



GATE 2022 General Aptitude (GA)

Q.1 – Q.5 Carry ONE mark each.

Q.1	Mr. X speaks Japanese Chinese.
(A)	neither / or
(B)	either / nor
(C)	neither / nor
(D)	also / but

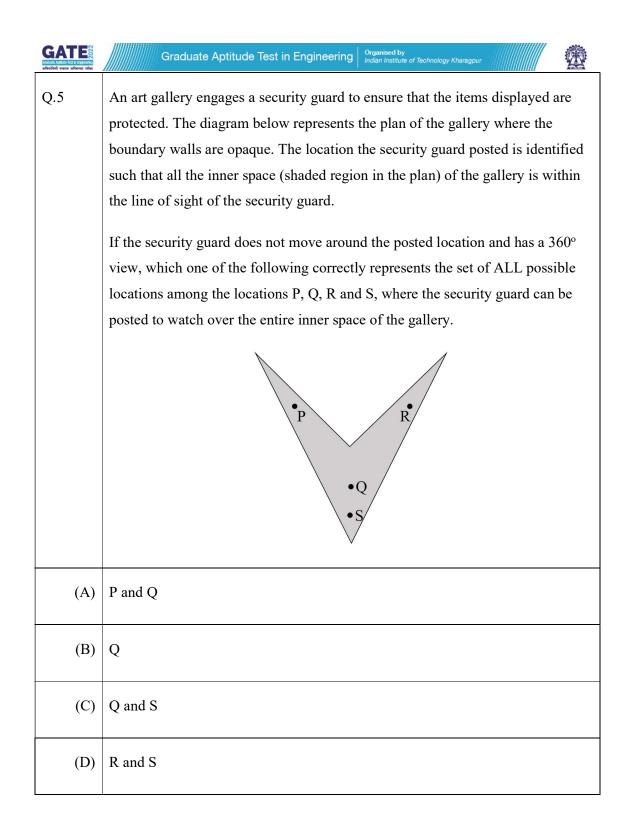
Q.2	A sum of money is to be distributed among P, Q, R, and S in the proportion 5 : 2 : 4 : 3, respectively. If R gets ₹ 1000 more than S, what is the share of Q (in ₹)?
(A)	500
(B)	1000
(C)	1500
(D)	2000

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Q.3	A trapezium has vertices marked as P, Q, R and S (in that order anticlockwise). The side PQ is parallel to side SR.
	Further, it is given that, $PQ = 11$ cm, $QR = 4$ cm, $RS = 6$ cm and $SP = 3$ cm.
	What is the shortest distance between PQ and SR (in cm)?
(A)	1.80
(B)	2.40
(C)	4.20
(D)	5.76



Q.4	The figure shows a grid formed by a collection of unit squares. The unshaded
	unit square in the grid represents a hole.
	\leftarrow \rightarrow What is the maximum number of squares without a "hole in the interior" that can be formed within the 4 × 4 grid using the unit squares as building blocks?
(A)	15
(B)	20
(C)	21
(D)	26







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Q. 6 – Q. 10 Carry TWO marks each.

Q.6	Mosquitoes pose a threat to human health. Controlling mosquitoes using chemicals may have undesired consequences. In Florida, authorities have used genetically modified mosquitoes to control the overall mosquito population. It remains to be seen if this novel approach has unforeseen consequences. Which one of the following is the correct logical inference based on the information in the above passage?
(A)	Using chemicals to kill mosquitoes is better than using genetically modified mosquitoes because genetic engineering is dangerous
(B)	Using genetically modified mosquitoes is better than using chemicals to kill mosquitoes because they do not have any side effects
(C)	Both using genetically modified mosquitoes and chemicals have undesired consequences and can be dangerous
(D)	Using chemicals to kill mosquitoes may have undesired consequences but it is not clear if using genetically modified mosquitoes has any negative consequence





Q.7	Consider the following inequalities. (i) $2x - 1 > 7$ (ii) $2x - 9 < 1$ Which one of the following expressions below satisfies the above two inequalities?
(A)	$x \leq -4$
(B)	$-4 < x \le 4$
(C)	4 < x < 5
(D)	$x \ge 5$

Q.8	Four points P(0, 1), Q(0, -3), R(-2 , -1), and S(2 , -1) represent the vertices of a quadrilateral.
	What is the area enclosed by the quadrilateral?
(A)	4
(B)	$4\sqrt{2}$
(C)	8
(D)	8√2





Q.9	In a class of five students P, Q, R, S and T, only one student is known to have copied in the exam. The disciplinary committee has investigated the situation and recorded the statements from the students as given below.
	Statement of P: R has copied in the exam.
	Statement of Q: S has copied in the exam.
	Statement of R: P did not copy in the exam.
	Statement of S: Only one of us is telling the truth.
	Statement of T: R is telling the truth.
	The investigating team had authentic information that S never lies.
	Based on the information given above, the person who has copied in the exam is
(A)	R
(B)	Р
(C)	Q
(D)	Т





Q.10	Consider the following square with the four corners and the center marked as P, Q, R, S and T respectively.
	Let X, Y and Z represent the following operations:
	X: rotation of the square by 180 degree with respect to the S-Q axis.
	Y: rotation of the square by 180 degree with respect to the P-R axis.
	Z: rotation of the square by 90 degree clockwise with respect to the axis perpendicular, going into the screen and passing through the point T.
	Consider the following three distinct sequences of operation (which are applied in the left to right order).
	(1) XYZZ
	(2) XY (3) ZZZZ
	Which one of the following statements is correct as per the information provided above?
(A)	The sequence of operations (1) and (2) are equivalent
(B)	The sequence of operations (1) and (3) are equivalent
(C)	The sequence of operations (2) and (3) are equivalent
(D)	The sequence of operations (1), (2) and (3) are equivalent

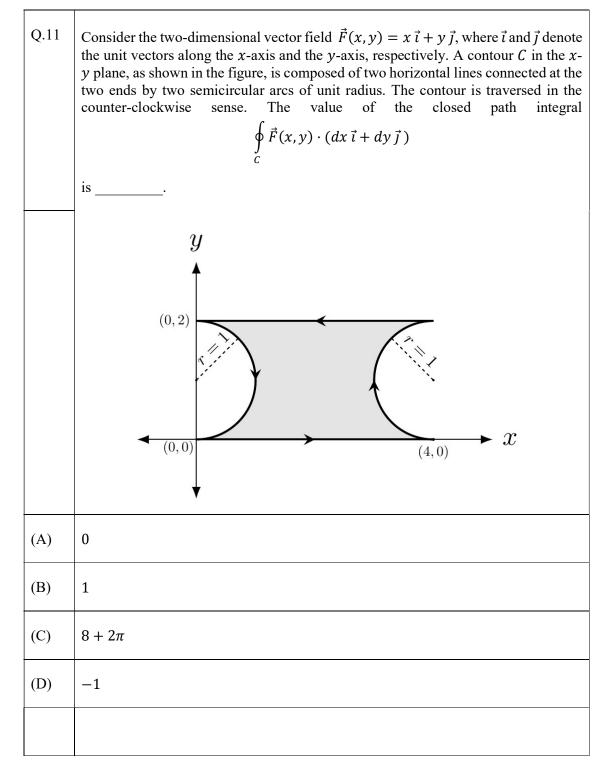




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GATE 2022 Electronics and Communications Engineering (EC)

Q.11 – Q.35 Carry ONE mark Each





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Q.12	Consider a system of linear equations $Ax = b$, where
	$A = \begin{bmatrix} 1 & -\sqrt{2} & 3 \\ -1 & \sqrt{2} & -3 \end{bmatrix}, b = \begin{bmatrix} 1 \\ 3 \end{bmatrix}.$
	This system of equations admits
(A)	a unique solution for x
(B)	infinitely many solutions for x
(C)	no solutions for x
(D)	exactly two solutions for x



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Q.13	The current <i>I</i> in the circuit shown is $ \begin{array}{c} $		
(A)	1.25×10^{-3} A		
(B)	0.75×10^{-3} A		
(C)	-0.5×10^{-3} A		
(D)	1.16×10^{-3} A		





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Q.14	Consider the circuit shown in the figure. The current <i>I</i> flowing through the 10 Ω resistor is
	$\begin{array}{c} 1 \Omega \\ + \\ 3 V \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\$
(A)	1 A
(B)	0 A
(C)	0.1 A
(D)	-0.1 A





Q.15	The Fourier transform $X(j\omega)$ of the signal $x(t) = \frac{t}{(1+t^2)^2}$
	is
(A)	$\frac{\pi}{2j}\omega e^{- \omega }$
(B)	$\frac{\pi}{2}\omega e^{- \omega }$
(C)	$\frac{\pi}{2j}e^{- \omega }$
(D)	$\frac{\pi}{2}e^{- \omega }$



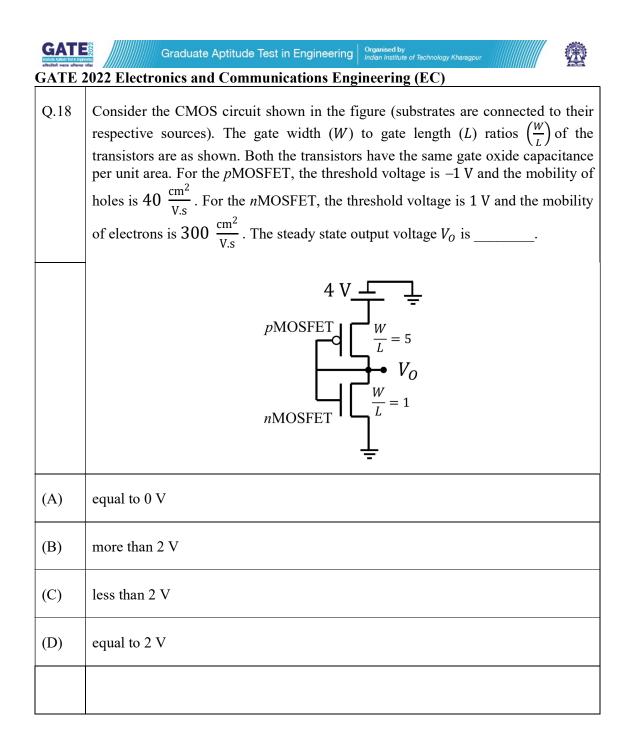


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Q.16	Consider a long rectangular bar of direct bandgap <i>p</i> -type semiconductor. The equilibrium hole density is 10^{17} cm ⁻³ and the intrinsic carrier concentration is 10^{10} cm ⁻³ . Electron and hole diffusion lengths are 2 μ m and 1 μ m, respectively.		
	The left side of the bar $(x = 0)$ is uniformly illuminated with a laser having photon energy greater than the bandgap of the semiconductor. Excess electron-hole pairs are generated ONLY at $x = 0$ because of the laser. The steady state electron density at $x = 0$ is 10^{14} cm ⁻³ due to laser illumination. Under these conditions and ignoring electric field, the closest approximation (among the given options) of the steady state electron density at $x = 2 \mu m$, is		
(A)	$0.37 \times 10^{14} \mathrm{cm}^{-3}$		
(B)	$0.63 \times 10^{13} \text{ cm}^{-3}$ $3.7 \times 10^{14} \text{ cm}^{-3}$ 10^{3} cm^{-3}		
(C)			
(D)			





Q.17	In a non-degenerate bulk semiconductor with electron density $n = 10^{16} \text{ cm}^{-3}$, the value of $E_C - E_{Fn} = 200 \text{ meV}$, where E_C and E_{Fn} denote the bottom of the conduction band energy and electron Fermi level energy, respectively. Assume thermal voltage as 26 meV and the intrinsic carrier concentration is 10^{10} cm^{-3} . For $n = 0.5 \times 10^{16} \text{ cm}^{-3}$, the closest approximation of the value of $(E_C - E_{Fn})$, among the given options, is
(A)	226 meV
(B)	174 meV
(C)	218 meV
(D)	182 meV





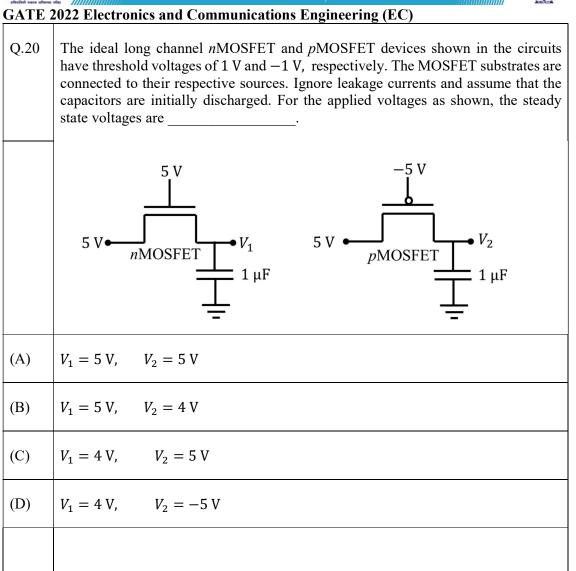


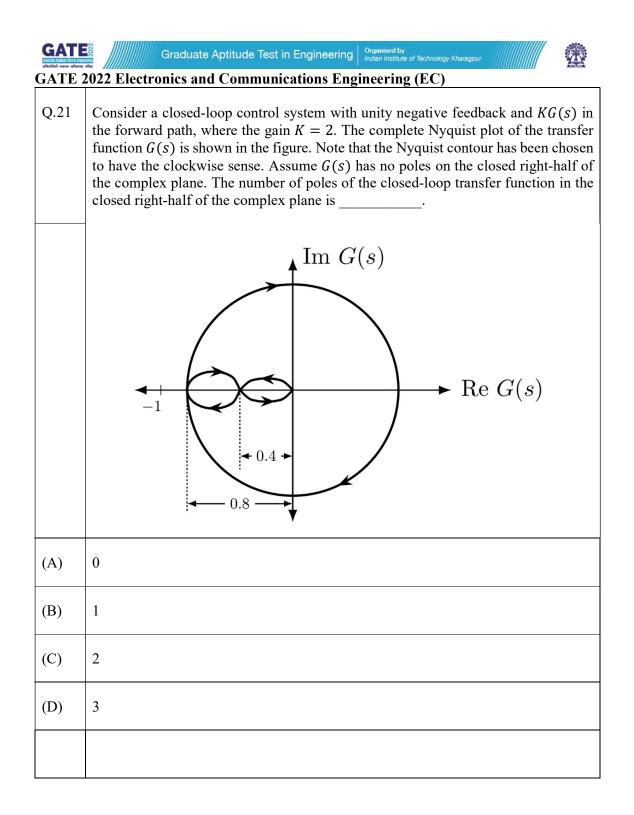
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Q.19	Consider the 2-bit multiplexer (MUX) shown in the figure. For OUTPUT to be the XOR of C and D, the values for A_0 , A_1 , A_2 , and A_3 are	
	$A_{0} \longrightarrow 0$ 1 2 $A_{2} \longrightarrow 2$ $A_{3} \longrightarrow C$ C D $A_{0} \longrightarrow 0$ D	
(A)	$A_0 = 0, \ A_1 = 0, \ A_2 = 1, \ A_3 = 1$	
(B)	$A_0 = 1, \ A_1 = 0, \ A_2 = 1, \ A_3 = 0$	
(C)	$A_0 = 0, \ A_1 = 1, \ A_2 = 1, \ A_3 = 0$	
(D)	$A_0 = 1, \ A_1 = 1, \ A_2 = 0, \ A_3 = 0$	



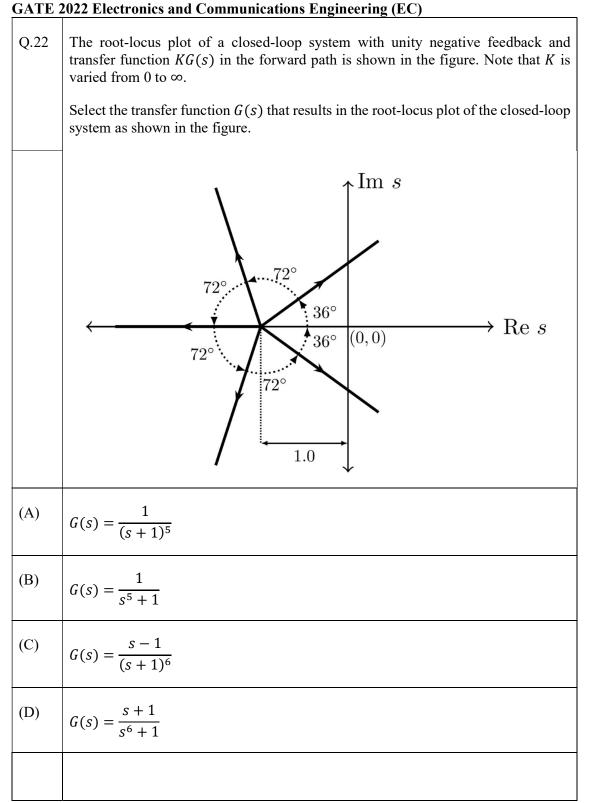






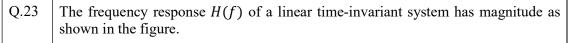








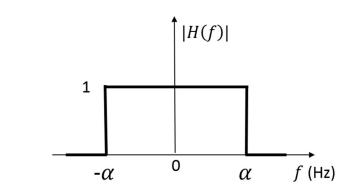




Statement I: The system is necessarily a pure delay system for inputs which are bandlimited to $-\alpha \le f \le \alpha$.

Statement II: For any wide-sense stationary input process with power spectral density $S_X(f)$, the output power spectral density $S_Y(f)$ obeys $S_Y(f) = S_X(f)$ for $-\alpha \le f \le \alpha$.

Which one of the following combinations is true?



(A)	Statement I is correct, Statement II is correct
(B)	Statement I is correct, Statement II is incorrect
(C)	Statement I is incorrect, Statement II is correct
(D)	Statement I is incorrect, Statement II is incorrect



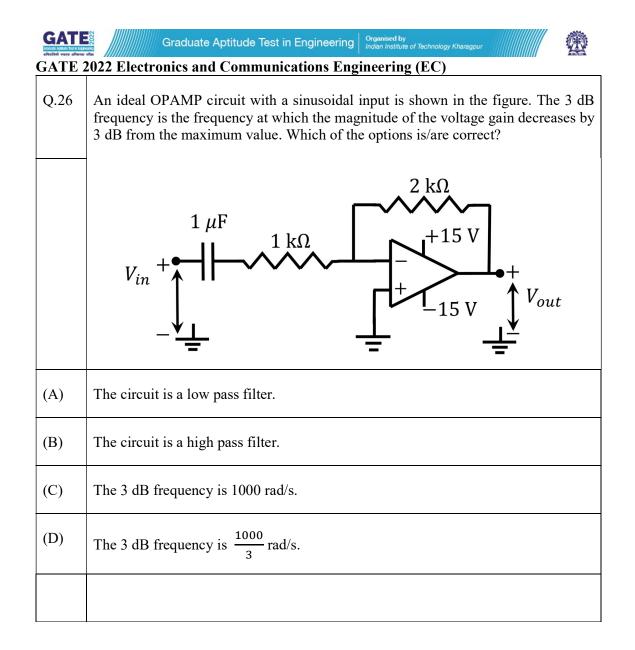


Q.24	In a circuit, there is a series connection of an ideal resistor and an ideal capacitor. The conduction current (in Amperes) through the resistor is $2\sin(t + \pi/2)$. The displacement current (in Amperes) through the capacitor is
(A)	$2\sin(t)$
(B)	$2\sin(t+\pi)$
(C)	$2\sin(t+\pi/2)$
(D)	0





Q.25	Consider the following partial differential equation (PDE)		
$a\frac{\partial^2 f(x,y)}{\partial x^2} + b\frac{\partial^2 f(x,y)}{\partial y^2} = f(x,y),$ where <i>a</i> and <i>b</i> are distinct positive real numbers. Select the combination of the real parameters ξ and η such that $f(x,y) = e^{(\xi x + -)}$ is a solution given PDE.			
(A)	$\xi = \frac{1}{\sqrt{2a}} , \ \eta = \frac{1}{\sqrt{2b}}$		
(B)	$\xi = \frac{1}{\sqrt{a}} , \ \eta = 0$		
(C)	$\xi = 0$, $\eta = 0$		
(D)	$\xi = \frac{1}{\sqrt{a}} , \ \eta = \frac{1}{\sqrt{b}}$		







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Q.27		
Q.27	Select the Boolean function(s) equivalent to $x + yz$, where x, y , and z are Boolean variables, and + denotes logical OR operation.	
(A)	x + z + xy	
(B)	(x+y)(x+z)	
(C)	x + xy + yz	
(D)	x + xz + xy	
Q.28	Select the correct statement(s) regarding CMOS implementation of NOT gates.	
(A)	Noise Margin High (NM_H) is always equal to the Noise Margin Low (NM_L) , irrespective of the sizing of transistors.	
(B)	Dynamic power consumption during switching is zero.	
(C)	For a logical high input under steady state, the n MOSFET is in the linear regime of operation.	
(D)	Mobility of electrons never influences the switching speed of the NOT gate.	



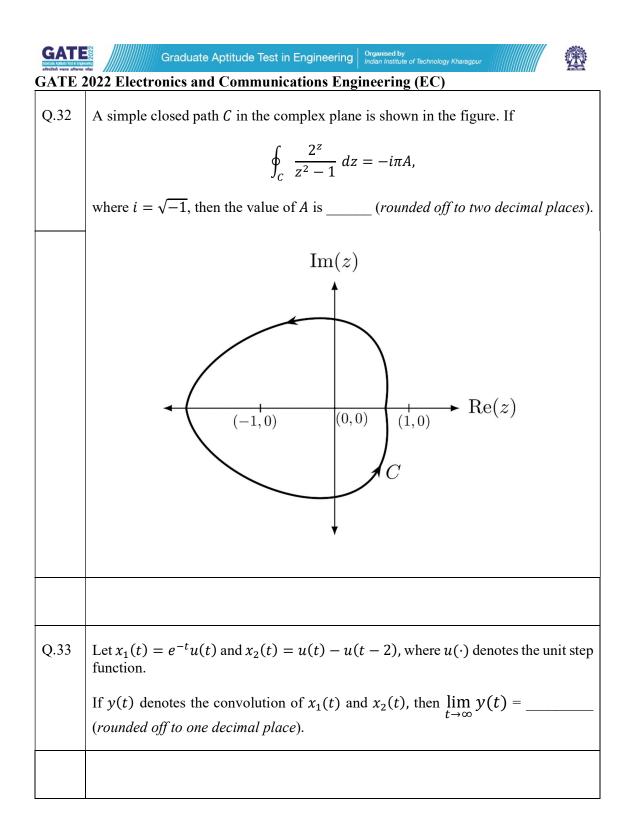


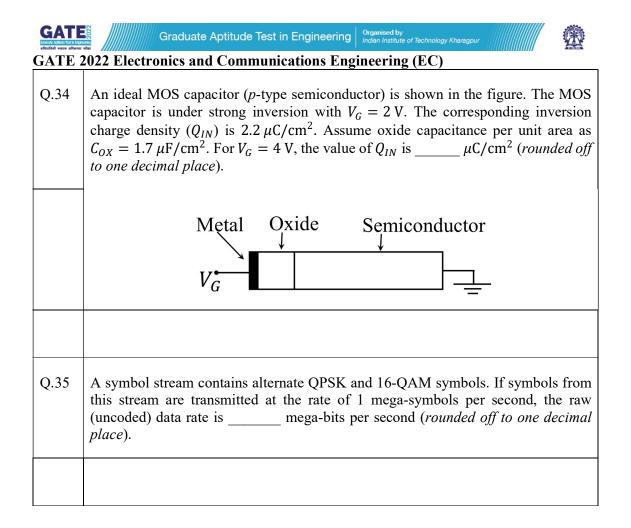
GATE 2022 Electronics and Communications Engineering (EC)			
Let $H(X)$ denote the entropy of a discrete random variable X taking K possible distinct real values. Which of the following statements is/are necessarily true?			
$H(X) \leq \log_2 K$ bits			
$H(X) \le H(2X)$			
$H(X) \le H(X^2)$			
$H(X) \le H(2^X)$			
Consider the following wave equation,			
$\frac{\partial^2 f(x,t)}{\partial t^2} = 10000 \frac{\partial^2 f(x,t)}{\partial x^2}$			
Which of the given options is/are solution(s) to the given wave equation?			
$f(x,t) = e^{-(x-100t)^2} + e^{-(x+100t)^2}$			
$f(x,t) = e^{-(x-100t)} + 0.5e^{-(x+1000t)}$			
$f(x,t) = e^{-(x-100t)} + \sin(x+100t)$			
$f(x,t) = e^{j100\pi(-100x+t)} + e^{j100\pi(100x+t)}$			





GATE 2022 Electronics and Communications Engineering (EC) Q.31 The bar graph shows the frequency of the number of wickets taken in a match by a bowler in her career. For example, in 17 of her matches, the bowler has taken 5 wickets each. The median number of wickets taken by the bowler in a match is ___ (rounded off to one decimal place). $\mathbf{2}$ $\mathbf{2}$ Number of wickets in a match









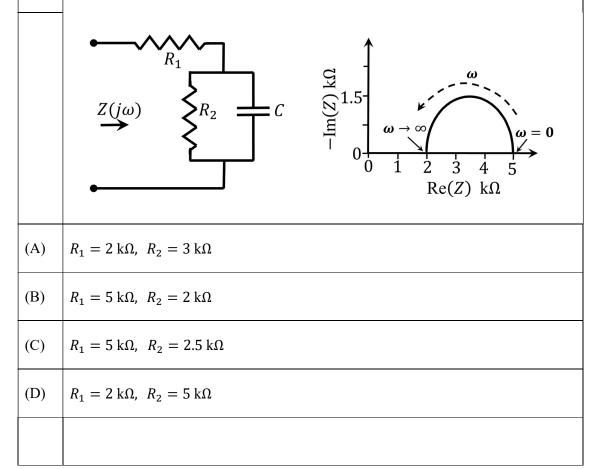
GATE 2022 Electronics and Communications Engineering (EC) Q.36 – Q.65 Carry TWO marks Each

Q.36	The function $f(x) = 8 \log_e x - x^2 + 3$ attains its minimum over the interval [1, e] at $x = $						
	(Here $\log_e x$ is the natural logarithm of <i>x</i> .)						
(A)	2						
(B)	1						
(C)	е						
(D)	$\frac{1+e}{2}$						
Q.37	Let α , β be two non-zero real numbers and v_1 , v_2 be two non-zero real vectors of size 3×1 . Suppose that v_1 and v_2 satisfy $v_1^T v_2 = 0$, $v_1^T v_1 = 1$, and $v_2^T v_2 = 1$. Let A be the 3×3 matrix given by:						
	$A = \alpha v_1 v_1^T + \beta v_2 v_2^T$						
	The eigenvalues of A are						
(A)	0, α, β						
(B)	$0, \ \alpha + \beta, \ \alpha - \beta$						
(C)	$0, \frac{\alpha+\beta}{2}, \sqrt{\alpha\beta}$						
(D)	$0, 0, \sqrt{\alpha^2 + \beta^2}$						





Q.38 For the circuit shown, the locus of the impedance $Z(j\omega)$ is plotted as ω increases from zero to infinity. The values of R_1 and R_2 are:







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Q.39	Consider the circuit shown in the figure with input $V(t)$ in volts. The sinusoidal steady state current $I(t)$ flowing through the circuit is shown graphically (where t is in seconds). The circuit element Z can be								
	$V(t) = \sin(t)$ $U(t) = \sin(t)$ $U(t) = \sin(t)$ $U(t) = \sin(t)$ $U(t) = \frac{1}{\sqrt{2}} A$ $U(t) = \frac{1}{\sqrt{2}} A$ $U(t) = \frac{1}{\sqrt{2}} A$								
(A)	a capacitor of 1 F								
(B)	an inductor of 1 H								
(C)	a capacitor of $\sqrt{3}$ F								
(D)	an inductor of $\sqrt{3}$ H								





Q.40	Consider an ideal long channel <i>n</i> MOSFET (enhancement-mode) with gate length 10 µm and width 100 µm. The product of electron mobility (μ_n) and oxide capacitance per unit area (C_{OX}) is $\mu_n C_{OX} = 1 \text{ mA/V}^2$. The threshold voltage of the transistor is 1 V. For a gate-to-source voltage $V_{GS} = [2 - \sin(2t)]$ V and drain-to-source voltage $V_{DS} = 1$ V (substrate connected to the source), the maximum value of the drain-to-source current is					
(A)	40 mA					
(B)	20 mA					
(C)	15 mA					
(D)	5 mA					





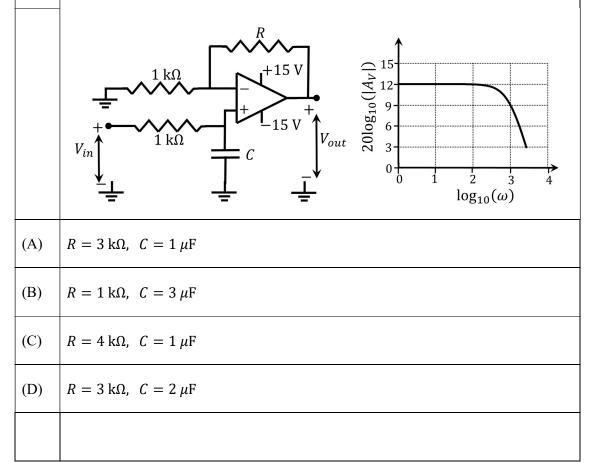
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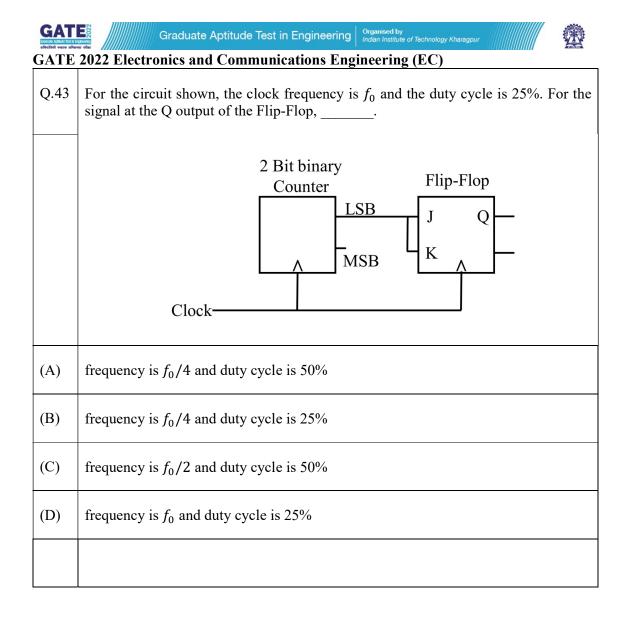
Q.41 For the following circuit with an ideal OPAMP, the difference between the maximum and the minimum values of the capacitor voltage (V_c) is _____. R V_{C+} +15 V (Wm) ²⁰ 10 С -12 V R Ŕ 0 0 V_D (V) (A) 15 V 27 V (B) (C) 13 V 14 V (D)





Q.42 A circuit with an ideal OPAMP is shown. The Bode plot for the magnitude (in dB) of the gain transfer function $(A_V(j\omega) = V_{out}(j\omega)/V_{in}(j\omega))$ of the circuit is also provided (here, ω is the angular frequency in rad/s). The values of *R* and *C* are ______.





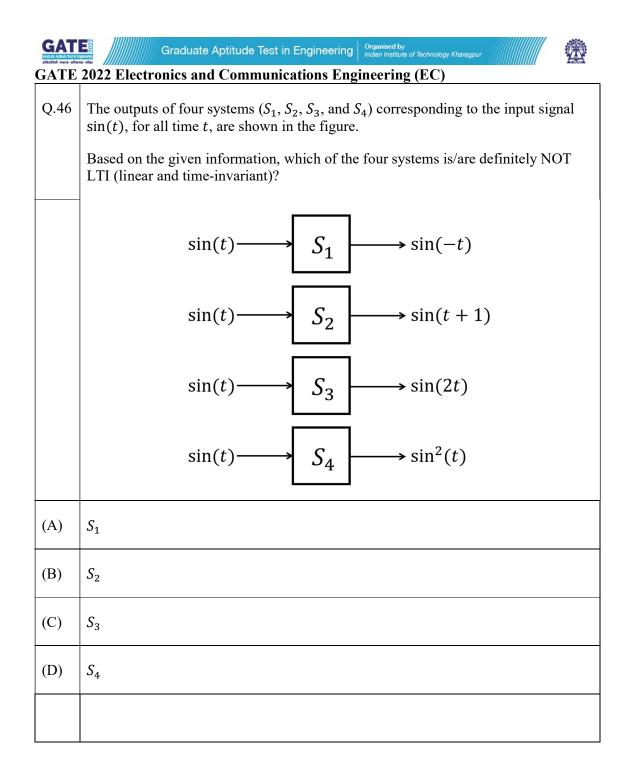


Q.44	Consider an even polynomial $p(s)$ given by					
	$p(s) = s^4 + 5s^2 + 4 + K ,$					
	where K is an unknown real parameter. The complete range of K for which $p(s)$ has all its roots on the imaginary axis is					
(A)	$-4 \le K \le \frac{9}{4}$					
(B)	$-3 \le K \le \frac{9}{2}$					
(C)	$-6 \le K \le \frac{5}{4}$					
(D)	$-5 \le K \le 0$					





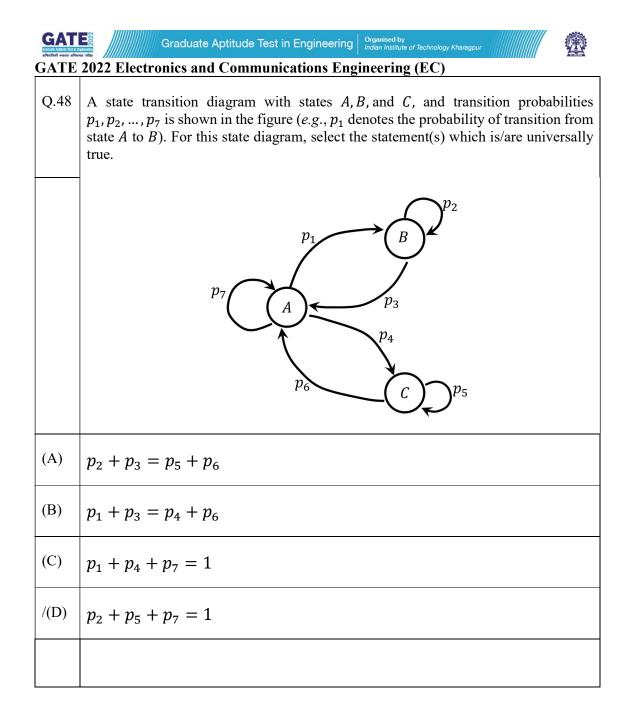
Q.45	Consider the following series: $\sum_{n=1}^{\infty} \frac{n^d}{c^n}$ For which of the following combinations of <i>c</i> , <i>d</i> values does this series converge?
	Tor which of the following combinations of <i>t</i> , <i>u</i> values does this series converge:
(A)	c = 1, d = -1
(B)	c = 2, d = 1
(C)	c = 0.5, d = -10
(D)	c = 1, d = -2





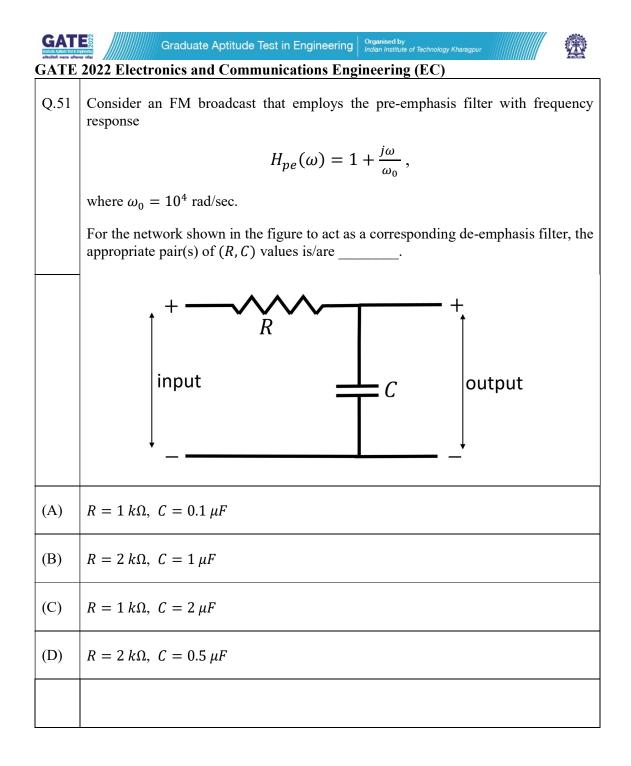


Q.47	Select the CORRECT statement(s) regarding semiconductor devices.
(A)	Electrons and holes are of equal density in an intrinsic semiconductor at equilibrium.
(B)	Collector region is generally more heavily doped than Base region in a BJT.
(C)	Total current is spatially constant in a two terminal electronic device in dark under steady state condition.
(D)	Mobility of electrons always increases with temperature in Silicon beyond 300 K.





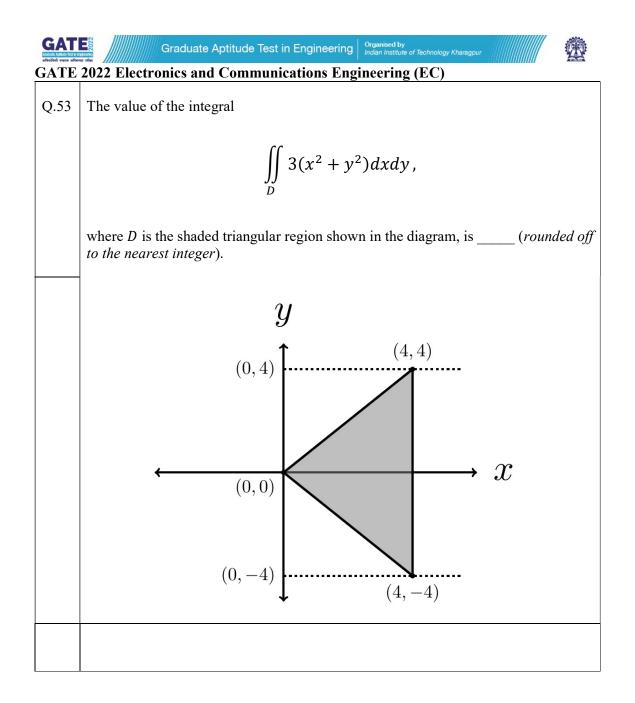
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Q.49	Consider a Boolean gate (D) where the output Y is related to the inputs A and B as, $Y = A + \overline{B}$, where + denotes logical OR operation. The Boolean inputs '0' and '1' are also available separately. Using instances of only D gates and inputs '0' and '1', 						
(A)	NAND logic can be implemented						
(B)	OR logic cannot be implemented						
(C)	NOR logic can be implemented						
(D)	AND logic cannot be implemented						
Q.50	Two linear time-invariant systems with transfer functions						
	$G_1(s) = \frac{10}{s^2 + s + 1}$ and $G_2(s) = \frac{10}{s^2 + s\sqrt{10} + 10}$						
	have unit step responses $y_1(t)$ and $y_2(t)$, respectively. Which of the following statements is/are true?						
(A)	$y_1(t)$ and $y_2(t)$ have the same percentage peak overshoot.						
(B)	$y_1(t)$ and $y_2(t)$ have the same steady-state value.						
(C)	$y_1(t)$ and $y_2(t)$ have the same damped frequency of oscillation.						
(D)	$y_1(t)$ and $y_2(t)$ have the same 2% settling time.						
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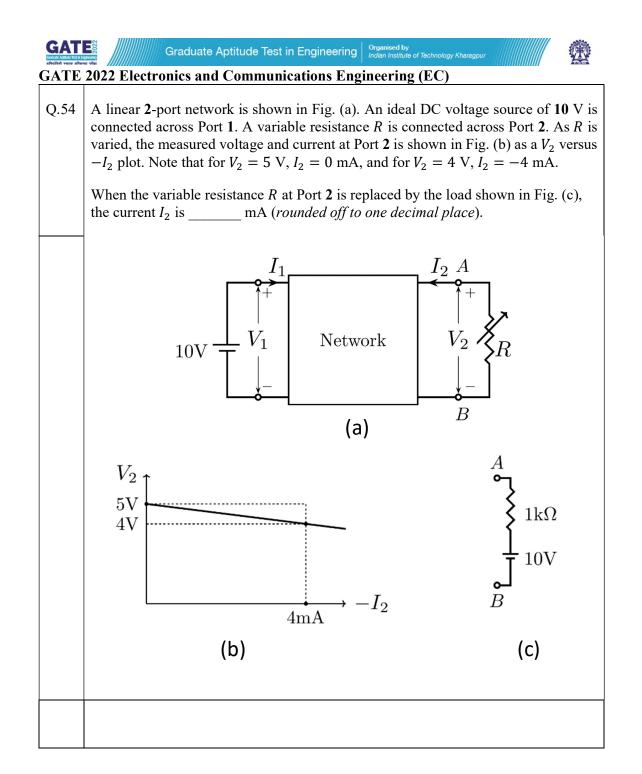






Q.52	A waveguide consists of two infinite parallel plates (perfect conductors) at a separation of 10^{-4} cm, with air as the dielectric. Assume the speed of light in air to be 3×10^8 m/s. The frequency/frequencies of TM waves which can propagate in this waveguide is/are					
(A)	$6 \times 10^{15} \text{ Hz}$					
(B)	$0.5 \times 10^{12} \text{ Hz}$					
(C)	$8 \times 10^{14} \text{ Hz}$					
(D)	1×10^{13} Hz					





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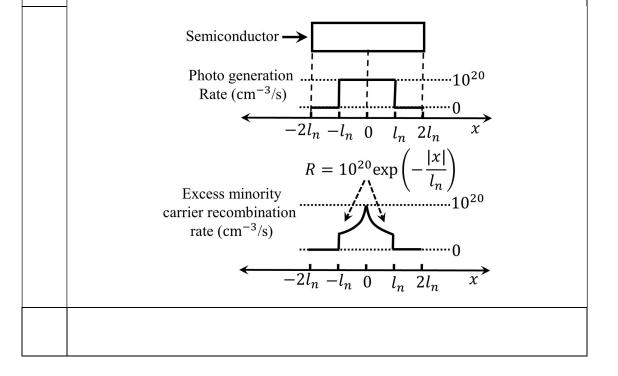


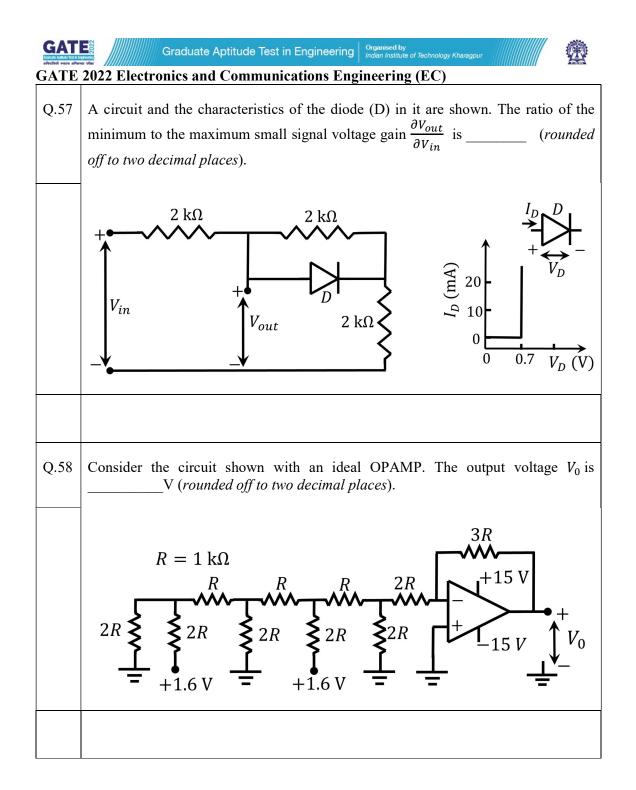
Q.55 For a vector $\overline{\mathbf{x}} = [x[0], x[1], ..., x[7]]$, the 8-point discrete Fourier transform (DFT) is denoted by $\overline{\mathbf{X}} = DFT(\overline{\mathbf{x}}) = [X[0], X[1], ..., X[7]]$, where

$$X[k] = \sum_{n=0}^{7} x[n] \exp\left(-j\frac{2\pi}{8}nk\right).$$

Here, $j = \sqrt{-1}$. If $\overline{\mathbf{x}} = [1, 0, 0, 0, 2, 0, 0, 0]$ and $\overline{\mathbf{y}} = DFT(DFT(\overline{\mathbf{x}}))$, then the value of y[0] is ______ (rounded off to one decimal place).

Q.56 A *p*-type semiconductor with zero electric field is under illumination (low level injection) in steady state condition. Excess minority carrier density is zero at $x = \pm 2l_n$, where $l_n = 10^{-4}$ cm is the diffusion length of electrons. Assume electronic charge, $q = -1.6 \times 10^{-19}$ C. The profiles of photo-generation rate of carriers and the recombination rate of excess minority carriers (*R*) are shown. Under these conditions, the magnitude of the current density due to the photo-generated electrons at $x = \pm 2l_n$ is _____ mA/cm² (rounded off to two decimal places).

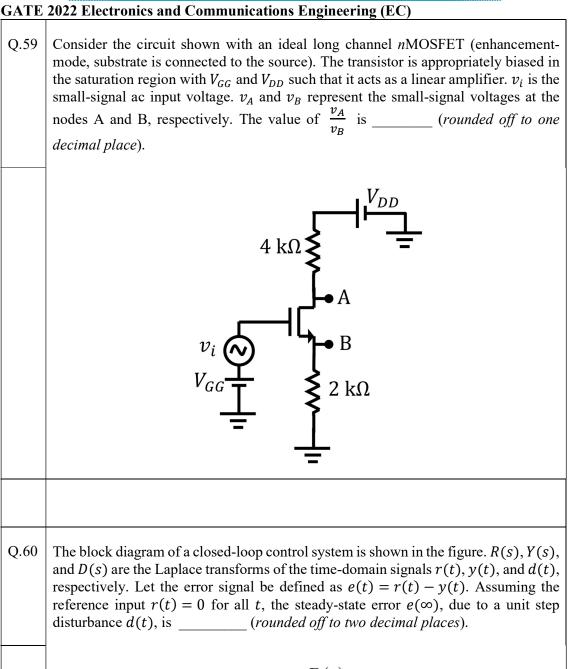


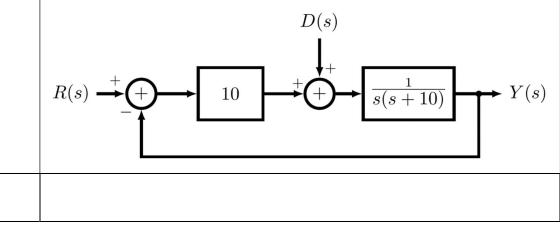


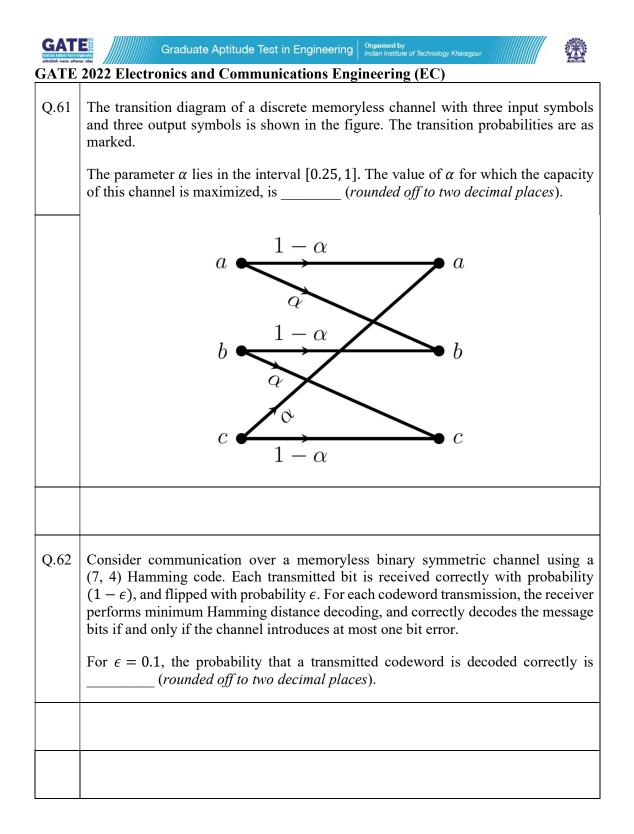




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Q.63	Consider a channel over which either symbol x_A or symbol x_B is transmitted. Let the output of the channel Y be the input to a maximum likelihood (ML) detector at the receiver. The conditional probability density functions for Y given x_A and x_B are:					
	$f_{Y x_A}(y) = e^{-(y+1)}u(y+1),$					
	$f_{Y x_B}(y) = e^{(y-1)} (1 - u(y-1)),$					
	where $u(\cdot)$ is the standard unit step function. The probability of symbol error for this system is (rounded off to two decimal places).					
Q.64	Consider a real valued source whose samples are independent and identically distributed random variables with the probability density function, $f(x)$, as shown in the figure.					
	$\int f(x)$					
	x					
	-2 0 1					
	Consider a 1 bit quantizer that maps positive samples to value α and others to value β . If α^* and β^* are the respective choices for α and β that minimize the mean square quantization error, then $(\alpha^* - \beta^*) = $ (rounded off to two decimal places).					



Q.65 | In an electrostatic field, the electric displacement density vector, \vec{D} , is given by

$$\vec{D}(x, y, z) = (x^3 \vec{\iota} + y^3 \vec{j} + xy^2 \vec{k}) \text{ C/m}^2,$$

where \vec{i} , \vec{j} , \vec{k} are the unit vectors along x-axis, y-axis, and z-axis, respectively. Consider a cubical region R centered at the origin with each side of length 1 m, and vertices at ($\pm 0.5 \text{ m}, \pm 0.5 \text{ m}, \pm 0.5 \text{ m}$). The electric charge enclosed within R is ______ C (rounded off to two decimal places).





Q. No.	Session	Question Type	Subject Name	Key/Range	Mark
1	3	MCQ	GA	С	1
2	3	MCQ	GA	D	1
3	3	MCQ	GA	В	1
4	3	MCQ	GA	В	1
5	3	MCQ	GA	С	1
6	3	MCQ	GA	D	2
7	3	MCQ	GA	С	2
8	3	MCQ	GA	С	2
9	3	MCQ	GA	В	2
10	3	MCQ	GA	В	2
11	3	MCQ	EC	A	1
12	3	MCQ	EC	С	1
13	3	MCQ	EC	В	1
14	3	MCQ	EC	В	1
15	3	MCQ	EC	A	1
16	3	MCQ	EC	A	1
17	3	MCQ	EC	С	1
18	3	MCQ	EC	C	1
19	3	MCQ	EC	С	1
20	3	MCQ	EC	C	1
21	3	MCQ	EC	C	1
22	3	MCQ	EC	A	1
23	3	MCQ	EC	С	1
24	3	MCQ	EC	C	1
25	3	MSQ	EC	A,B	1
26	3	MSQ	EC	B,C	1
27	3	MSQ	EC	B,C	1
28	3	MSQ	EC	C	1
29	3	MSQ	EC	A,B,D	1
30	3	MSQ	EC	A,C	1
31	3	NAT	EC	4.0 to 4.0	1
32	3	NAT	EC	0.50 to 0.50	1
33	3	NAT	EC	0.0 to 0.0	1
34	3	NAT	EC	5.5 to 5.7	1
35	3	NAT	EC	2.99 to 3.01	1
36	3	MCQ	EC	B	2
37	3	MCQ	EC	A	2
38	3	MCQ	EC	A	2
39	3	MCQ	EC	В	2
40	3	MCQ	EC	C	2
41	3	MCQ	EC	C	2
42	3	MCQ	EC	A	2
43	3	MCQ	EC	A	2
44	3	MCQ	EC	A	2





3	MSQ	EC	B,D	2
3	MSQ	EC	C,D	2
3	MSQ	EC	A,C	2
3	MSQ	EC	A,C	2
3	MSQ	EC	A,C	2
3	MSQ	EC	A	2
3	MSQ	EC	A	2
3	MSQ	EC	MTA	2
3	NAT	EC	512 to 512	2
3	NAT	EC	3.9 to 4.1	2
3	NAT	EC	7.9 to 8.1	2
3	NAT	EC	0.57 to 0.61	2
3	NAT	EC	0.70 to 0.80	2
3	NAT	EC	-0.55 to -0.45	2
3	NAT	EC	-2.1 to -1.9	2
3	NAT	EC	-0.11 to -0.09	2
3	NAT	EC	1.00 to 1.00	2
3	NAT	EC	0.84 to 0.86	2
3	NAT	EC	0.22 to 0.25	2
3	NAT	EC	1.15 to 1.18	2
3	NAT	EC	0.48 to 0.52	2
	3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 MSQ 3 NAT 3 <t< td=""><td>3 MSQ EC 3 NAQ EC 3 NAT EC</td><td>3 MSQ EC C,D 3 MSQ EC A,C 3 MSQ EC A 3 MSQ EC A 3 MSQ EC MSQ 3 MSQ EC MA 3 MSQ EC MSQ 3 MSQ EC MA 3 NAT EC 512 to 512 3 NAT EC 3.9 to 4.1 3 NAT EC 0.57 to 0.61 3 NAT EC 0.70 to 0.80 3 NAT EC -0.55 to -0.45 3 NAT EC -0.11 to -0.09 3 NAT EC 1.00 to 1.00 3 NAT EC 0.22 t</td></t<>	3 MSQ EC 3 NAQ EC 3 NAT EC	3 MSQ EC C,D 3 MSQ EC A,C 3 MSQ EC A 3 MSQ EC A 3 MSQ EC MSQ 3 MSQ EC MA 3 MSQ EC MSQ 3 MSQ EC MA 3 NAT EC 512 to 512 3 NAT EC 3.9 to 4.1 3 NAT EC 0.57 to 0.61 3 NAT EC 0.70 to 0.80 3 NAT EC -0.55 to -0.45 3 NAT EC -0.11 to -0.09 3 NAT EC 1.00 to 1.00 3 NAT EC 0.22 t