EE1101 – Signals and Systems – Jan - May 2017

End Semester Examination

Name:	**Section**: KJ | UK | DV | VV **Roll**:

Instructions; Use pen only; For the objective type questions, answer on the question paper itself; Return the question paper along with your answer script.

1 Objective type questions [20]

1. Starting with $f(t)$, we are to arrive at $f(at-b)$ by shifting and scaling. We can either scale by _____ and then shift by _____, or shift by _____ and then scale by _____. [2]

2. A function $f(t)$ is non-zero only on $t = [2, 3)$, linearly decreasing from 1 at $t = 2$ to 0 at $t = 3$. Express this function in terms of functions $t, u(t)$ or their shifted/scaled versions: _____ [2]

3. Given that a smooth function $\phi(t)$ has $\phi(0) = 2$, the value of $\int_{-\infty}^{-1} \phi(t)\delta(t)dt$ is _____. [1]

4. The function $f(t) = \alpha \exp(-\alpha t)$ approaches a dirac delta function $\delta(t)$, if (circle the correct answer(s)): (a) $\alpha \to 0$, (b) $\alpha \to \infty$, (c) $t \to \infty$, (d) none of the above. [1]

5. They system $y(t) = \exp(x(t))$ is BIBO stable/unstable, and the output to an input $x(t) = tu(t)$ is bounded/unbounded. (Circle the correct answers) [1]

6. The discrete signal $x[n] = cos(2\pi f n)$ is periodic if f is _____. [1]

7. For a memoryless LTI system, the ratio between $y(t)$ and $x(t)$ is: (a) constant, (b) time-dependent, (c) requires more information to be provided, (d) $\delta(t)$. (circle the correct answer(s))[1]

8. For a complex Fourier series to represent a real signal, the condition on the Fourier series coefficient is _____. [1]

9. The periodic function $x(t) = \ln(t)$ defined over a period $0 < t \leq 1$, does not have Fourier series representation because it does not satisfy the specific condition of _____. [1]

10. If an audio signal is connected across a series R-C circuit and the output is taken across the resistor, which frequencies are enhanced?
    (a) Low, (b) High, (c) All equally enhanced, (d) All equally suppressed. [1]

11. If $X(j\omega) \longleftrightarrow x(t)$ denotes a Fourier pair, then complete the following Fourier pair: $\frac{dX(j(\omega-\omega_o))}{d\omega} \longleftrightarrow$ _____. [1]

12. The ideal low pass filter with cut-off ω_c has impulse response $h(t) =$ _____. This is not realizable because _____. [2]

13. For $x(t) = -\exp(-at)u(-t)$ and $a > 0$, the Fourier transform of $x(t)$ exists/doesn't exist (circle the correct answer). If it exists, it is _____, and if not, this is why: _____ [2].

14. Given a transfer function $H(s) = s/[(s+a)(s+b)]$, with $a > 0 > b$, of the three possible ROCs for this function, which of them is causal? _____. [1]

15. In solving a n^{th} order ordinary differential equation initial value problem, the number of initial conditions required is: (a) 1, (b) n, (c) $n-1$, (d) n^2. [1]

16. Consider the bilateral Laplace transform of $x(t)$ to be $X(s)$, which is known to be a rational function, with poles and zeroes strictly in the left half plane. The final value of such a function, $x(\infty)$, is _____. [1]
