation for design of IIR filter. 07  
 b) Convert the analog filter into digital filter whose system function is 08  

$$H(s) = \frac{s+0.2}{(s+0.2)^2+9} \quad Ts = 1 \text{ sec}$$
 using impulse invariant
- Q.8 a) Explain frequency sampling method for design of FIR filter. 07  
 b) Design high pass FIR filter of length using handing window with cut off frequency 1 rad/sec. 08
- Q.9 a) Explain limit cycles oscillation in recursive system. 07  
 b) Explain quantization error in computation of DFT. 08
- Q.10 a) Explain Gibb's phenomenon. 05  
 b) Design second under digital low pass Butterworth filter with cut-off frequency 1 KHz and sampling frequency  $10^4$  sample/sec using bilinear transformation method. 10