JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-2 EXAMINATION- APRIL - 2018
B. Tech (IVth Semester) (CSE/IT)

COURSE CODE: 10B11EC301   MAX. MARKS: 25

COURSE NAME: SIGNALS & SYSTEMS

COURSE CREDITS: 04   MAX. TIME:1.5 HR

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. Marks are indicated below each question

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Q1. Define deterministic and random signals with the help of examples.   [2]   CO1

Q2. Determine the total response of the system described by following 2nd order differential equation   [3]   CO2

$$(D^2 + 4D + 3)y(t) = (3D + 5)x(t)$$

when the input to the system is $x(t) = 10\,e^{-2t}$ u(t). The initial conditions are $y(0) = 3, y'(0) = -7$.

Q3. **(a)** What are the limitations of Fourier series?   [1]   CO3

(b) Prove the time shifting property of continuous-time Fourier series.   [2]

(c) A continuous-time periodic signal $x(t)$ is real valued and has a fundamental period $T = 6$. The non-zero Fourier series coefficients of $x(t)$ are $a_1 = a_{-1} = 4$, $a_3 = a_{-3}^* = 2j$. Express the $x(t)$ in the form of $x(t) = \sum_{k=0}^{\infty} A_k \cos(w_k t + \varphi_k)$.   [2.5]

Q4. **(a)** Write the Dirichlet conditions for continuous-time Fourier transform.   [1.5]   CO3

(b) Prove the convolution property of discrete-time Fourier transform.   [2.5]

(c) Show that the Fourier transform of a train of impulses of unit amplitude separated by $T\,sec$ is also a train of impulses of amplitude $\frac{1}{T}$ separated by $w_0 = \frac{2\pi}{T}$.   [2.5]

Q5. **(a)** Determine the Fourier transform of the following signals   CO3

   i. $x(t) = e^{-|t-1|}$ [2.5]

   ii. $x[n] = 3^n \cos\left(\frac{\pi n}{6}\right) u[n]$ [2.5]

(b) Consider a causal & stable LTI system, defined by following difference equation

$$y[n] = \frac{1}{6}y[n-1] - \frac{5}{6}y[n-2] + x[n]$$

   i. Determine the frequency response of the system.   [1.5]

   ii. Determine the impulse response of the system.   [1.5]