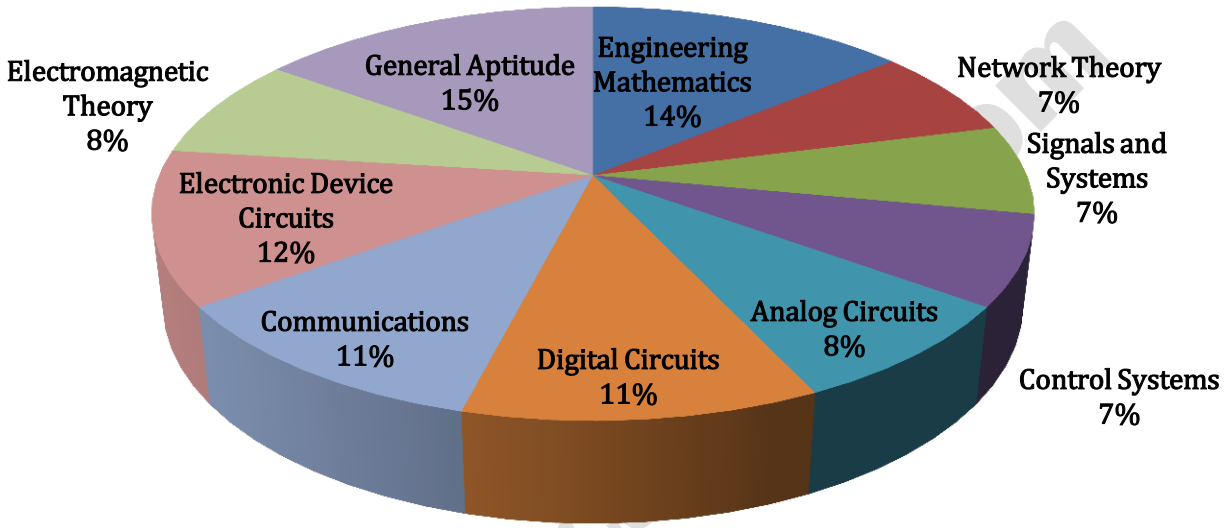
ANALYSIS OF GATE 2018* (Memory Based)

Electronics and Communication Engineering



ECE ANALYSIS-2018_10-Feb_Morning

SUBJECT	No. of Ques.	Topics Asked in Paper(Memory Based)	Level of Ques.	Total Marks
Engineering Mathematics	1 Marks: 6 2 Marks: 4	Random Variables; Partial Derivative; Taylor's Series, DOL, Eigen Values, Res Differential Equation	Tough/Easy	14
Network Theory	1 Marks: 1 2 Marks: 3	Basic Components and types of circuits; RC Circuits; RLC Circuits Two Port Networks	Easy	7
Signals and Systems	1 Marks: 3 2 Marks: 2	Linearity, Pole-zero NQ camp, FS, DFT	Easy	7
Control Systems	1 Marks: 1 2 Marks: 3	Feedback Controllers; State Space, Bode plot TD Analysis	Moderate	7
Analog Circuits	1 Marks: 2 2 Marks: 3	Operational Amplifiers ; Trans Imp Amplifier; Small Signal AM Diode; Zener Diode	Easy	8
Digital Circuits	1 Marks: 3 2 Marks: 4	FSM, CMOS, LF, MUX, FF, ROM	Moderate	11
Communications	1 Marks: 3 2 Marks: 4	AM, Binary Channel; Prob of error, Gaussian Boise HT, RV	Tough	11
Electronic Device Circuits	1 Marks: 4 2 Marks: 4	EB; Built in Potential; NMOS, CMOS, IC Fabrications; P-N Junction, Solar cell	Easy	12
Electromagnetic Theory	1 Marks: 2 2 Marks: 3	SMIT, Transmission Lines, WG, OI, SD	Easy	8
General Aptitude	1 Marks: 5 2 Marks: 5	Filling Blanks, Geometry Numbers, GP, Mixt, CI, Probability	Tough/Easy	15
Total	**65**			**100**
Faculty Feedback	Majority of the question were concept based. General Aptitude And Mathematics is Very Easy. Core Subject Questions were 50% easy, 30% medium and 20% tough.			

GATE 2018 Examination*

Electronics and Communication Engineering

Test Date: 10-Feb-2018

Test Time: 9:00 AM 12:00 PM

Subject Name: Electronics and Communication Engineering

General Aptitude

Q.1 - Q.5 Carry One Mark each.

1. "By giving him the last _____ of cake, you will ensure lasting _____ in our house today"
   (A) Peas, Piece
   (B) Piece, Peace
   (C) Peace, Piece
   (D) Peace, Peas
   [Ans. B]

2. Even though there is a vast scope for its _____ , tourism has remained a/an _____ area.
   (A) Improvement, Neglected
   (B) Rejection, Approved
   (C) Fame, Glam
   (D) Interested, Disinterested
   [Ans. A]

3. 715☐423/3, Smallest whole number ☐ is
   (A) 0
   (B) 2
   (C) 5
   (D) 6
   [Ans. *] Will update soon

4. $1+\frac{1}{4}+\frac{1}{16}+\frac{1}{64}+\frac{1}{256}+\cdots\cdots$
   (A) 2
   (B) 7/4
   (C) 3/2
   (D) 4/3
   [Ans. *] Will update soon

5. John from his earlier days has been considered as leader of the team by the cricket board. As he is quite aggressive in nature. Aggression has slowly taken toll on his game unable to make big scores. Aggression had a positive effect on the crowd which created diehard fans for him. Since last three seasons, his calculative, shrewd nature is slowly yielding success. Which of the following statements are logically inferred from above passage?
   (i) Even as a junior cricketer, John was considered a good captain.
   (ii) Finding a good captain is challenging.
   (iii) Fans and the cricket board have different views of captain.
   (iv) Over the past three seasons, John is storing big scores.
   (A) (i), (ii) and (iii)
   (B) (iii) and (iv)
   (C) (ii) and (iv)
   (D) All of the above.
   [Ans. *] Will update soon

Q.6 - Q.10 Carry Two Mark each.

6. A place x has a great biodiversity which is rich of different species. It is also full of coral reefs and sand. But the great limitation has been the remoteness of the location. One company has made a good business plan of developing the area along with Helicopter facility to nearest airport. This place can potentially become one of the great place for tourists. But the environmentalists have a feeling that, this would lead to pollution and cause damage to the biodiversity just like the fate of other beaches.
Which of the following is the logical inference of above passage?
(A) Culture and tradition of local people will be influenced by tourists.
(B) Region will be crowded and polluted by tourism.
(C) The coral reefs are on decline and would soon vanish.
(D) Helicopter connectivity would lead to increase in tourists coming to region.
[Ans. B]

7. A person 'B' wants to purchase car after 5 years for which he needs Rs.10,00,000. He thought to invest an amount in such a way that there is a compound interest of 10% annually. Find the minimum amount he needs to invest to serve the purpose.
(A) 5,00,000 (B) 6,21,000
(C) 6,66,667 (D) 7,50,000
[Ans. B]

8. A cab has done an accident and a hit and run case has been registered. Following details are provided.
(i) 85% of cabs are green and remaining is blue.
(ii) Witness identified the cab to be blue.
(iii) Witness can be correct with a chance of 80%.
What is the probability that the cab is blue?
(A) 12% (B) 15%
(C) 41% (D) 80%
[Ans. C]

9. A person is standing and his height is 1.5 meters. At a distance of 3 meters there is a lamp post. The light from lamp at the top of post cast a shadow such that length of shadow is twice the height of person. The height of lamp post is?
(A) 1.5 meters (B) 3 meters
(C) 4.5 meters (D) 6 meters
[Ans. B]

10. 'A' and 'B' alloys which contain gold and copper in ratio 2:3 and 3:7 by mass respectively. Equal masses of alloys 'A 'and 'B' are molted to make alloy 'C'. Find the ratio of gold to copper in alloy 'C'
(A) 5:10 (B) 7:13
(C) 6:11 (D) 9:13
[Ans. B]

Technical

1. M is a 4 × 4 matrix below are a few statements related to M
S1: M has 4 linear eigen vectors
S2: M has 4 distinct eigen vectors
S3: M is non-singular(invertible)
(A) S1 implies S2
(B) S1 implies S3
(C) S2 implies S1
(D) S3 implies S2
[Ans. A]

2. $F(x,y) = \frac{ax^2+by^2}{xy}$ and $\frac{\partial f}{\partial x} = \frac{\partial f}{\partial y}$ $(x = 1; y = 2)$
The relation between a and b is
(A) $a = b/4$
(B) $a = b/2$
(C) $a = 2b$
(D) $a = 4b$
[Ans. D]

3. The matrix $A = \begin{bmatrix} k & 2k \\ k^2 - k & k^2 \end{bmatrix}$ and $X = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ and $AX = 0$. Given that infinite solutions are possible, the number of distinct values of k are _____?
[Ans. 2]

4. For functions $r = x + y + z$ and $z^3 - xy + yz + y^3 = 1$; x and y are independent variables
$\frac{\partial r}{\partial x} =$ _____ [2 Decimals] for $(x = 2, y = -1, 1)$
[Ans. *] Will update soon

5. The Differential equation $\frac{d^2y}{dt^2} = -\frac{dy}{dt} - \frac{5y}{4}$ with initial conditions $y(0) = 1$, $\frac{dy}{dt}\Big|_{t=0}$ 'y' indicates position of the particle with respect to time. Position of particle at $t = \pi$ is _____?
[Ans. *] Will update soon

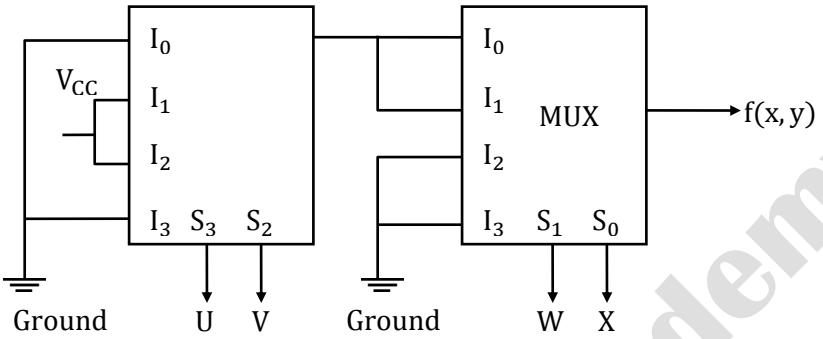
6. x_1, x_2, x_3 and x_4 are independent random variable satisfying normal distribution with mean '0' and variance '1'. The probability that x_4 is smallest is_____
[Ans. *] Will update soon

7. A system with unity feedback system has open loop transfer function
$G(s) = \frac{k}{s(s+2)}$
If the resonant peak M_r is equal to 2, then the value of Gain k is_____
[Ans. *]Will update soon

8. The Nyquist criteria and Routh –Hurwitz method in control system are generally used to control stability of a system, which of the following statement is correct?
(A) Both are used to find range of gain k for relative stability
[Ans. *]Will update soon

9. A SOP representation of a digital system is
$f(x) = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C}$
The representation of the above Boolean expression in POS term is
(A) $(\bar{A} + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})(\bar{A} + B + C)$
(B) $(\bar{A} + B + \bar{C})(A + B + C)(\bar{A} + \bar{B} + C)$
(C) $(A + B + \bar{C})(A + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})(\bar{A} + \bar{B} + C)(\bar{A} + \bar{B} + \bar{C})$
(D) $(\bar{A} + B + \bar{C})(A + \bar{B} + C)(\bar{A} + \bar{B} + C)(A + \bar{B} + C)(\bar{A} + \bar{B} + \bar{C})$
[Ans. C]

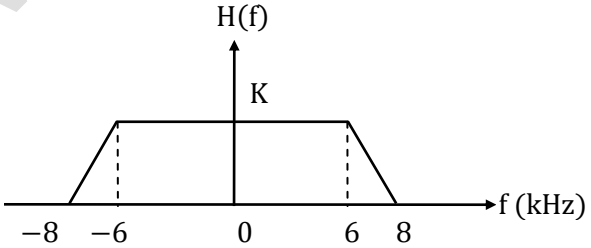
10. The output f(x, y) of the MUX is



(A) $\bar{W}(UV + \bar{U}\bar{V})$ (B) $W(UV + \bar{U}\bar{V})$
(C) $\bar{W}(U\bar{V} + \bar{U}V)$ (D) $W(U\bar{V} + \bar{U}V)$
[Ans. C]

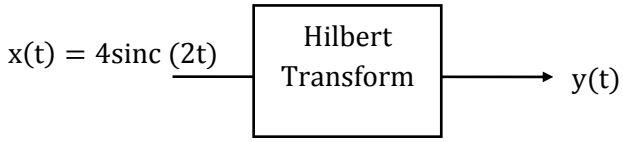
11. The Fourier series representing of a signal continuous time signal is
$$X(t) = \sum_{k=-\infty}^{\infty} a_k e^{+\frac{j2\pi}{T}nt}$$
The fundamental time period of the signal x(t) is $T = 10$
If the fundamental time period of signal y(t) is $T' = 40$ and the $\sum_{k=-\infty}^{\infty} |a_k| = 16$ then the Fourier series coefficient of y(t) signal is
(A) 64 (B) 32
(C) 16 (D) 4
[Ans. C]

12. A continuous time modulating signal has bandwidth is equal to 5 kHz .The magnitude of impulse response H(f) is 'K' as shown below
The minimum sampling rate (f_s) in kHz to reconstructed the original signal x(t) is



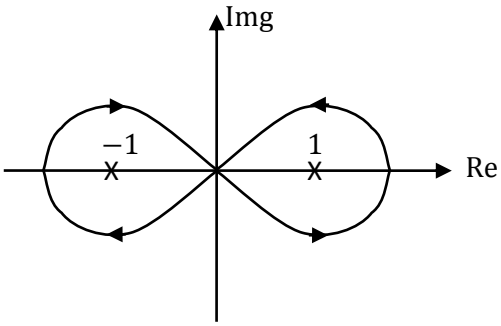
[Ans. 13]

13. A continuous time signal x(t) is applied to Hilbert transform as shown below
$x(t) = 4\,\text{sinc}\,(2t)$
The value of $\int_{-\infty}^{\infty}|y(t)|^2$ is



[Ans. *]Will update soon

14. The complex variable representation in shown in figure when $\sqrt{-1} = j$



The value of $\frac{1}{\pi j}\oint \frac{1}{z^2-1}dz$ is _____

[Ans. 0]

15. The state space representation of a system is
$\dot{x} = \begin{bmatrix}-4 & -1.5\\ 4 & 0\end{bmatrix}x + \begin{bmatrix}2\\0\end{bmatrix}u$
$y = [1.5 \quad 0.625]x$
The transfer function of system is

(A) $\frac{3s+5}{s^2+4s+6}$ (B) $\frac{1.5s+0.625}{s^2+4s+6}$

(C) $\frac{5s+3}{s^2+4s+6}$ (D) $\frac{1.5s+3}{s^2+4s+6}$

[Ans. A]

16. Four equations of a continuous time systems are mention below. Which of the following is a Non-linear system

(A) $\frac{d^3y(t)}{dt^3}+\frac{2d^2y(t)}{dt^2}+y_1(t)=\frac{2d^2u(t)}{dt^2}+4\frac{du}{dt}+8\,u(t)$

(B) $\frac{d^2y(t)}{dt^2}+\frac{4dy(t)}{dt}=\frac{2u(t)}{dt}+u(t)$

(C) $y(t) = au(t) + b$ where $b \neq 0$

(D) $y(t) = \int_{\infty}^{\tau} u(\tau)d\tau$

[Ans. C]

17. For a differential Equation $\frac{dy}{dx} = \frac{x^2+y^2}{2y} + \frac{y}{x}$. A point P(1, 0) satisfies differential equation. The equation of the curve is

(A) $\ln\left[1+\frac{y^2}{x^2}\right] = x-1$

(B) $\frac{1}{2}\ln\left[1+\frac{y^2}{x^2}\right] = x-1$

(C) $\ln\left[1+\frac{y}{x}\right] = x-1$

(D) $\frac{1}{2}\ln\left[1+\frac{y}{x}\right] = x-1$

[Ans. A]

18. The function $P(s) = s^3 + a_2s^2 + a_1s + a_0$. The derivative $P'(s)$ has no real root. The number of real roots of P(s) are

(A) 0

(B) 1

(C) 2

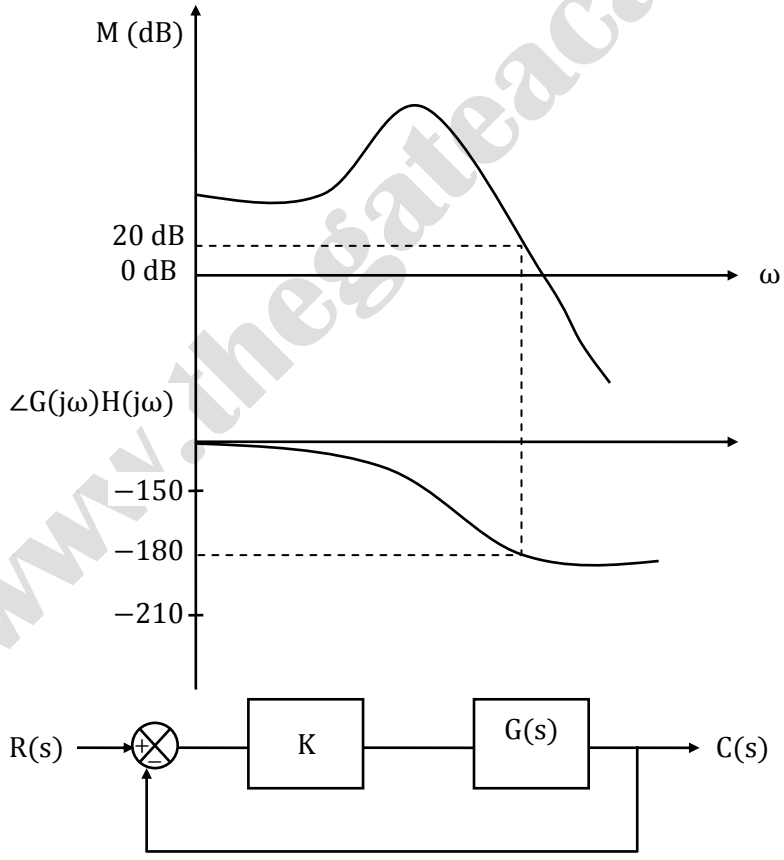
(D) 3

[Ans. *] Will update soon

19. $f(x) = \int_0^x e^{-t^2/2}\,dt$. The Taylor series expansion of f(x) around x = 0 is given by $f(x) = a_0 + a_1x + a_2x^2 + \ldots$. The value of a_2 is _____ [Accuracy 2 decimals]

[Ans. 0]

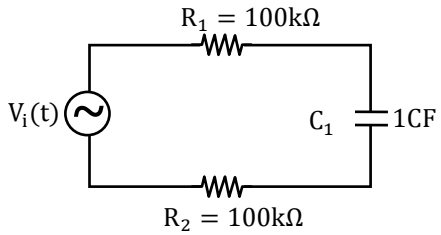
20. Bode plot of stable system is shown below. $G(s) = \frac{a_0}{s^3+a_1s^2+a_0s+b_0}$



[Ans. *] Will update soon

21. A unity feedback is applied to a system, if the feedback system is stable for $k<k_o$,then the maximum value of k_o is _____
[Ans. *] Will update soon

22. The electric network is shown below $R_1 = R_2 = 100\ k\Omega$



$V_i(t) = 5 \sin [5t]$
The voltage across capacitor (V_c) is
(A) $1.25\ \sqrt{2} \sin [5t - 0.25\ \pi]$
(B) $1.25\ \sqrt{2} \sin [5t - 0.125\pi$
(C) $2.5\ \sqrt{2} \sin [5t - 0.25\pi]$
(D) $2.5\sqrt{2} \sin [5t - 0.125\ \pi]$
[Ans. C]

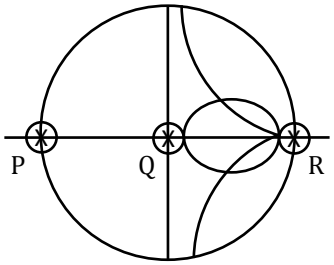
23. The characteristic of ideal trans impedance circuit is
(A) Low input impedance and high output impedance
(B) Low input impedance and low output impedance
(C) High input impedance and low output impedance
(D) High input impedance and high output impedance
[Ans. *] Will update soon

24. For a transmission line resistance per unit length $R = 0.05\ \Omega/m$ and characteristic impedance $Z_o = 50\ \Omega$. The Attenuation constant (in Np/m) is _____?
[Ans. 0.001]

25. For a rectangular wave guide with dimensions 'a' and 'b' such that a>b. The cut off frequency of TE_{01} is twice that of TE_{10}. The frequency of operation is 25% greater that the cut off frequency. If the guide wave length is 4 cm, the value of b is _____ (Accuracy 2 decimal points)
[Ans. *] Will update soon

26. The distance in m/a wave has to propagate in a medium having skin depth $\delta = 0.1$ m so that the amplitude of wave attenuates by 20 dB is?
(A) 0.12
(B) 0.23
(C) 0.46
(D) 2.3
[Ans. *] Will update soon

27. For Smith Chart as shown:



Which of the following about P, Q and R satisfies?

(A) P: Open Circuit, Q: Short Circuit ,R: Matched load

(B) P: Short Circuit, Q: Matched Circuit, R: Open Circuit

(C) P: Open Circuit, Q: Matched load, R: Short Circuit

(D) P: Short Circuit, Q: Open Circuit, R: Matched load.

[Ans. C]

28. For a amplitude modulated signal $\delta(t) - \cos(2000\pi t) + 4\cos(2400\pi t) + \cos(2800\,\pi t)$. The ratio of power in message signal to that of carrier power is _____?

[Ans. 0.25]

29. Binary channel code in which each code word has fixed length of 5 bit. The hamming distance between any pair of distinct code words in this code is atleast 2. The maximum number of code words such a code can contain is _____?

[Ans. 16]

30. A random variable 'x' takes values -0.5 to 0.5 with probability $\frac{1}{4}$ and $\frac{3}{4}$ respectively. $y = x + z$ with x and z being independent and z is uniformly distributed $Z\epsilon(-1,1)$ by MAP rule based output $\hat{x}$

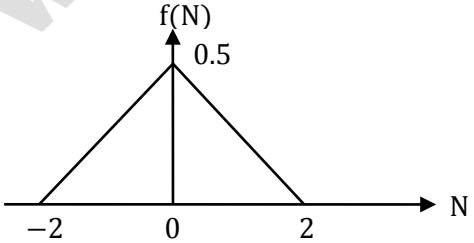
$\hat{x} = -0.5 \quad y < \alpha$

$= 0.5 \quad y > \alpha$

The value of α is _____ (accuracy 2 decimal)

[Ans. *] Will update soon

31. Binary source generator symbols 'x' in the interval of $[-1,1]$ are transmitted over a noisy channel. The probability of transmission for $x = 1$ is 0.5. Input to the threshold detector is $R = X + N$. The probability density function f_N of noise is as shown in figure



If the detection threshold is zero, the probability of error is _____ (2 decimal)

[Ans. 0.875]

32. $C(t) = A_C \cos(2\pi f_c t)$ and $m(t) = \cos(2\pi f_m t)$ are carrier and message signals respectively such that $f_c \gg 5f_m$. The signal $C(t) + m(t)$ is applied to a non-linear device. $V_o(t)$ is output and $V_i(t)$ is input such that $v_o(t) = a\, v_i(t) + b v_i^2(t)$ with a and b positive constants. Output is passed through band pass filter (BPF) with center frequency f_c and bandwidth $3f_m$ of amplitude modulated wave. If power of side band is half the carrier power the ratio of a to b is _____?

(A) 0.25 (B) 0.5
(C) 1 (D) 2

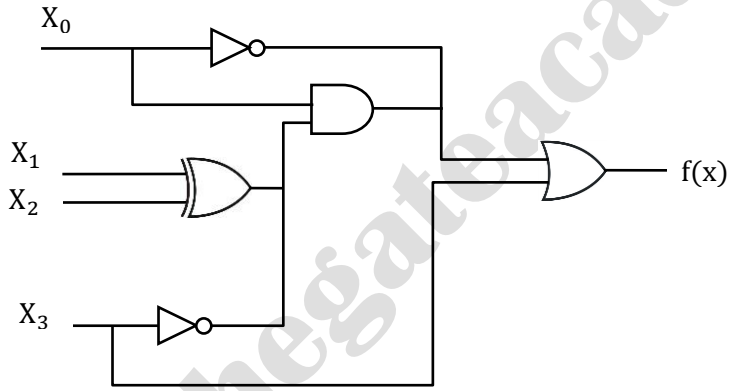
[Ans. *] Will update soon

33. Consider a white Gaussian noise process N(t) with two sided power spectral density $S_N(t) = 0.5$ Watt/Hz as input to filter $h(t) = 0.5\, e^{-t^2/2}$ resulting y(t). The power in y(t) is _____?

(A) 0.11 (B) 0.22
(C) 0.33 (D) 0.44

[Ans. *] Will update soon

34. A logic circuit diagram is shown below .Some logic gates are wired logic and only high when the output of other logic gates are high.



The number of distinct value of $X_0\ X_1\ X_2\ X_3$ for which output f(x) is remain 1 are _____

[Ans. *]Will update soon