Answer Key

of

Electronics Engineering

GATE-2015

Afternoon Session | **31st Jan, 2015**

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Section - I (General Aptitude)

Q.1 Choose the word most similar in meaning to the given word:

(a) Inept (b) Graceful
(c) Suitable (d) Dreadful

Ans. **(a)**

End of Solution

Q.2 Choose the appropriate word/phase, out of the four options given below, to complete the following sentence:

Dhoni, as well as the other team members of the Indian team_____present on the occasion.

(a) were (b) was
(c) has (d) have

Ans. **(b)**

End of Solution

Q.3 An electric bus has onboard instruments that report the total electricity consumed since the start of the trip as well as the total distance covered. During a single day of operation, the bus travels on stretches *M*, *N*, *O* and *P*, in that order. The cumulative distance travelled and the corresponding electricity consumption are shown in the Table below:

Stretch	Cumulative distance (km)	Electricity used (kWh)
M	20	12
N	45	25
O	75	45
P	100	57

The stretch where the electricity consumption per km is minimum is

(a) *M* (b) *N*
(c) *O* (d) *P*

Ans. **(d)**

End of Solution

Q.4 What is the adverb for the given word below?

Misogynous

(a) Misogynousness (b) Misogynity
(c) Misogynously (d) Misogynous

Ans. **(*)**

End of Solution

Q.5 Ram and Ramesh appeared in an interview for two vacancies in the same department. The probability of Ram's selection is 1/6 and that of Ramesh is 1/8. What is the probability that only one of them will be selected?

(a) 47/48 (b) 1/4
(c) 13/48 (d) 35/48

Ans. **(b)**

End of Solution

Q.6 Given below are two statements followed by two conclusions. Assuming these statements to be true, decide which one logically follows.

Statements:

I. All film star are playback singers.

II. All film directors are film stars.

Conclusions:

I. All film directors are playback singers.

II. Some film stars are film directors.

(a) Only conclusion I follows. (b) Only conclusion I nor II follows.
(c) Neither conclusion I nor II follows. (d) Both conclusions I and II follow.

Ans. **(d)**

End of Solution

Q.7 In the following sentence certain parts are underlined and marked *P*, *Q* and *R*. One of the parts may contain certain error or may not be acceptable in standard written communication. Select the part containing an error. Choose *D* as your answer if there is no error.

The student concreted all the errors that the instructor marked on the answer book.

(a) *P* (b) *Q*
(c) *R* (d) No Error

Ans. **(b)**

End of Solution

Q.8 If $a^2 + b^2 + c = 1$, then $ab + bc + ac$ lies in the interval

(a) [1, 2/3] (b) [–1/2, 1]
(c) [–1, 1/2] (d) [2, –4]

Ans. **(b)**

End of Solution

Q.9 Lamenting the gradual sidelining of the arts in school curricula, a group of prominent artists wrote to the Chief Minister last year, asking him to allocate more funds to support arts education in schools. However, no such increase has been announced in this year's Budget. The artists expressed their deep anguish at their request not being approved, but many of them remain optimistic about finding in the future.

Which of the statement(s) below is/are logically valid and can be inferred from the above statements?

(i) The artists expected funding for the arts to increase this year.

(ii) The Chief Minister was receptive to the idea of increasing funding for the arts.

(iii) The Chief Minister is a prominent artists.

(iv) Schools are giving less importance to arts education nowadays.

(a) (iii) and (iv) (b) (i) and (iv)

(c) (i), (ii) and (iv) (d) (i) and (iii)

Ans. (b)

End of Solution

Q.10 A tiger is 50 leaps of its own behind a deer. The tiger takes 5 leaps per minute to the deer's 4. If the tiger and the deer cover 8 metre and 5 meter per leap respectively, what distance in metres will the tiger have to run before it catches the deer?

Ans. (800)

Section - II (Electronics Engineering)

Q.1 The general solution of the differential equation $\frac{dy}{dx} = \frac{1+\cos 2y}{1-\cos 2x}$ is

(a) $\tan y - \cot x = c$ (c is a constant) (b) $\tan x - \cot y = c$ (c is a constant)

(c) $\tan y + \cot x = c$ (c is a constant) (d) $\tan x + \cot y = c$ (c is a constant)

Ans. (c)

End of Solution

Q.2 Two causal discrete-time signals $x[n]$ and $y[n]$ are related as $y[n] = \sum_{m=0}^{n} x[m]$. If the z-transform of $y[n]$ is $\frac{2}{z(z-1)^2}$, the value of $x[2]$ is _____.

Ans. (0)

End of Solution

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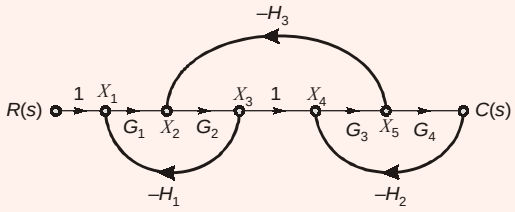
Q.3 A unity negative feedback system has an open-loop transfer function $G(s) = \dfrac{K}{s(s+10)}$. the gain K for the system to have a damping ratio of 0.25 is _____.

Ans. **(400)**

End of Solution

Q.4 For the signal flow graph shown in the figure, the value of $\dfrac{C(s)}{S(s)}$ is



(a) $\dfrac{G_1G_2G_3G_4}{1-G_1G_2H_1-G_3G_4H_2-G_2G_3H_3+G_1G_2G_3G_4H_1H_2}$

(b) $\dfrac{G_1G_2G_3G_4}{1+G_1G_2H_1+G_3G_4H_2+G_2G_3H_3+G_1G_2G_3G_4H_1H_2}$

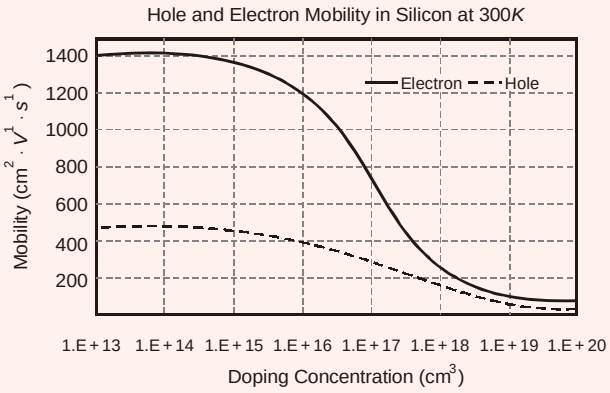
(c) $\dfrac{1}{1+G_1G_2H_1+G_3G_4H_2+G_2G_3H_3+G_1G_2G_3G_4H_1H_2}$

(d) $\dfrac{1}{1-G_1G_2H_1-G_3G_4H_2-G_2G_3H_3+G_1G_2G_3G_4H_1H_2}$

Ans. **(b)**

End of Solution

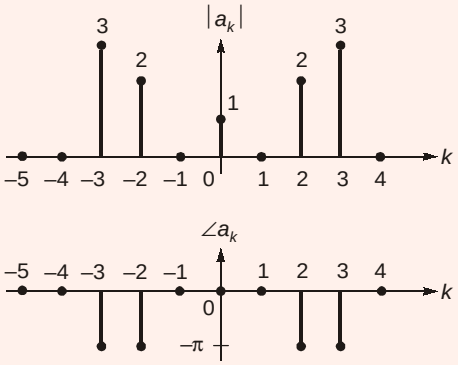
Q.5 A piece of silicon is doped uniformly with phosphorous with a doping concentration of $10^{16}/cm^3$. The expected value of mobility versus doping versus doping concentration for silicon assuming full dopant ionization is shown below. The charge of an electron is 1.6×10^{-19} C. The conductivity (in $S\,cm^{-1}$) of the silicon sample at 300 K is _____.



Ans. **(1.92)**

End of Solution

Q.6 The magnitude and phase of the complex Fourier series coefficient a_k of a periodic signal $x(t)$ are shown in the figure. Choose the correct statement from the four choices given. Notation: C is the set of complex number, R is the set of purely real numbers, and P is the set of purely imaginary numbers.

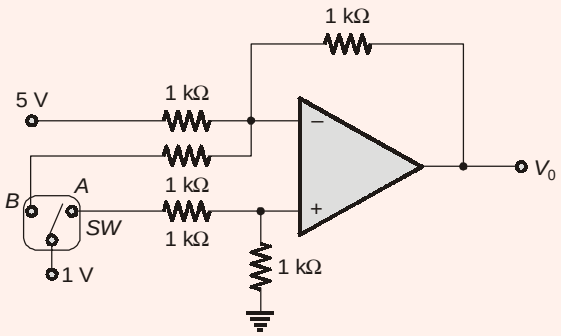


(a) $x(t) \in R$
(b) $x(t) \in P$
(c) $x(t) \in (C–R)$
(d) the information given is not sufficient to draw any conclusion about $x(t)$

Ans. **(c)**

End of Solution

Q.7 In the circuit shown, V_0 V_{0A} = for switch SW in position A and $V_0 = V_{0B}$ for SW in position B. Assume that the opamp is deal. The value of $\frac{V_{0B}}{V_{0A}}$ is _____.



Ans. **(1.5)**

End of Solution

Q.8 In a source free region in vaccum, if the electrostatic potential $\varphi = 2x^2 + y^2 + cz^2$, the value of constant c must be _____.

Ans. **(–3)**

End of Solution

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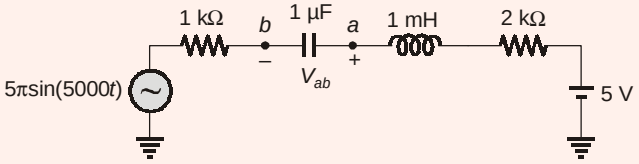
Q.9 In the circuit shown, the average value of the voltage V_{ab} (in Volts) in steady state condition is _____.



Ans. **(5)**

End of Solution

Q.10 The bilateral Laplace transform of a function $f(t) = \begin{cases} 1 & \text{if } a \le t \le b \\ 0 & \text{otherwise} \end{cases}$ is

(a) $\dfrac{a-b}{s}$

(b) $\dfrac{e^{Z}(a-b)}{s}$

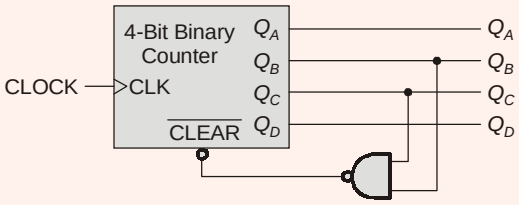
(c) $\dfrac{e^{-as}-e^{-bs}}{s}$

(d) $\dfrac{e^{-(a-b)}}{s}$

Ans. **(c)**

End of Solution

Q.11 A mod-n counter using a synchronous binary up-counter with synchronous clear input is shown in the figure. The value of n is _____.



Ans. **(6)**

End of Solution

Q.12 The electric field of a uniform plane electromagnetic wave is

$$\vec{E} = (\hat{a}_x + j2\hat{a}_y)\exp[j(2\pi \times 10^7 t - 0.2z)].$$

The polarization of the wave is

(a) right handed circular

(b) right handed elliptical

(c) left handed circular

(d) left handed elliptical

Ans. **(d)**

End of Solution

Q.13 The signal $\cos\left(10\pi t+\frac{\pi}{4}\right)$ is ideally sampled at a sampling frequency of 15 Hz. The sampled signal is passed through a filter with impulse response $\left(\frac{\sin(\pi t)}{\pi t}\right)\cos\left(40\pi t-\frac{\pi}{2}\right)$. The filter output is

(a) $\frac{15}{2}\cos\left(40\pi t-\frac{\pi}{4}\right)$

(b) $\frac{15}{2}\left(\frac{\sin(\pi t)t}{\pi t}\right)\cos\left(10\pi t+\frac{\pi}{4}\right)$

(c) $\frac{15}{2}\cos\left(10\pi t-\frac{\pi}{4}\right)$

(d) $\frac{15}{2}\left(\frac{\sin(\pi t)t}{\pi t}\right)\cos\left(10\pi t-\frac{\pi}{2}\right)$

Ans. **(a)**

End of Solution

Q.14 A sinusoidal signal of amplitude A is quantized by a uniform quantizer. Assume that the signal utilizes all the representation levels of the quantizer. If the signal to quantization noise ratio is 31.8 dB, the number of levels in the quantizer is____.

Ans. **(32)**

End of Solution

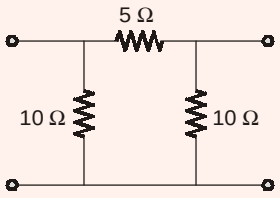
Q.15 Let the signal $f(t) = 0$ outside the interval $[T_1, T_2]$, where T_1 and T_2 are finite. Furthermore, $|f(t)| < \infty$. The region of convergence (RoC) of the signal's bilateral Laplace transform $F(s)$ is

(a) a parallel strip containing the $j\Omega$ axis
(b) a parallel strip not containing the $j\Omega$ axis
(c) the entire s-plane
(d) a half plane containing the $j\Omega$ axis

Ans. **(c)**

End of Solution

Q.16 The 2-port admittance matrix of the circuit shown is given by



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(a) $\begin{bmatrix} 0.3 & 0.2 \\ 0.2 & 0.3 \end{bmatrix}$ (b) $\begin{bmatrix} 15 & 5 \\ 5 & 15 \end{bmatrix}$

(c) $\begin{bmatrix} 3.33 & 5 \\ 5 & 3.33 \end{bmatrix}$ (d) $\begin{bmatrix} 0.3 & 0.4 \\ 0.4 & 0.3 \end{bmatrix}$

Ans. **(a)**

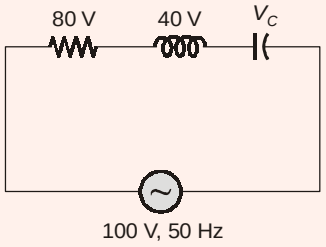
End of Solution

Q.17 Let $f(z) = \dfrac{az+b}{cz+d}$. If $f(z_1) = f(z_2)$ for all $z_1 \neq z_2$, $a = 2$, $b = 4$ and $c = 5$, then d should be equal to _____.

Ans. **(10)**

End of Solution

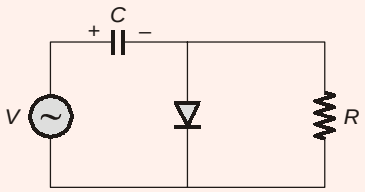
Q.18 The voltage (V_c) across the capacitor (in Volts) in the network shown in ____ .



Ans. **(100)**

End of Solution

Q.19 If the circuit shown has to function as a clamping circuit, then which one of the following conditions should be satisfied for the sinusoidal signal of period T ?



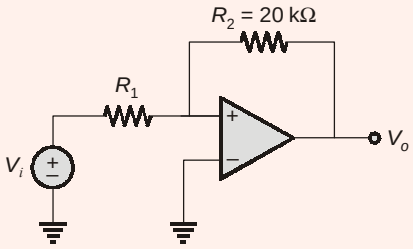
(a) $RS << T$ (b) $RC = 0.35\ T$

(c) $RC \approx T$ (d) $RC >> T$

Ans. **(d)**

End of Solution

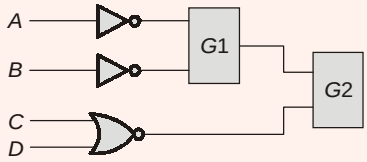
Q.20 In the bistable circuit shown, the ideal opamp has saturation levels of ± 5 V. The value of R_1 (in kΩ) that gives a hysteresis width of 500 mV is _____.



Ans. **(1)**

End of Solution

Q.21 In the figure shown, the output Y is required to be $Y = A\,B + \bar{C}\bar{D}$. The gates $G1$ and $G2$ must be,



(a) NOR, OR
(b) OR, NAND
(c) NAND, OR
(d) AND, NAND

Ans. **(a)**

End of Solution

Q.22 An n-type silicon sample is uniformly illuminated with light which generates 10^{20} electron-hole pairs per cm^3 per second. The minority carrier lifetime in the sample is 1 μs. In the steady state, the hole concentration in the sample is approximately 10_x, where x is an integer. The value of x is _____.

Ans. **(14)**

End of Solution

Q.23 The value of x for which all the eigen-values of the matrix given below are real is

$$\begin{bmatrix} 10 & 5+j & 4 \\ x & 20 & 2 \\ 4 & 2 & -10 \end{bmatrix}$$

(a) $5 + j$
(b) $5 - j$
(c) $1 - 5j$
(d) $1 + 5j$

Ans. **(a)**

End of Solution

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Q.24 In an 8085 microprocessor, which one of the following instructions changes the content of the accumulator?

(a) *MOV B, M*
(b) *PCHL*
(c) *RNZ*
(d) *SBI BEH*

Ans. **(d)**

End of Solution

Q.25 By performing cascading and/or summing/differencing operations using transfer function blocks $G_1(s)$ and $G_2(s)$, one CANNOT realize a transfer function of the form

(a) $G_1(s)\,G_2(s)$
(b) $\dfrac{G_1(s)}{G_2(s)}$
(c) $G_1(s)\left(\dfrac{1}{G_1(s)}+G_2(s)\right)$
(d) $G_1(s)\left(\dfrac{1}{G_1(s)}-G_2(s)\right)$

Ans. **(b)**

End of Solution

Q.26 A function of Boolean variables, X, Y and Z is expressed in terms of the min-terms as

$F(X, Y, Z) = \Sigma\ (1, 2, 5, 6, 7)$

Which one of the product of sums given below is equal to the function $F(X, Y, Z)$?

(a) $(\bar{X}+\bar{Y}+\bar{Z})\cdot(\bar{X}+Y+Z)\cdot(X+\bar{Y}+\bar{Z})$
(b) $(X+Y+Z)\cdot(X+\bar{Y}+\bar{Z})\cdot(\bar{X}+Y+Z)$
(c) $(\bar{X}+\bar{Y}+Z)\cdot(\bar{X}+Y+\bar{Z})\cdot(X+\bar{Y}+Z)\cdot(X+Y+\bar{Z})\cdot(X+Y+Z)$
(d) $(X+Y+\bar{Z})\cdot(\bar{X}+Y+Z)\cdot(\bar{X}+Y+\bar{Z})\cdot(\bar{X}+\bar{Y}+Z)\cdot(\bar{X}+\bar{Y}+\bar{Z})$

Ans. **(b)**

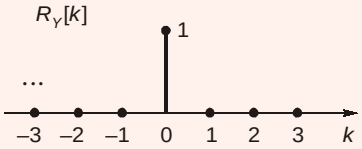
End of Solution

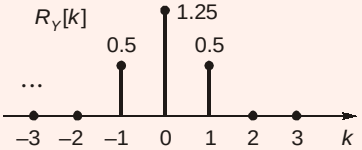
Q.27 An air-filled rectangular waveguide of interval dimensions a can × b cm ($a > b$) has a cutoff frequency of 6 GHz for the dominant TE^{10} mode. For the same waveguide, if the cutoff frequency of the TM_{11} mode is 15 GHz, the cutoff frequency of the TE_{01} mode in GHz is_____.

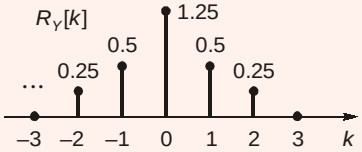
Ans. **(13.75)**

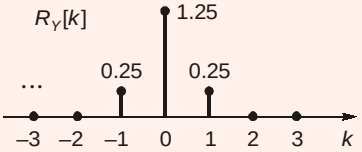
End of Solution

Q.28 $\{X_n\}_{n=-\infty}^{n=\infty}$ is an independent and identically distributed (i.i.d.) random process X_n equally likely to be + 1 or – 1. $\{Y_n\}_{n=-\infty}^{n=\infty}$ is another random process obtained as $Y_n = X_n + 0.5\,X_{n-1}$. The autocorrelation function of $\{Y_n\}_{n=-\infty}^{n=\infty}$ denoted by $R_y[k]$, is

(a)


(b)


(c)


(d)


Ans. **(c)**

End of Solution

Q.29 In MOS capacitor with in oxide layer thickness of 10 mm. The maximum depletion layer thickness is 100 mm. The permittivities of the semiconductor and the oxide layer are ε_s and ε_{ax} respectively. Assuming $\varepsilon_s/\varepsilon_{ax} = 3$ the ratio of the maximum capacitance to the minimum capacitance of this MOS capacitor is_____.

Ans. **(4.33)**

End of Solution

Q.30 An LC tank circuit consists of an ideal capacitor C connected in parallel with a coil of inductance L having an internal resistance R. The resonant frequency of the tank circuit is

(a) $\dfrac{1}{2\pi\sqrt{LC}}$

(b) $\dfrac{1}{2\pi\sqrt{LC}}\sqrt{1-R^2\dfrac{C}{L}}$

(c) $\dfrac{1}{2\pi\sqrt{LC}}\sqrt{1-\dfrac{L}{R^2C}}$

(d) $\dfrac{1}{2\pi\sqrt{LC}}\sqrt{1-R^2\dfrac{C}{L}}$

Ans. **(b)**

End of Solution

Q.31 Let the random variable X represent the number of times a fair coin needs to be tossed till two consecutive heads appear for the first time. The expectation of X is_____.

Ans. **(1.5)**

End of Solution

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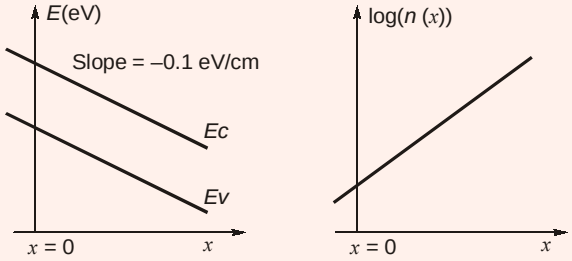
Q.32 The energy band diagram and the electron density profile $n(x)$ in a semiconductor are shown in the figures. Assume that $n(x) = 10^{15} e^{\left(\frac{qax}{kT}\right)} cm^{-3}$, with $\alpha = 0.1$ V/cm and x expressed in cm. Given $\frac{kT}{q} = 0.026$ V, $D_n = 36\ cm^2\ s^{-1}$, and $\frac{D}{\mu} = \frac{kT}{q}$.

The electron current density (in A/cm^2) at $x = 0$ is



(a) -4.4×10^{-2} (b) -2.2×10^{-2}

(c) 0 (d) 2.2×10^{-2}

Ans. **(c)**

End of Solution

Q.33 The transfer function of a mass-spring-damper system is given by

$$G(s) = \frac{1}{Ms^2 + Bs + K}$$

The frequency response data for the system are given in the following table.

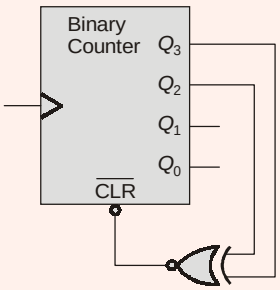
ω in rad/s	$\lvert G(j\omega)\rvert$ in dB	arg ($G(j\omega)$) in deg
0.01	–18.5	–0.2
0.1	–18.5	–1.3
0.2	–18.4	–2.6
1	–16	–16.9
2	–11.4	–89.4
3	–21.5	–151
5	–32.8	–167
10	–45.3	–174.5

The unit step response of the system approaches a steady state value of _____.

Ans. **(0.4)**

End of Solution

Q.34 The figure shows a binary counter with synchronous clear input. With the decoding logic shown, the counter works as a



(a) mod-2 counter
(b) mod-4 counter
(c) mod-5 counter
(d) mod-6 counter

Ans. **(b)**

End of Solution

Q.35 The state variable representation of a system is given as

$$x = \begin{bmatrix} 0 & 1 \\ 0 & -1 \end{bmatrix} x, \quad x(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$y = [0\ 1]x$

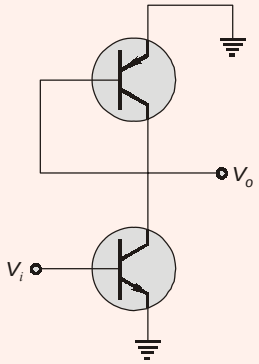
The response $y(t)$ is

(a) sin (t)
(b) $1 - e^{r}$
(c) $1 - \cos(t)$
(d) 0

Ans. **(d)**

End of Solution

Q.36 In the ac equivalent circuit shown, the two BJTs are biased in active region and have identical parameters with $\beta >> 1$. The open circuit small signal voltage gain is approximately_____.



Ans. **(–1)**

End of Solution

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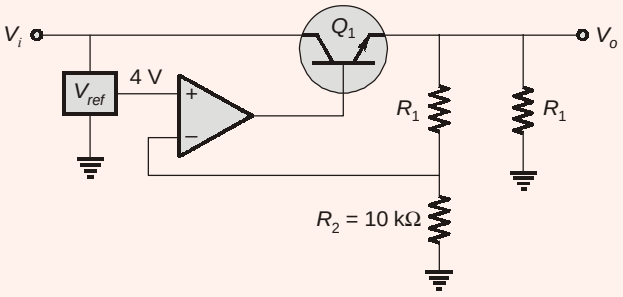
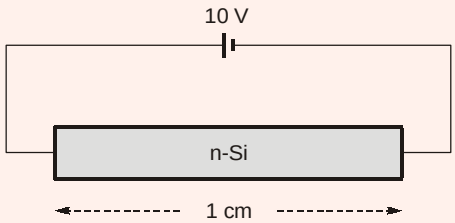
Q.37 For the voltage regulator circuit shown, the input voltage (V_{in}) is 20 V ± 20% and the regulated output voltage (V_{out}) is 10 V. Assume the opamp to be ideal. For a load RL drawing 200 MA, the maximum power dissipation in Q_1 (in Watts) is_____.



Ans. **(2.8)**

End of Solution

Q.38 A dc voltage of 10 V is applied across an n-type silicon bar having a rectangular cross-section and length of 1 cm as shown in figure. The donor doping concentration N_D and the mobility of electrons μ_n are 10^{16} cm^{-3} and 1000 cm^{-3} V^{-1}S^{-1}, respectively. The average time (in μs) taken by the electrons to move from one end of the bar to other end is _____.



Ans. **(100)**

End of Solution

Q.39 Consider two real sequences with time-origin marked by the bold value,

$x_1[n] = \{1, 2, 3, 0\}$, $x_2[n] = \{1, 3, 2, 1\}$

Let $X_1(k)$ and $X_2(k)$ be 4-point DFTs of $x_1[n]$ and $x_2[n]$, respectively.

Another sequence $x_3[n]$ is derived by taking 4-point inverse DFT of $X_3(n) = X_1(k)X_2(k)$.

The value of $x_3[n]$ is _____.

Ans. **(11)**

End of Solution

Q.40 Input $x(t)$ and output $y(t)$ of an LTI system are related by the differential equation $y(t) - y(t) - 6y(t) = x(t)$. If the system is neither causal nor stable, the impulse response $h(t)$ of the system is

(a) $\frac{1}{5}e^{3t}u(-t)+\frac{1}{5}e^{-2t}u(-t)$

(b) $-\frac{1}{5}e^{3t}u(-t)+\frac{1}{5}e^{-2t}u(-t)$

(c) $\frac{1}{5}e^{3t}u(-t)-\frac{1}{5}e^{-2t}u(t)$

(d) $-\frac{1}{5}e^{3t}u(-t)-\frac{1}{5}e^{-2t}u(t)$

Ans. **(*)**

End of Solution

Q.41 The value of the integral $\int_{-\infty}^{\infty} 12\cos(2\pi t)\frac{\sin(4\pi t)}{4\pi t}dt$ is_____.

Ans. **(3)**

End of Solution

Q.42 Let $x(t) = a\ s(t) + s(-t)$ with $s(t) = \beta e^{-4t}u(t)$, where $u(t)$ is unit step function. If the bilateral Laplace transform of $x(t)$ is

$$X(s) = \frac{16}{s^2 - 16} \quad -4 < \text{Re}\{s\} < 4;$$

then the value of β is _____.

Ans. **(–2)**

End of Solution

Q.43 The electric field of a plane wave propagating in a lossless non-magnetic medium is given by the following expression

$$E(z,t) = a_x\ 5\cos(2\pi \times 10^9 t + \beta z) + a_y\ 3\cos\left(2\pi \times 10^9 t + \beta z - \frac{\pi}{2}\right)$$

(a) Right Hand Circular

(b) Left Hand Elliptical

(c) Right Hand Elliptical

(d) Linear

Ans. **(b)**

End of Solution

Q.44 Let $X \in \{0, 1\}$ and $Y \in \{0, 1\}$ be two independent binary random variables. If $P(X = 0) = p$ and $P(Y = 0) = q$, then $P(X + Y \geq 1)$ is equal to

(a) $pq\ (1 - p)(1 - q)$

(b) pq

(c) $p(1 - q)$

(d) $1 - pq$

Ans. **(d)**

End of Solution

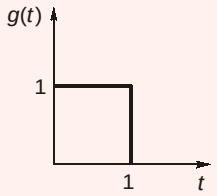
Q.45 If C denotes the counterclockwise unit circle, the value of the contour integral $\frac{1}{2\pi j}\oint_c \text{Re}\{z\}dz$ is _____.

Ans. **(0)**

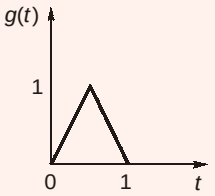
End of Solution

Q.46 Consider a binary, digital communication system which uses pulses $g(t)$ and $-g(t)$ for transmitting bits over an AWGN channel. If the receiver uses a matched filter, which one of the following pulses will give the minimum probability of bit error?

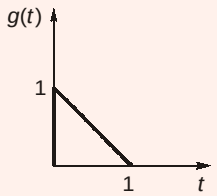
(a)



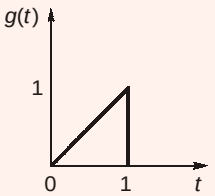
(b)



(c)



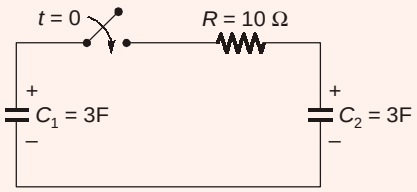
(d)



Ans. **(*)**

End of Solution

Q.47 In the circuit shown, the initial voltages across the capacitors C_1 and C_2 and 1 V and 3 V, respectively. The switch is closed at time $t = 0$. The total energy dissipated (in Joules) in the resistor R until steady state is reached, is _____.



Ans. **(3)**

End of Solution

Q.48 The output of a standard second-order system for a unit step input is given as $y(t) = 1 - \frac{2}{\sqrt{3}} e^{-t} \cos\left(\sqrt{3}t - \frac{\pi}{6}\right)$. The transfer function of the system is

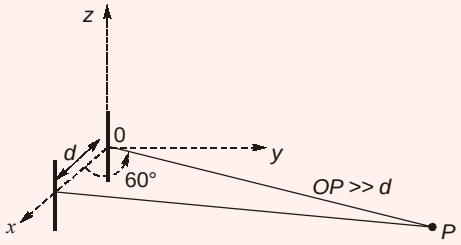
(a) $\frac{2}{(s+2)(s+\sqrt{3})}$ (b) $\frac{1}{s^2+2s+1}$

(c) $\frac{3}{s^2+2s+3}$ (d) $\frac{4}{s^2+2s+4}$

Ans. (d)

End of Solution

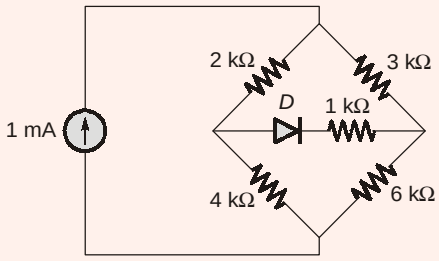
Q.49 Two half-wave dipole antennas placed as shown in the figure are excited with sinusoidally varying currents of frequency 3 MHz and phase shift of π/2 between them (the element at the origin leads in phase). If the maximum radiated E-field at the point *P* in the *x*-*y* plane occurs at an azimuthal angle of 60°, the distance d (in meters) between the antennas is_____.



Ans. (50)

End of Solution

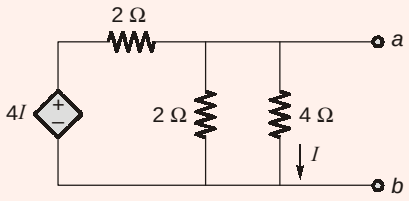
Q.50 The diode in the circuit given below has $V_{ON} = 0.7$ V but is ideal otherwise. The current (in mA) in the 4 kΩ resistor is_____.



Ans. (0.6)

End of Solution

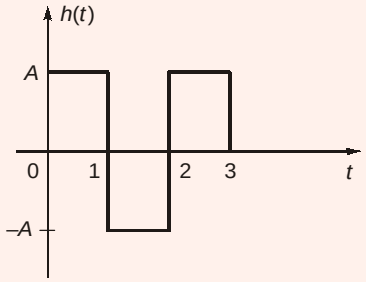
Q.51 In the circuit shown, the Norton equivalent resistance (in Ω) across terminals a-b is_____.



Ans. **(1.33)**

End of Solution

Q.52 A zero mean white Gaussian noise having power spectral density $\frac{N_0}{2}$ is passed through an LTI filter whose impulse response $h(t)$ is shown in the figure. The variance of the filtered noise at $t = 4$ is



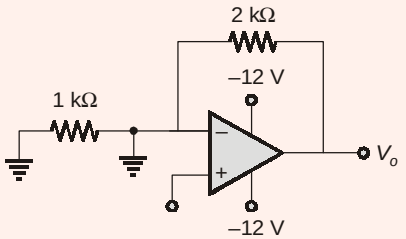
(a) $\frac{3}{2}A^2N_0$ (b) $\frac{3}{4}A^2N_0$

(c) A^2N_0 (d) $\frac{1}{2}A^2N_0$

Ans. **(*)**

End of Solution

Q.53 Assuming that the opamp in the circuit shown below is deal, the output voltage V_0 (in volts) is _____.



Ans. **(12)**

End of Solution

Q.54 Consider the differential equation $\frac{dx}{dt} = 10 - 0.2x$ with initial conduction $x(0) =$ 1. The response $x(t)$ for $t > 0$ is

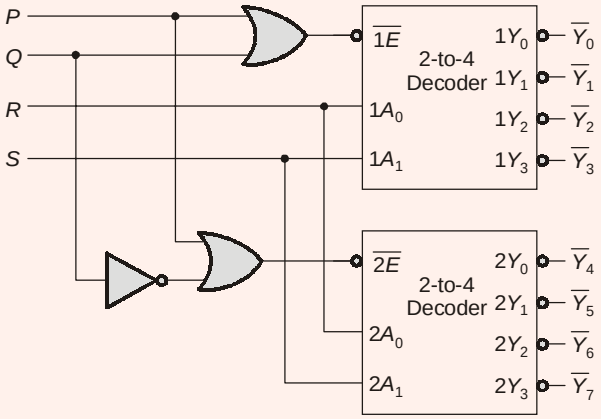
(a) $2 - e^{-0.2t}$ (b) $2 - e^{0.2t}$

(c) $50 - 49e^{-0.2t}$ (d) $50 - 49e^{0.2t}$

Ans. **(c)**

End of Solution

Q.55 A 1-to-8 demultiplexer with data input D_{in}, address inputs S_0, S_1, S_2 (with S0 as the LSB) and $\bar{Y}_0$ to $\bar{Y}_7$ as the eight demultiplexed outputs, is to be designed using two 2-to-4 decoders (with enable input $\bar{E}$ and address inputs A_0 and A_1) as shown in the figure D_{in}, S_0, S_1 and S_2 are to be connected to P, Q, R and S, but not necessarily in this order. The respective input connections to P, Q, R and S terminals should be



(a) S_2, D_{in}, S_0, S_1 (b) S_1, D_{in}, S_0, S_2

(c) D_{in}, S_0, S_1, S_2 (d) D_{in}, S_2, S_0, S_1

Ans. **(d)**

End of Solution

■■■■