Instrumentation Engineering Sample Questions
Questions And Answers

No.	Question
1	A scalar field is given by $f = x^{2/3} + y^{2/3}$, where x and y are the Cartesian coordinates. The derivative of f along the line y = x directed away from the origin, at the point (8,8) is

Options

A) $\dfrac{\ddot{O}2}{3}$ **B)** $\dfrac{\ddot{O}3}{3}$

C) $\dfrac{2}{\ddot{O}3}$ **D)** $\dfrac{3}{\ddot{O}2}$

Correct Answer   A

2	Given the discrete-time sequence x[n] = [2, 0, -1,-3, 4, 1, -l, $X(e^{jp})$ is

Options
A) 8 **B)** 6p
C) 8p **D)** 6

Correct Answer   C

3	A microscope uses a micro-objective 10X, numerical aperture 0.25 and an eyepiece of focal length of 25 mm. The magnification of the microscope is

Options
A) 25 **B)** 50
C) 100 **D)** 125

Correct Answer   C

4	The output from a 633 nm He-Ne laser comes out from the mirror with a beam diameter of lmm and diverges to the far field. It is brought to a focus by a convex lens of focal length of 17 mm. The spot size diameter of the beam at the focal point is

Options
A) 20 m m   **B)** 26 m m
C) 52 m m **D)** 13 m m

Correct   C

| 5 | A minimal microcomputer system is constructed using INTEL 8085 microprocessor, an 8156 RAM and an 8355 ROM. The chip enable CE of 8355 are connected to the address line A_{12}. of 8085. The address of port A of the 8156 chip is |

| Options | **A)** 21H **B)** 12 H
C) 11H **D)** 20H |

| Correct Answer | D |

| 6 | Bilinear transformation avoids the problem of aliasing encountered with the use of impulse-invariance through |

| Options | **A)** mapping the entire imaginary axis of the s-plane on to the unit circle in the z-plane | **B)** pre-filtering the input signal to impose bank-limitedness |
| | **C)** mapping zeros of the left half of the s-plane inside the unit circle in the z-plane | **D)** up-sampling the input signal so that the bandwidth is reduced |

| Correct Answer | A |

| 7 | Two identical 2-port networks with y-parameters $y_{11} = -y_{12} = -y_{21} = y_{22}$ I S are connected in cascade. The overall y-parameters will satisfy the condition |

| Options | **A)** $y_{11} = I S$ | **B)** $y_{12} = -\dfrac{1}{2} S$ |
| | **C)** $y_{21} = -2 S$ **D)** $y_{22} = I S$ | |

| Correct Answer | A |

| 8 | A temperature sensor having a range of 0-100° C has a worst case accuracy specification of $\pm 1.0\%$ of true value or $\pm 0.3\%$ of full scale, whichever is higher. The sensitivity of the sensor is experimentally obtained by taking its readings at true temperatures 25° C and 75° C. The maximum error in sensitivity, expressed as percentage of its ideal value is |

| Options | **A)** $\pm 0.105\%$ **B)** $\pm 0.21\%$ |

C) $\pm 1.05\%$ **D)** $\pm 2.1\%$

Correct Answer   C

9   A quartz crystal (Young's modulus, E=9 x 10^{10} N/m^2) with piezo-electric properties has diameter of 10mm and thickness of 2 MM. Its voltage sensitivity constant is 4500 V/mm. If the voltage output is 127.3V, the applied load is approximately

Options
A) 100 N   **B)** 200 N
C) 127.3 N   **D)** 6.4 N

Correct Answer   A

10   The transfer function of a PID Controller is given by G(s) = 4 (1 + $\frac{1}{2s}$ +0.5s as w tends to infinity

Options

A) magnitude of G(jw) tends to zero and phase angle of G(jw) tends to zero

B) magnitude of G(jw) tends to infinity and phase angle of G(jw) tends to zero

C) magnitude tends of G(jw) to infinity and phase angle of G(jw) tends to –90°

D) magnitude tends of G(jw) to zero and phase angle of G(jw) tends to +90°

Correct Answer   B

11   An oscilloscope screen displays a line inclined at 45°. Its Y-input is a sine wave of frequency f then the X-input should be

Options

A) sine wave of frequency f and 0° phase shift with the Y-input

B) sine wave of frequency f and 45° phase shift with the Y-input

C) sine wave of frequency f and 90° phase shift with the Y-input

D) saw-tooth wave of frequency f

12	If the Fourier transform of x[n] is $X(e^{jw})$ then the Fourier transform of $(-1)^n x[n]$ is

A) $(-j)^w X(e^{jw})$ **B)** $(-1)^w X(e^{jw})$

Options **C)** $X(e^{(j(w-p))})$ **D)** $\dfrac{d}{dw}(X(e^{jw}))$

Correct Answer C

13	One method of measuring the radius of an arc (r) is to allow a roller of radius (r) to oscillate to and fro on the arc and measure the average time per oscillation, T seconds . The roller will then have a linear acceleration of 2g/3 where g is acceleration due to gravity in such an experiment, the value of radius of arc can be found from the expression:

Options **A)** $(T^2g/6p^2)+r$ **B)** $(T^2g/6p^2)-r$
C) $(T^2g/6p^2)$ **D)** $(6r^2/T^2g)$

Correct Answer A

14	The following terms used in the context of an instrument are numbered as shown : (1) accuracy, (2) sensitivity, (3) precision and (4) resolution Match these with their possible definitions listed below P. Repeatability of readings on successive observations Q. Smallest perceptible change in the output R. Deviation of the output from the true value S. Minimum value of the input from the true value T. Ratio of the change in the instrument reading to the change in the measured variable.

Options **A)** 1-P, 2-Q, 3-R, 4-S **B)** 1-S, 2-Q, 3-P, 4-T
C) 1-R, 2-T, 3-P, 4-Q **D)** 1-T, 2-Q, 3-P, 4-R

Correct Answer C

15	Which one of the following is derived unit (NOT a basic unit) in SI system?
Options	**A)** Candela **B)** coulomb
	C) Kelvin **D)** mol.
Correct Answer	C

16	An amplifier of gain 10, with a gain-bandwidth product of 1 MHz and slew rate of 0.1 V/ms is fed with a10 KHz symmetrical square wave of ± 1 V amplitude. Its output will be
Options	**A)** ± 10 V amplitude square wave **B)** ± 2.5 V amplitude square wave
	C) ± 10 Vamplitude triangular wave **D)** ± 2.5 V amlitude triangular wave
Correct Answer	C

17	V_1 and V_2 are the input voltages of an instrumentation amplifier. The output of the instrumentation amplifier is found to be $100(V_1 - V_2) + 10^{-4}(V_1 + V_2)$. The gain and the common mode rejection ratio (CMRR) of the instrumentation amplifier respectively are
Options	**A)** (50, 60 dB) **B)** (50, 120 dB)
	C) (100, 60dB) **D)** (100, 120 dB)
Correct Answer	C

18	The sequence x[n] whose z-transform is $X[z] = e^{(1/Z)}$ is
Options	**A)** $\dfrac{1}{n!}$ u[n] **B)** $\dfrac{1}{-n!}$ u[-n]
	C) $(-1)^n \dfrac{1}{n!}$ **D)** $\dfrac{1}{-(n+1)!}$

u[n]   u[-n-1]

19   The time taken by an ionized atom, of mass m kg and charge e Coulombs, pulsed into a field-free region with V volts, to reach a detector L meters away is

Options

A) $\dfrac{1}{L}\dfrac{1}{\sqrt{\dfrac{m}{2eV}}}$

B) $L\sqrt{\dfrac{m}{2eV}}$

C) $\dfrac{m}{L}\sqrt{\dfrac{L}{2eV}}$

D) $\dfrac{2}{L}\sqrt{\dfrac{m}{2eV}}$

Correct Answer   B

20   The clock frequency of a timer-counter is 10MHz. The timer-counter is used in the period mode and the input to the timer-counter is a square wave of frequency 2 kHz. The display of the timer-counter will show a value

Options   **A)** 200 **B)** 2000
C) 5000 **D)** 50000

Correct Answer   C