ACE
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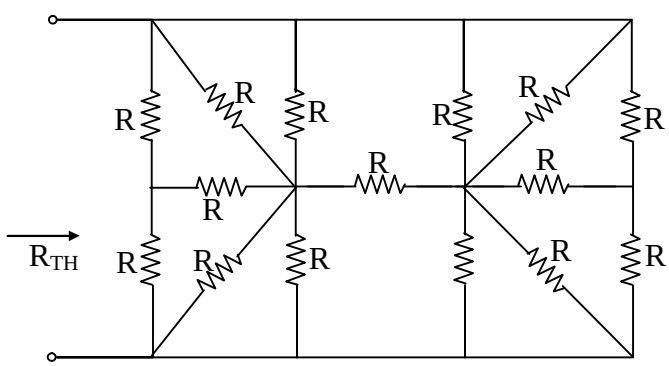
GATE – 2015 – Electronics & Communication Engineering (EC)

(Questions Based on Memory of Students)

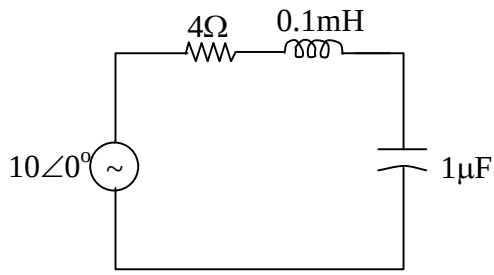
SET – 1 (31st January Forenoon Session)

01.



For the above circuit if R = 300 Ω then the value of R_{TH} (in Ω) is

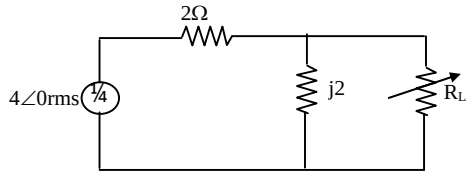
02. In the circuit shown below at resonance the amplitude of the voltage across the capacitor (in V) is _____ .



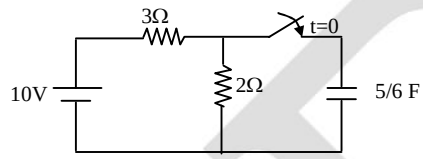
03. For a series resonant circuit the damping factor is

(a) $\frac{R}{2}\sqrt{\frac{L}{C}}$ (b) $\frac{R}{2}\sqrt{\frac{C}{L}}$ (c) $\frac{2L}{R^2C}$ (d) $\frac{R^2C}{2L}$

04. For the circuit shown below, the maximum power delivered to the load(in W) is ____.

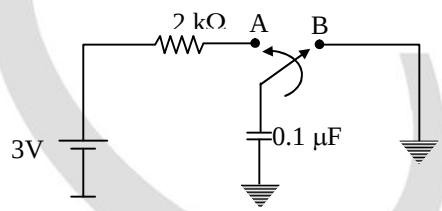


05.



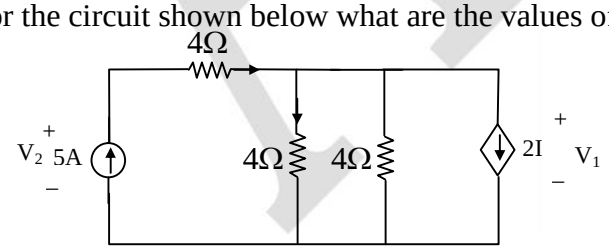
For the circuit shown above the switch is closed at t = 0. The value of voltage across capacitor (in V) at t = 1sec is _____.

06. The capacitor is initially uncharged and the switch is moved from position B to position A. The energy taken from the source to charge the capacitor from 0 V to 3 V is



(a) 1 J (b) 0.45 J (c) 0.9 J (d) 1.5 J

07. For the circuit shown below what are the values of V_1 & V_2 respectively (in V) ?



(a) 5,25 (b) 25, 5 (c) 5, 5 (d) 25, 25

08. $G(s) = \dfrac{K(s+1)}{(s+10)}$

The polar plot of the above unity f/b system lies in

(a) Ist Quadrant (b) IInd Quadrant

(c) IIIrd Quadrant (d) IVth Quadrant

09. In a lead network, the feed forward path consists of a resistor R in parallel with a capacitor C. The TF of the lead n/w is

$G(S) = \dfrac{S+2}{S+4}$. The value of RC is ———.

10. The open loop transfer function of unity feedback system is given as $G(s) = \left(K_p + \dfrac{K_I}{s}\right)\left(\dfrac{1}{s(s+5)}\right)$,

the condition for which the system becomes stable is

(a) $K_p > K_I/5 > 0$ (b) $5K_I < K_p$

(c) $5K_I > K_p$ (d) $K_I > 5\,K_p$

11. Negative feedback in a closed loop control system does not

(a) reduce overall gain

(b) reduce bandwidth

(c) Improve distance rejection

(d) reduce sensitivity to parameter variation

12. The open loop transfer function of unity feedback system is given as $G(s)H(s) = \dfrac{K(s+4)}{(s+8)(s^2-9)}$.

The value of K for which the point –1 + j2 lies on the root locus is _____.

13. The open loop transfer function of unity feedback system is given as $G(s) = \dfrac{K}{s(s+1)(s+3)}$. The value of K(>0) for which the root locus crosses the imaginary axis is _____ .

14. If a Si semiconductor sample is doped with 5th group element with $N_D = 1\times10^{16}/cm^3$, and the electron & hole mobilities of the Si sample are $1200\,cm^2/Vs$ & $400\,cm^2/Vs$ respectively then the value of resistivity of Si (in Ω-cm) is _____

15. In P-N junction diode negative differential resistance is observed for

(a) Both P & N side are heavily doped.

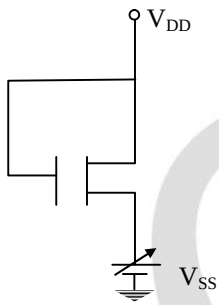
(b) Only N side is heavily doped.

(c) Only P side is heavily doped.

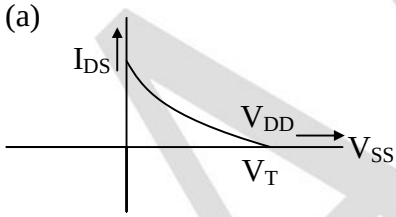
(d) An intrinsic Si sample is inserted between P & N.

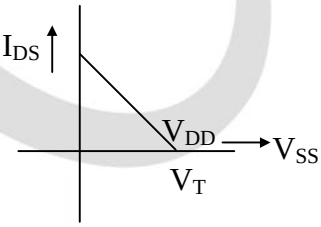
16. The built in potential for an abrupt p-n junction is 0.75 V. If the junction capacitance at a reverse bias voltage of 1.25 V is 5 pF, the value of the junction capacitance (pF) for a reverse bias voltage of 7.25 V is

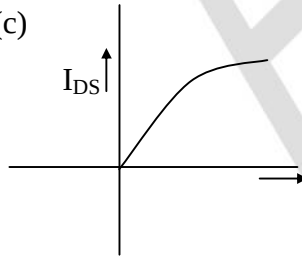
17. Acceptor and donor concentrations are $10^{17}/cm^3$ and $10^{15}/cm^3$ respectively. Hole and electron diffusion constants are 36 cm^2/sec 48 cm^2/sec. Diffusion time constant is 100µs.
The hole current density (in nA/m^2) from P side to N side is _____.

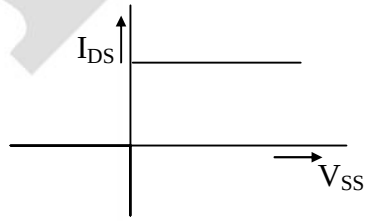
18. 

The I_{DS} versus V_{ss} characteristics for the above circuit is

(a) 

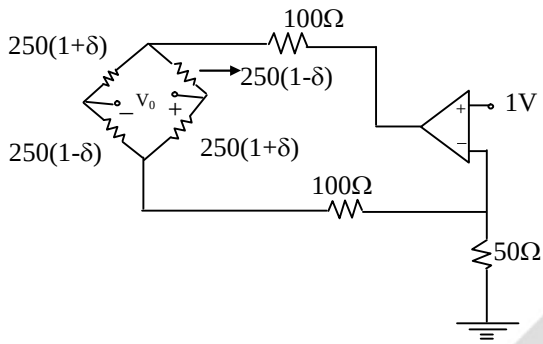
(b) 

(c) 



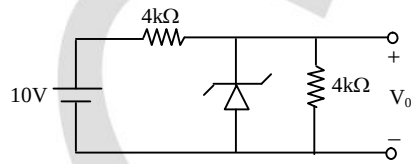
19. For a N channel MOSFET the channel length modulation parameter is $\lambda = 0.05\,V^{-1}$, I_D = 1 mA for V_{DS} = 0.5 V. The value of output resistance r_o (in kΩ) is _____.

20.



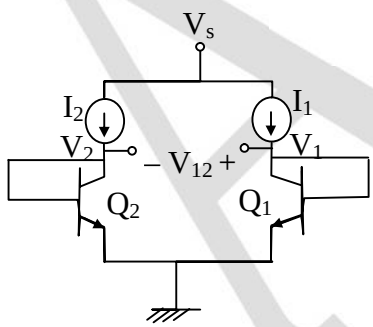
For the circuit shown above if $\delta = 0.05$, the value of the output voltage V_o (in mV) is _____ .

21. For the circuit shown in the figure given below assume that the zener diode is ideal and $V_z = 6V$ for the zener diode.



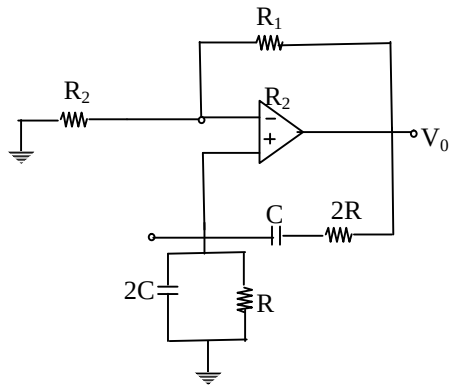
The value of output voltage V_0 (in V) is _____ .

22. Consider the circuit shown below:



For the circuit shown above BJTs Q_1 and Q_2 are Identical,
$I_1 = 80mA$, $I_2 = 4mA$
$V_T = 26$ mV at 27^0C.
The value of V_{12} in (mV) at 50^oC is ____ .

23. Consider the circuit shown below

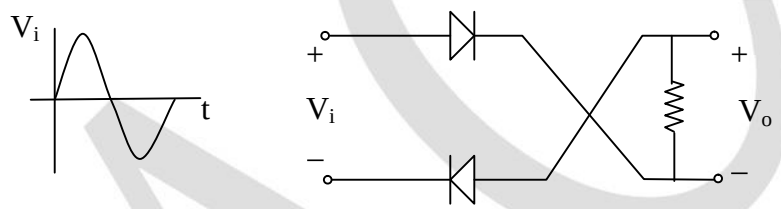


The value of ω_o & the relation between R_1 & R_2 for the circuit shown above is

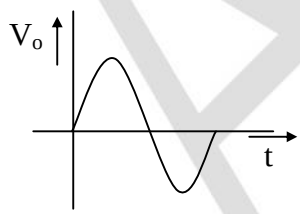
(a) $\omega_o = \frac{1}{4RC}$, $R_1 = 4R_2$ (b) $\omega_o = \frac{1}{2RC}$, $R_1 = 4R_2$

(c) $\omega_o = \frac{1}{2RC}$, $R_1 = 2R_2$ (d) $\omega_o = \frac{1}{4RC}$, $R_1 = 2R_2$

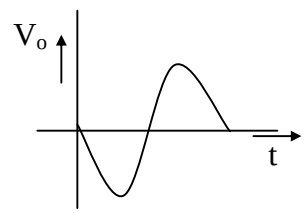
24. For the circuit shown below the wave form for the output voltage is



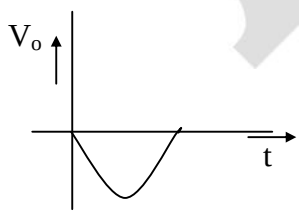
(a)



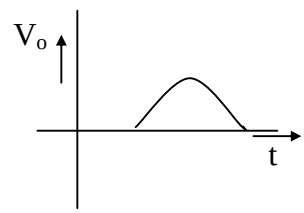
(b)



(c)



(d)



25. The shift registers in which the results of addition and the carry operation are stored are

(a) A & C (b) A & F (c) B & F (d) B & C

26. The expression for canonical SOP form of a function is $F(x,y,z) = xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + \bar{x}y\bar{z}$. The expression for canonical POS form is.

(a) F = (x+y+z)(x+y+$\bar{z}$)(x+$\bar{y}$+$\bar{z}$)($\bar{x}$+$\bar{y}$+$\bar{z}$)

(b) F = ($\bar{x}$+y+z)(x+y+$\bar{z}$)(x+$\bar{y}$+$\bar{z}$)($\bar{x}$+$\bar{y}$+$\bar{z}$)

(c) F = ($\bar{x}$+$\bar{y}$+z)(x+y+$\bar{z}$)(x+$\bar{y}$+$\bar{z}$)($\bar{x}$+$\bar{y}$+$\bar{z}$)

(d) F = (x+y+z)($\bar{x}$+y+$\bar{z}$)(x+$\bar{y}$+$\bar{z}$)($\bar{x}$+$\bar{y}$+$\bar{z}$)

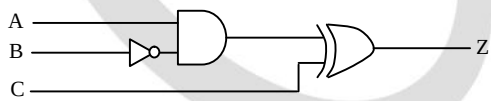
27. A three input majority circuit has SOP expression given as M (a,b,c) = ab+bc+ca. which of the following three input gate can satisfy the following expression?

$M\left(\overline{M(a,b,c)}, M\left(a,b,\bar{c}\right), c\right)$

(a) 3-Input XOR (b) 3-Input NAND

(c) 3-Input NOR (d) 3-Input XNOR

28. For the circuit shown below each of the gates has a delay of 20 ns, & the inputs are A = C = 0, B = 1 initially . At t =0, the inputs are flipped i.e A = C = 1, B = 0. For how much time (in ns), the output Z will be 1 ?

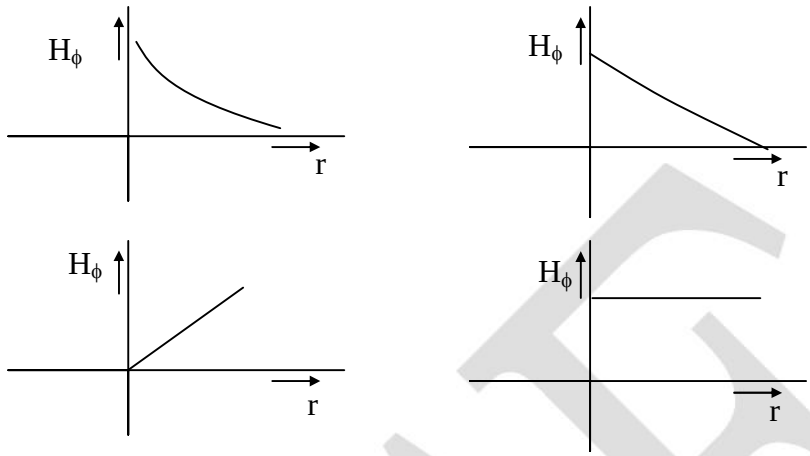


29. A 16kb (16384 bit) memory array is designed as a square with as aspect ratio of one (number of rows = number of columns). The minimum number of address lines needed for the row decoder is _____.

30. For a 4 bit D/A converter, the analog value for the digital input of 0000 and 0001 are 0V & 0.0625 V respectively. The analog value (in V) for digital input 1111 is ____.

31. The electric field intensity of wave in perfect dielectric medium is given as $\bar{E} = 2\cos\left(10^8 t - \frac{z}{\sqrt{2}}\right).\hat{a}_x$. The wave length of the wave (in meters) is ————.

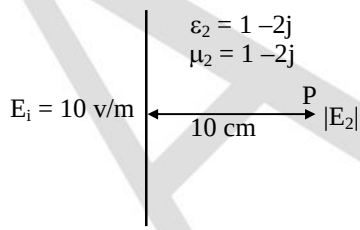
32. If a current carrying conductor is placed on Z-axis and Hϕ represents the magnetic field intensity at a distance of r, which of the following represents the relationship between H_ϕ and r?



33. $H_Z = \cos(25\pi x)\cos(30.3\,\pi y)\cos\beta z$ .If a = 0.08 cm
b = 0.033 cm then the mode of operation of the waveguide is
(a) TE_{12} (b) TM_{12} (c) TE_{21} (d) TM_{21}

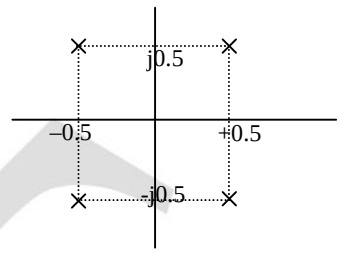
34. If $E = 24\pi\cos(\omega t-\beta x)\,\hat{a}_z \frac{V}{m}$, the average power (in mW) across an surface of 10 cm ×10cm over the plane x+y=1 is _____.

35. What is the magnitude of value of E_2.



36. x (–t) * δ(–t – t_o) =
(a) x(–t + t_o) (b) x(t–t_o) (c) x(t+t_o) (d) x(–t–t_o)

37. A system given by impulse response h[n] has zeros of multiplicity '4' at origin. The pole zero graph for the system is given below. If h[0] = 1, then which of the following option is correct according to system pole-zero location?



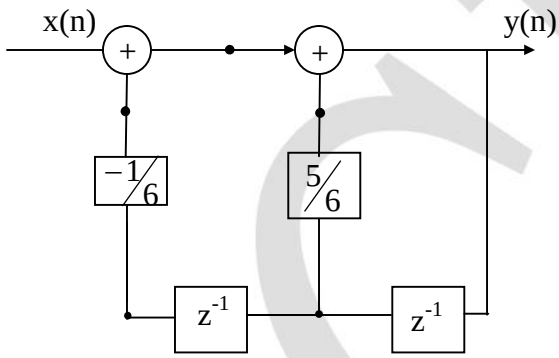
(a) h(n) is imaginary for all n

(b) h(n) is Real for all n

(c) h(n) is real for even values of n

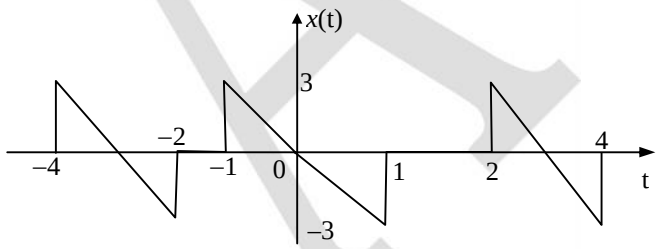
(d) h(n) is imaginary for odd values of n

38. For the discrete system shown in the figure given below, the location of the poles is



(a) 1/2 , 3 (b) 2, 3 (c) 1/2, 1/3 (d) 2, 1/3

39. A signals x(t) is given as



The power of the signal

$y(t) = x\left(\frac{1}{2}(t-1)\right)$ is _____

40.

$$\begin{bmatrix} A \\ B \\ C \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & W^{-1} & W^{-2} \\ 1 & W^{-2} & W^{-4} \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$$\begin{bmatrix} P \\ Q \\ R \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & W & W^2 \\ 1 & W^2 & W^4 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & W^1 & 0 \\ 0 & 0 & W^2 \end{bmatrix} \begin{bmatrix} A/3 \\ B/3 \\ C/3 \end{bmatrix}$$

$W = e^{j2\pi/3}$

(A) [b a c] (B) [b c a] (C) [c a b] (D) [c b a]

41. A modulated signal is given as

$x(t) = m(t)\cos\omega_c t + \hat{m}(t)\sin\omega_c t$

where $\hat{m}(t)$ is a Hillbert transform of m(t)

The signal x(t) is

(a) High pass signal

(b) Low pass signal

(c) Band pass signal

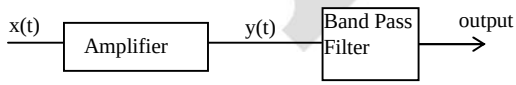
(d) Single side band with carrier

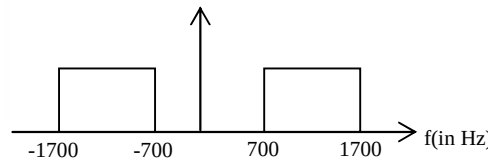
42. A GSM system has 200KHz bandwidth. It can be shared by the 8 users by TDMA techniques. If 12 users are talking at the same time, what is the minimum message bandwidth (in Hz) of signal sent to cell site ?

43. The Step size of a DM system is 0.1 V, and the sampling rate is 20,000 samples /sec. If frequency of message signal is 2 kHz; then the maximum amplitude of signal to avoid slope overload distortion is

(a) $\frac{1}{2\pi}$ (b) $\frac{1}{\pi}$ (c) $\frac{2}{\pi}$ (d) π

44. For the given system



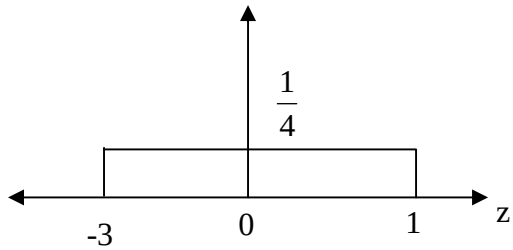


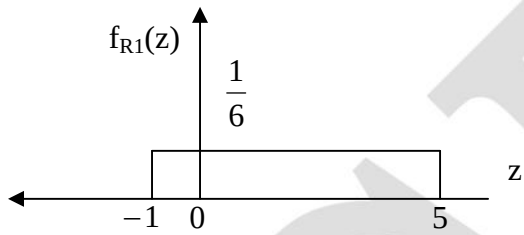
$x(t) = m(t)\cos(2400\pi t)$.

$y(t) = x^2(t) + 10\,x(t)$

If the message signal m(t) is band limited to W Hz and output is 10x(t), the maximum value of W (in Hz) is ____.

45. If p(0) = $\frac{1}{3}$; p (1) = $\frac{2}{3}$ $f_{R0}(z)$





The min probability of error is

(a) 1/4 (b) 1/6 (c)1/3 (d) 2/3

46. If P(X = 0) = 0.2 and P (X = 1) = 0.8 and the cross over probability is 1/7. Given that Y = 0 was received, what is the probability that X = 1 was transmitted?

47. The solution of the differential equation $\frac{d^2x}{dt^2}+\frac{2dx}{dt}+1=0$ with the given initial conditions y(0) = y′(0) = 1 is

(a) $y = (1+2t)e^{t}$ (b) $y = e^{t} + 2e^{-t}$ (c) $y = (1–2t)e^{-t}$ (d) $y = (1+2t)e^{-t}$

48. A matrix is given as $\begin{bmatrix} 4 & 1 & 2 \\ P & 2 & 1 \\ 14 & -4 & 10 \end{bmatrix}$ and has an Eigen vector as $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$.

The value of P is ———

49. A function is defined as $f(x) = 1 – x^2 + x^3$ in $x \in [-1 \quad 1]$

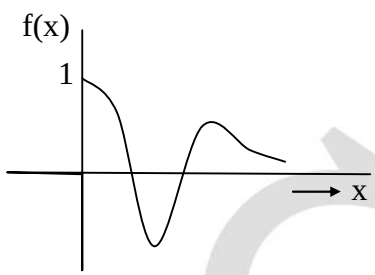
Which of the following values satisfy the mean value theorem in open interval of (–1 1)?

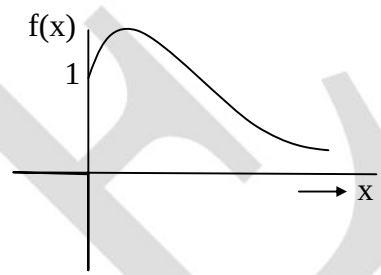
(a) $-\frac{1}{2}$ (b) $-\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

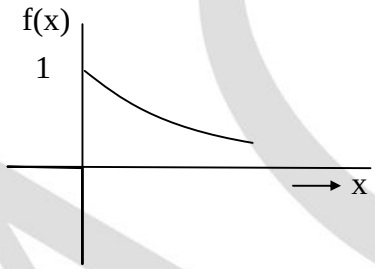
50. If vector P is given by $x^3y\hat{a}_x - x^2y^2\hat{a}_y - x^2yz\bar{a}_x$ then P is
(a) solenoidal and irrotational
(b) not solenoidal but irrotational
(c) solenoidal but not irrotational
(d) neither solenoidal non irrotational

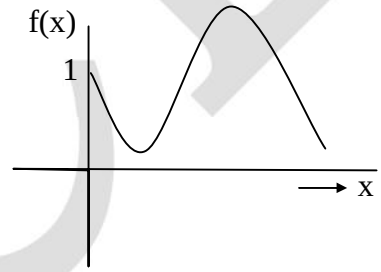
51. The maximum area (in sq units) of a rectangle whose vertices lie on the ellipse $x^2 + 4y^2 = 1$ is _____.

52. A function is given as $f(x) = e^{-x}(1+x+x^2)$. Which of the following represents f(x) ?

(a)


(b)


(c)


(d)


53. If a complex function is given as $z = x + iy$, then which of the following is wrong?
(a) $\frac{1}{z^2-1}$ has residue of $\frac{1}{2}$ for z =1
(b) $\int z^2 dz = 0$
(c) $\bar{z} = x - iy$ is analytic
(d) None

54. If A & B are two independent events $p(A) \neq 0$; $p(B) \neq 0$ then which of the following statement is not true?
(a) P(B/A) = P(B)
(b) $P(A \cap B) = P(A)P(B)$
(c) $P(A \cup B) = P(A) + P(B)$
(d) $P(\overline{A} \cap \overline{B}) = P(\overline{A}).P(\overline{B})$

55. Consider the system of equations given below:
$-x + 2y - 3z = 2$
$x + 6y + 12z = 1$
$2x - 4y + 3kz = -4$
What is the value of 'k' for which the system of equations has infinite number of solutions?

General Aptitude:

01. Which of the following has the same meaning as the word Educe?
(a) exert (b) extract (c) educate (d) extend

02. Frogs _____.
(a) Croak (b) Roar (c) Hiss (d) Patter

03. If □, ◇, → represent the following operations

$a \square b = \frac{a-b}{a+b}$; $a \diamond b = \frac{a+b}{a-b}$;

$a \rightarrow b = ab$.

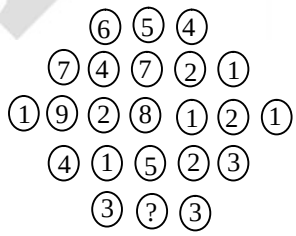
Then the value of $(66 \square 6) \rightarrow (66 \diamond 6)$ is

04. If $\log_x \frac{5}{7} = -\frac{1}{3}$ then x = ?

05. Cube of side 3 unit is made using cubes of side 1 unit. The ratio of number of visible of faces to the non visible faces is
(a) 1:3 (b) 1:2 (c) 1:4 (d) 2:3

06. On the annual occasion, the Principal presented a _____ to the chief guest as token of gratitude.
(a) momento (b) memento (c) momentum (d) moment

07. Find the missing number:



08. Humpty Dumpty sits on a wall for having lunch. Some times the wall breaks. When the wall breaks person sitting on the wall falls down.
Which of the following is true ?
(a) A person having dinner on the wall does not fall down.
(b) Humpty Dumpty some times fall down.
(c) The person taking lunch on the wall falls down every time.
(d) The wall breaks every time Humpty Dumpty sit on the wall for having lunch.

09. Tuberculosis, along with its effects ranks as one of the leading causes of death.
Which of the following replaces the underlined part?
(a) ranks as one of the leading causes of death.
(b) rank as one of the leading causes of death.
(c) rank one in causing of death.
(d) ranks one in causing of death.

NOTE: We don't claim the questions to be exact as given in GATE – 2015. The questions are based on memory of the students who appeared for the GATE – 2015 Exam.