Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

IV SEMESTER B.S. DEGREE EXAMINATION – APRIL/ MAY 2017

SUBJECT: SIGNAL ANALYSIS AND TELEMETRY (BM 241)

(BRANCH: BM)

Saturday, 29 April 2017

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1A. Find whether or not the following systems is stable:

a) $y(n) = x^2(n)$ b) $x(n) = \cos x(n)$ c) $x(n) = \dfrac{e^{x(n)}}{x(n-1)}$

1B. Explain with an example the following properties of systems.

a) Invertibility b) Dynamic c) Causality d) Shift invariance

1C. i) Find the even and odd parts of the signal $x(n) = \alpha^n u(n)$.

ii) Sketch the sequence $x(n) = 1$; n=0, = 2; n=1, = 3; n=2 and =0; elsewhere as a function of scaled and shifted unit steps.

(6+8+6)

2A. Find the discrete-time fourier coefficients for

$$x(n) = 1 + \cos\left(\frac{2\pi}{N}\right)n + 2\cos\left(\frac{4\pi}{N}n + \frac{\pi}{3}\right) + 4\cos\left(\frac{6\pi}{N}n + \frac{\pi}{4}\right)$$

2B. Determine the inverse discrete time fourier transform of

$$X(e^{j\omega}) = \frac{\frac{2}{3}e^{-j\omega} + 5}{1 + \frac{5}{6}e^{-j\omega} + \frac{1}{6}e^{-j2\omega}}$$

2C.Compute the output for a discrete time linear shift invariant system whose impulse response $h(n)$ and the input $x(n)$ are given by,

$h(n) = \alpha^n u(n)$ $x(n) = u(n)$ **(6+8+6)**

3A. What do you mean by Sampling theorem? How useful is the theorem in reconstructing the original signal?

3B. Using appropriate properties, find the z-transform of the following:

a) $x(n) = (3)2^n u(n)$ b) $x(n) = \left(\frac{1}{2}\right)^n u(n) * \left(\frac{1}{3}\right)^n u(n)$

3C. Describe the following properties of discrete time fourier transform with proof.

a) Difference in time b) Convolution c) Differentiation in frequency **(6+8+6)**

4A. Using the power series expansion method, determine the inverse z-transform of

$$X(z) = \frac{1}{1-1.5z^{-1}+0.5z^{-2}}; \ |z| > 1$$

4B. Provide proof for the following properties of z-transform:

(a) Time shift (b) Time reversal (c) Differentiation in frequency

4C. Explain the following terms:

a) Continuous and discrete signals
b) Even and odd signals
c) Deterministic and random signals **(6+8+6)**

5A. The antenna current of an AM transmitter modulated to a depth of 40% by an audio sinewave is 12 A. It increases to 14 A as a result of simultaneous modulation by another audio sinewave. What is the modulation index? Mention the need for modulation.

5B. Derive an expression for the power in the amplitude modulated wave. Draw the waveform of the amplitude modulated double side band full carrier wave.

5C.How the FM signal is generated using the parameter variation method? **(6+8+6)**

6A. What do you mean by square law modulation? Provide neat block schematic with mathematical expressions.

6B. Define Bio-telemetry? Describe with a block diagram the Bio-telemetry system.

6C. How does Carson's rule estimate the FM bandwidth? **(6+8+6)**

7A. Explain the indirect method of FM generation with neat circuit diagram.

7B. With a neat block schematic and waveforms, describe the detection of pulse time modulation signals.

7C. Discuss in detail the applications of bio-telemetry in the field of healthcare. **(6+8+6)**

8A. Explain the PCM transmitter with a block diagram.

8B. Describe the following terms with respect to human studies and applications:
(a) Hazardous environments (b) Care of critically ill **(8+12)**