

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST - 1 EXAMINATION – FEBRUARY 2020

B.TECH IV SEMESTER (ECE)

COURSE CODE: 18B11EC412

MAX. MARKS: 15

COURSE NAME: FUNDAMENTALS OF SIGNALS AND SYSTEMS

COURSE CREDITS: 04

MAX. TIME: 1Hr.

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

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| 1(a). | Sketch the following signals: | [CO-1] | 1 |
| | (i) $u(t-5) - u(t-7)$ | | |
| | (ii) $t^2[u(t-1) - u(t-2)]$ | | |
| (b). | Simplify the following expressions: | [CO-1] | 1 |
| | (i) $\left(\frac{\sin t}{t^2+2}\right)\delta(t)$ | | |
| | (ii) $[e^{-t}\cos(3t - 60^\circ)]\delta(t)$ | | |
| (c). | Evaluate the following integrals | [CO-1] | 1 |
| | (i) $\int_{-1}^1 (3t^2 + 1)\delta(t)dt$ | | |
| | (ii) $\int_{-\infty}^{\infty} (t^2 + \cos\pi t)\delta(t - 1)dt$ | | |
| (d). | Determine whether or not each of the following signals is periodic.
If signal is periodic, determine its fundamental period. | [CO-1] | 1 |
| | (i) $x(t) = \sin^2 t$ (ii) $x(t) = \cos t + \sin\sqrt{2} t$ | | |
| (e). | Determine whether the following are causal or non-causal systems | [CO-1] | 1 |
| | (i) $y(t) = x^2(t-1)$ (ii) $y(t) = x(t+5)$ | | |
| 2(a). | Determine the convolution of a function $f(t)$ with a unit impulse. | [CO-2] | 1 |
| (b). | Explain how causality restrictions on both signals and systems
simplify the limits of integration in equation | [CO-2] | 2 |

$$y(t) = f(t) * h(t) = \int_{-\infty}^{\infty} f(\tau)h(t - \tau)d\tau$$

- (c). Using direct integration, find $e^{-at}u(t)*e^{-bt}u(t)$ for $t \geq 0$ and $t < 0$ [CO-2] 2
- 3(a). Summarize the steps for graphical convolution. [CO-2] 1
- (b). Compute $y(t) = u(t)*u(t)$ for $t < 0$ and $t \geq 0$. Show all graphical steps of convolution. [CO-2] 2
- (c). Find $y_0(t)$, the zero input component of the response for an LTI system [CO-2] 2
described by the following differential equation:
 $(D^2 + 5D + 6)y(t) = Df(t)$
 When the initial condition are $y_0(0) = 0$, $y_0'(0) = -8$