(c) Determine the inverse z-transform of the following $x(z)$ using partial fraction expansion method if signal is causal : **6**

$$x(z) = \frac{z+2}{2z^2 - 7z + 3}$$

5. (a) Using time shifting property, determine the inverse z-transform of signal $x(z) = \frac{z^{-1}}{1-3z^{-1}}$ of signal is causal. **4**

(b) What are characteristics of Ideal digital filters ? How are these different than practical one ? **6**

(c) Why different types of window functions are used in FIR filters design ? Why not only ractangular window is used ? Discuss desirable features of any window function for FIR filters design. **10**

6. (a) Write down design steps for IIR digital filter. **6**

(b) What is Finite word length effects in DSP ? What are its consequences ? Explain. **14**

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B. Tech. EXAMINATION, May 2017

(Seventh Semester)

(Old Scheme) (Re-appear Only)

(EE-EEE-ECE)

ECE-407(NEW)/EE-407 (OLD)

DIGITAL SIGNAL PROCESSING

Time : 3 *Hours*] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt any *Five* questions.

1. (a) Define unit impulse and unit step function. Show how unit step function can be obtained from unit impulse function. **5**

(b) With suitable example distinguish a deterministic signal from a random signal. **5**

(c) Check whether the given signal in power signal or energy signal and find its value : **10**

$$x(n) = \begin{cases} 3(-1)^n, & n \geq 0 \\ 0, & n < 0 \end{cases}$$

2. (a) State the necessary and sufficient conditions for the existence of the Fourier series representation for a signal. **5**

(b) For each of these discrete-time systems, determine whether or not the system in linear, time-invariant, causal and stable : **8**

(i) $y(n) = nx(n)$

(ii) $y(n) = x^3(n)$

(c) Explain causality and stability of a linear-time invariant system. **7**

3. (a) For analog sinusoidal signal $x(t) = 3\sin(100\pi t)$:

(i) sketch the signal $x(t)$ for $0 \leq t \leq 30\ ms$

(ii) obtain nyquist rate

(iii) Determine frequency of discrete time signal $x(n)$ obtained after sampling $x(t)$ with sampling rate Fs = 300 samples/sec. Write expression of $x(n)$ also.

(b) Explain the process of reconstruction of the signal from its samples. Obtain impulse response of an ideal reconstruction filter. **8**

4. (a) Explain with block diagram, the discrete-time processing of continuous-time signals. Why is it required ? **9**

(b) Define *z*-transform of a signal and its ROC. What do you mean by bilateral and unilateral *z*-transforms ? **5**

7. (a) State and prove backward difference methods for IIR filter design. State its draw back if any. **8**

(b) Convert the analog filter with system function : **12**

$$H_a(s) = \frac{s + 0.1}{(s + 0.1)^2 + 16}$$

into a digital IIR filter by means of the bilinear transformation. The digital filter into have a resonant frequency of w_r = $\pi/2$. **12**

8. (a) What is Multirate signal processing ? **6**

(b) Explain decimation process with block diagram. Write I/O equations in time and frequency domain clearly. **14**

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