Electrical Engineering Department

Signal Analysis (802321) – G2

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Second Term (1435-1436), Second Exam

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Accredited ABET Engineering Accreditation Commission

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Q 1. Choose the correct answer: Total 27 *Marks*

1. The unit impulse signal is classified as: 1½ *Mark*

a) Energy signal.
b) Neither energy nor power signal.
c) Power signal.
d) Cannot decide.

2. Which formula is correct? 1½ *Mark*

a) $f_0 = 2\pi T_0$
b) $T_0 = 2\pi|\omega_0|$
c) $|\omega_0| = 2\pi T_0$
d) $T_0 = 2\pi/|\omega_0|$

3. The frequencies of a set of harmonically-related complex exponential signals, with the fundamental frequency $\omega_0 = 100\pi$ (rad/s), can be: 1½ *Mark*

a) 100π, 150π, 350π, and 550π.
b) 100π, 150π, 200π, and 250π.
c) 100π, 300π, 500π, and 700π.
d) 100π, 50π, 200π, and 300π.

4. The energy and power of the signal $g(t) = 3$ equal to: 1½ *Mark*

a) $E_g = 9$, $P_g = 0$
b) $E_g = \infty$, $P_g = 9$
c) $E_g = 3$, $P_g = 0$
d) $E_g = \infty$, $P_g = 3$

5. In the cascade (series) interconnection of systems: 1½ *Mark*

a) The total output is the output of the last system.
b) The output of the second system is fed back and added to external input.
c) The total output is the sum of the outputs of all systems.
d) The input is processed by all systems simultaneously.

6. In memoryless systems, the output at any instant *t* depends on input samples at: 1½ *Mark*

a) The same and / or past time
b) The same and / or future time
c) The same time only
d) The past time only

7. Which formula is correct? 1½ *Mark*

a) $e^{j\omega_0 t} = \cos\omega_0 t + \sin\omega_0 t$
b) $e^{j\omega_0 t} = \sin\omega_0 t + j\cos\omega_0 t$
c) $e^{-j\omega_0 t} = \cos\omega_0 t - j\sin\omega_0 t$
d) $e^{-j\omega_0 t} = \sin\omega_0 t - j\cos\omega_0 t$

8. The signal $\sin\omega_0 t$ can be expressed in terms of complex exponential signal as: 1½ *Mark*

a) $\frac{1}{2}[e^{j\omega_0 t} - e^{-j\omega_0 t}]$
b) $\frac{1}{j2}[e^{j\omega_0 t} - e^{-j\omega_0 t}]$
c) $\frac{1}{2}[e^{j\omega_0 t} + e^{-j\omega_0 t}]$
d) $\frac{1}{j2}[e^{j\omega_0 t} + e^{-j\omega_0 t}]$

9. The total-energy and power of the periodic complex exponential signal $e^{j\omega_0 t}$ are: 1 *Mark*

a) Energy is ∞, power is 1.
b) Energy is ∞, power is T_0.
c) Energy is T_0, power is 1.
d) Energy is ω_0, power is 1.

10. If the Cartesian form of a complex number is $(1 - j)^2$, its polar form is: 1 *Mark*

a) $2e^{j\pi/2}$
b) $2e^{j\pi/4}$
c) $2e^{-j\pi/4}$
d) $2e^{-j\pi/2}$

11. If the polar form of a complex number is $\sqrt{2}e^{-j\frac{\pi}{4}}$, its Cartesian form is: 1 *Mark*

a) $\frac{1}{\sqrt{2}} + j\frac{1}{\sqrt{2}}$
b) $1 - j$
c) $\frac{1}{\sqrt{2}} - j\frac{1}{\sqrt{2}}$
d) $1 + j$

12. Given an exponential signal $x(t)$. If the exponent equals $j2000\pi t$, the fundamental frequency and period-energy equal to: 1 *Mark*

a) f_0 = 1000 Hz, $E_{x\ period} = \infty$.
b) $f_0 = 2000\pi$ Hz, $E_{x\ period} = \infty$.
c) f_0 = 1000 Hz, $E_{x\ period}$ = 1 m.
d) $f_0 = 2000\pi$ Hz, $E_{x\ period}$ = 1 m.

13. For the exponential signal $e^{-j500\pi t}$, the fundamental frequency and period equal to: 1 *Mark*

a) $\omega_0 = 500\pi$, T_0 = 4 ms.
b) $\omega_0 = 500\pi$, T_0 = – 4 ms.
c) $\omega_0 = -500\pi$, T_0 = 4 ms.
d) ω_0 = – 500π, T_0 = – 4 ms.

14. Which two signals are not orthogonal? 1 *Mark*

a) sin t and cos t over the interval [0, ½ π]
b) sin t and cos t over the interval [0, π]
c) sin t and cos t over the interval [0, 2π]
d) sin t and cos t over the interval [– π/2, 3π/2]

15. Which one of the following signals is complex? 1 *Mark*

a) $\left|7e^{-j5000\pi t}\right|$
b) $j\left(\frac{1}{j}t + jt^2\right)$
c) $\frac{1}{2}\left[e^{j50\pi t} + e^{j50\pi t}\right]$
d) $\frac{1}{2}\left[e^{j50\pi t} + e^{-j50\pi t}\right]$

16. The inner product of the two complex-valued signals $g(t)$ and $x(t)$ is calculated as: 1 *Mark*

a) $\int_{t1}^{t2} \left|g(t)\,x^*(t)\right| dt$
b) $\int_{t1}^{t2} \left|g(t)\,x(t)\right|^* dt$
c) $\int_{t1}^{t2} g(t)\,x(t)dt$
d) $\int_{t1}^{t2} g^*(t)\,x(t)dt$

17. The system $y(t) = x(4 - t)$ is: 1 *Mark*

a) Causal and memoryless
b) Non-causal and memoryless
c) Causal and non-memoryless
d) Non-causal and non-memoryless

18. Which one of the following systems is causal? 1 *Mark*

a) $y(t) = x(-t + 2)$ b) $y(t) = x(-2t)$

c) $x(t) = \sum_{n=t-1}^{\infty} x(n)$ d) $x(t) = \sum_{n=-\infty}^{t-1} x(n)$

19. Which relation is correct? 1 *Mark*

a) $\int_{-\infty}^{\infty} \delta(t)dt = u(t)$ b) $\frac{du(t)}{dt} = \delta(t)$

c) $\frac{d\delta(t)}{dt} = u(t)$ d) a) and b)

20. Which relation is correct? 1 *Mark*

a) $u[n] = \delta[n] + \delta[n-1]$ b) $\delta[n] = u[n] + u[n-1]$

c) $u[n] = \delta[n] - \delta[n-1]$ d) $\delta[n] = u[n] - u[n-1]$

21. The running sum of the function $x[n]$ is: 1 *Mark*

a) $\sum_{m=-\infty}^{n} x[m]$ b) $\sum_{m=0}^{n} x[m]$

c) $\sum_{m=-\infty}^{\infty} x[m]$ d) $\sum_{m=1}^{\infty} x[m]$

22. Which statement is correct? 1 *Mark*

a) $\delta(t)$ is undefined at $t = \pm\infty$ b) $\delta[n]$ is undefined at $n = 0$

c) $\delta(t) = 1$ at $t = 0$ d) $\delta[n] = 1$ at $n = 0$

23. The system $y(t) = x^2(-t)$ is: 1 *Mark*

a) Invertible and causal. b) Non-invertible and causal.

c) Invertible and non-causal. d) Non-invertible and non-causal.

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