EC : ELECTRONICS AND COMMUNICATION ENGINEERING

Duration: Three Hours   **Maximum Marks:** 100

Read the following instructions carefully

1. Do not open the seal of the Question Booklet until you are asked to do so by the invigilator.

2. Take out the Optical Response Sheet (ORS) from this Question Booklet without breaking the seal and read the instructions printed on the ORS carefully. If you find that the Question Booklet Code printed at the right hand top corner of this page does not match with the Booklet Code on the ORS, exchange the booklet immediately with a new sealed Question Booklet.

3. On the right half of the ORS, using ONLY a black ink ball point pen, (i) darken the bubble corresponding to your test paper code and the appropriate bubble under each digit of your registration number and (ii) write your registration number, your name and name of the examination centre and put your signature at the specified location.

4. This Question Booklet contains **20 pages** including blank pages for rough work. After you are permitted to open the seal, please check all pages and report discrepancies, if any, to the invigilator.

5. There are a total of **65 questions carrying 100 marks**. All these questions are of objective type. Each question has only one correct answer. Questions must be answered on the left hand side of the ORS by darkening the appropriate bubble (marked A, B, C, D) using ONLY a black ink ball point pen against the question number. For each question darken the bubble of the correct answer. More than one answer bubbled against a question will be treated as an incorrect response.

6. Since bubbles darkened by the black ink ball point pen cannot be erased, candidates should darken the bubbles in the ORS very carefully.

7. Questions Q.1 – Q.25 carry 1 mark each. Questions Q.26 – Q.55 carry 2 marks each. The 2-mark questions include two pairs of common data questions and two pairs of linked answer questions. The answer to the second question of the linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is unattempted, then the answer to the second question in the pair will not be evaluated.

8. Questions Q.56 – Q.65 belong to the General Aptitude (GA) section and carry a total of 15 marks. Questions Q.56 – Q.60 carry 1 mark each, and questions Q.61 – Q.65 carry 2 marks each.

9. Unattempted questions will result in zero mark and wrong answers will result in **NEGATIVE marks**. For all 1 mark questions, $\frac{1}{3}$ mark will be deducted for each wrong answer. For all 2 mark questions, $\frac{2}{3}$ mark will be deducted for each wrong answer. However, in the case of the

linked answer question pair, there will be negative marks only for wrong answer to the first question and no negative marks for wrong answer to the second question.

10. Calculator is allowed whereas charts, graph sheets or tables are NOT allowed in the examination hall.

11. Rough work can be done on the question paper itself. Blank pages are provided at the end of the question paper for rough work.

12. Before the start of the examination, write your name and registration number in the space provided below using a black ink ball point pen.

Q.1 – Q.25 carry one mark each.

Q.1. The current i_b through the base of a silicon npn transistor is $i_b = 10000(\cos 1.01\pi t + 1)$ mA. At 300 K, the r_π in the small signal model of the transistor is
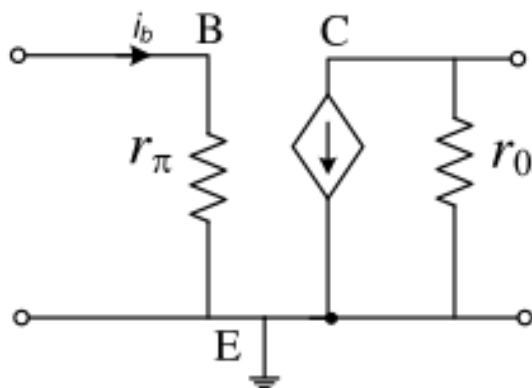
[GATE EC 2012]

Figure 1: Power spectral density $S_X(\omega)$

(a) 250 Ω

(b) 27.5 Ω

(c) 25 Ω

(d) 22.5 Ω

Q.2. The power spectral density of a real process $X(t)$ for positive frequencies is shown below. The values of $E[X^2(t)]$ and $E[X(t)]$, respectively, are
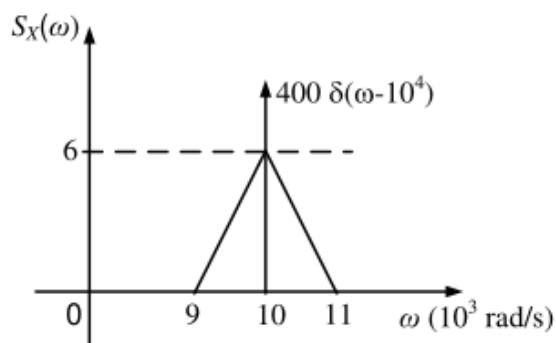
[GATE EC 2012]

Figure 2: Power spectral density $S_X(\omega)$

(a) $6000/\pi$, 0

(b) $6400/\pi$, 0

(c) $6400/\pi$, $20/(2\pi)$

(d) $6000/\pi$, $20/(2\pi)$

Q.3. In a baseband communications link, frequencies up to 3500 Hz are used for signaling. Using a raised cosine pulse with 75% excess bandwidth and for no inter-symbol interference, the maximum possible signaling rate in symbols per second is

[GATE EC 2012]

(a) 1750

(c) 4000

(b) 2625

(d) 5250

Q.4. A plane wave propagating in air with

$$\mathbf{E} = (8\hat{a}_x + 6\hat{a}_y + 5\hat{a}_z)e^{j(3z+y+4x-\omega t)} \text{ V/m}$$

is incident on a perfectly conducting slab positioned at $x \leq 0$. The **E** field of the reflected wave is

[GATE EC 2012]

(a) $(-8\hat{a}_x - 6\hat{a}_y - 5\hat{a}_z)e^{j(3z+y-4x-\omega t)}$ V/m

(c) $(8\hat{a}_x + 6\hat{a}_y + 5\hat{a}_z)e^{j(3z+y-4x-\omega t)}$ V/m

(b) $(-8\hat{a}_x - 6\hat{a}_y + 5\hat{a}_z)e^{j(3z+y-4x-\omega t)}$ V/m

(d) $(8\hat{a}_x + 6\hat{a}_y - 5\hat{a}_z)e^{j(3z+y-4x-\omega t)}$ V/m

Q.5. The electric field of a uniform plane electromagnetic wave in free space, along the positive x direction, is given by

$$\mathbf{E} = 10(\hat{a}_y + j\hat{a}_z)e^{-j25x}$$

The frequency and polarization of the wave, respectively, are **[GATE EC 2012]**

(a) 1.2 GHz and left circular

(c) 1.2 GHz and right circular

(b) 4 Hz and left circular

(d) 4 Hz and right circular
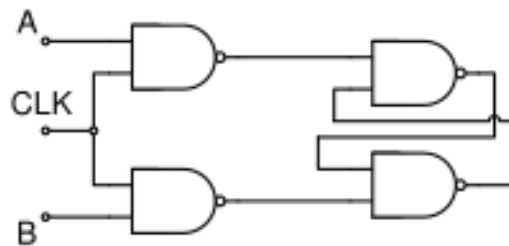
Q.6. Consider the given circuit.

[GATE EC 2012]

Figure 3: Circuit for Q.6

(a) does not occur

(c) occurs when CLK = 1 and A = B = 1

(b) occurs when CLK = 0

(d) occurs when CLK = 1 and A = B = 0

Q.7. The output Y of a 2-bit comparator is logic 1 whenever the 2-bit input A is greater than the 2-bit input B. The number of combinations for which the output is logic 1, is

[GATE EC 2012]

(a) 4

(c) 8

(b) 6

(d) 10

Q.8. The i–v characteristics of the diode in the circuit given below are
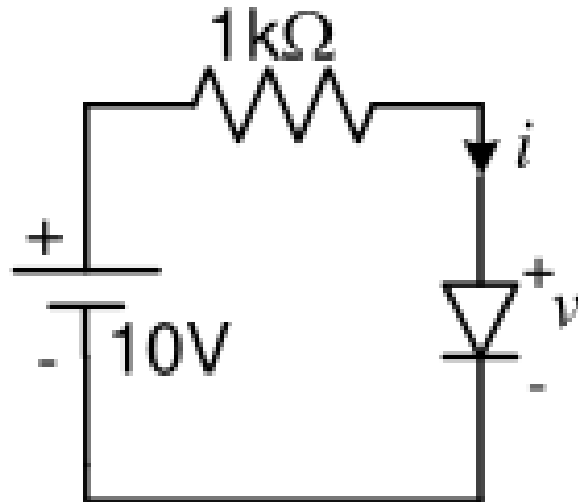
[GATE EC 2012]

Figure 4: Diode circuit for Q.8

(a) 10 mA

(c) 6.67 mA

(b) 9.3 mA

(d) 6.2 mA

Q.9. In the following figure, C_1 and C_2 are ideal capacitors. C_1 has been charged to 12 V before the ideal switch S is closed at $t = 0$. The current $i(t)$ for all t is
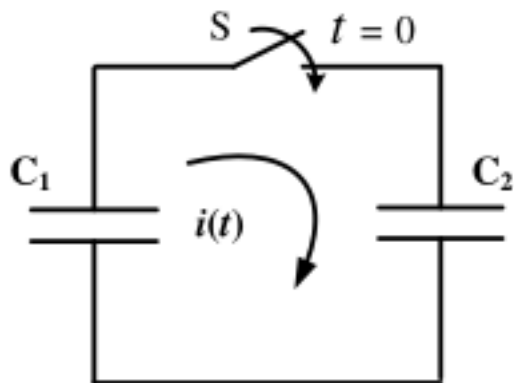
[GATE EC 2012]

Figure 5: Capacitor switching circuit for Q.9

(a) zero

(c) an exponentially decaying function

(b) a step function

(d) an impulse function

Q.10. The average power delivered to an impedance $(3 - j4)\,\Omega$ by a current $i(t) = 5\cos(100\pi t + 100)$ A is

[GATE EC 2012]

(a) 44.2 W

(c) 62.5 W

(b) 50 W

(d) 125 W

Q.11. The unilateral Laplace transform of $f(t)$ is $\frac{1}{s^2+s+1}$. The unilateral Laplace transform of $tf(t)$ is

[GATE EC 2012]

(a) $\dfrac{-s}{(s^2 + s + 1)^2}$

(c) $\dfrac{s}{(s^2 + s + 1)^2}$

(b) $\dfrac{s + 1}{(s^2 + s + 1)^2}$

(d) $\dfrac{s + 2}{(s^2 + s + 1)^2}$

Q.12. With initial condition $x(1) = 0.5$, the solution of the differential equation

$$\frac{dx}{dt} + x = t$$

is

[GATE EC 2012]

(a) $x = t - 1/2$ (c) $x = 2t$

(b) $x = t - 2$ (d) $x = t^2/2$

Q.13. The diodes and capacitors in the circuit shown are ideal. The voltage $v(t)$ across the diode D_1 is
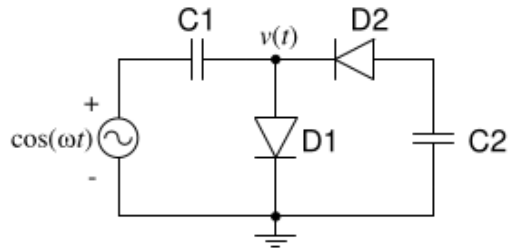[GATE EC 2012]

Figure 6: Circuit for Q.13

(a) $\cos(\omega t) - 1$ (c) $1 - \cos(\omega t)$

(b) $\sin(\omega t)$ (d) $1 - \sin(\omega t)$

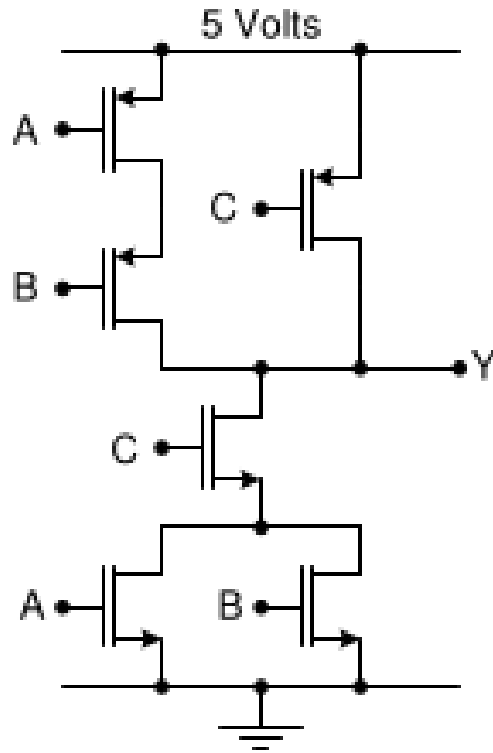**Q.14.** In the circuit shown
[GATE EC 2012]

Figure 7: Logic circuit for Q.14

(a) $Y = A + B + C$

(b) $Y = A(B + C)$

(c) $Y = (A + B)C$

(d) $Y = (A + C)B$

Q.15. A source alphabet consists of N symbols with the probability of the first two symbols being the same. A source encoder increases the probability of the first symbol by a small amount ϵ and decreases that of the second by ϵ. After encoding, the entropy of the source

[GATE EC 2012]

(a) increases

(b) remains the same

(c) increases only if $N = 2$

(d) decreases

Q.16. A coaxial cable with an inner diameter of 1 mm and outer diameter of 2.4 mm is filled with a dielectric of relative permittivity 10.89. Given $\mu_0 = 4\pi \times 10^{-7}$ H/m, $\epsilon_0 = 10^{-9}/(36\pi)$ F/m, the characteristic impedance of the cable is

[GATE EC 2012]

(a) 330 Ω

(b) 100 Ω

(c) 143.3 Ω

(d) 43.4 Ω

Q.17. The radiation pattern of an antenna in spherical coordinates is given by $F(\theta) = \cos^4 \theta$ for $0 \leq \theta \leq \pi/2$. The directivity of the antenna is

[GATE EC 2012]

(a) 10 dB

(b) 12.6 dB

(c) 11.5 dB

(d) 18 dB

Q.18. If $x[n] = (1/2)^n u[n] - (1/3)^n u[n]$, then the region of convergence (ROC) of its Z-transform will be

[GATE EC 2012]

(a) $|z| > 1/3$

(b) $1/3 < |z| < 1/2$

(c) $|z| > 1/2$

(d) $|z| < 1/3$

Q.19. In the sum of products function $f(X, Y, Z) = \Sigma(2, 3, 4, 5)$, the prime implicants are

[GATE EC 2012]

(a) $XY, X'Y$

(b) $XY, X'Y, YZ$

(c) $XY, X'Y, Y'Z$

(d) $XY, X'Y, YZ, Y'Z$

Q.20. A system with transfer function

$$G(s) = \frac{s^2 + 9}{(s + 1)(s + 3)(s + 4)}$$

is excited by $\sin(\omega t)$. The steady-state output of the system is zero at

[GATE EC 2012]

(a) $\omega = 1$ rad/s

(b) $\omega = 2$ rad/s

(c) $\omega = 3$ rad/s

(d) $\omega = 4$ rad/s

Q.21. The impedance looking into nodes 1 and 2 in the given circuit is
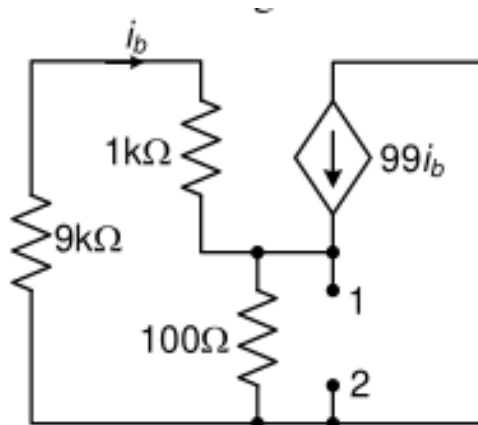
[GATE EC 2012]

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Figure 8: Circuit for Q.21

(a) 50 Ω

(c) 5 kΩ

(b) 100 Ω

(d) 10.1 kΩ

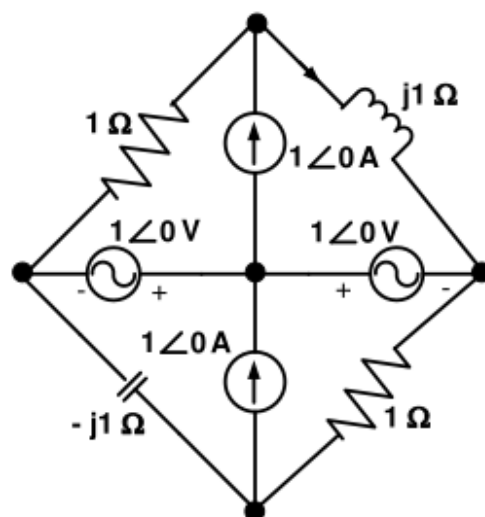**Q.22.** In the circuit shown below, the current through the inductor is
[GATE EC 2012]

Figure 9: Circuit for Q.22

(a) $\dfrac{1}{2+j}$ A

(c) $\dfrac{1}{1+j}$ A

(b) $\dfrac{1}{1+j}$ A (with negative sign)

(d) 0 A

Q.23. Given

$$f(z) = \frac{1}{(z + 1)(z - 1)(z + 2)}$$

If C is a counterclockwise path in the z-plane such that $|z + 1| = 1$, the value of

$$\frac{1}{2\pi j} \int_C f(z)\, dz$$

is

[GATE EC 2012]

(a) –2

(c) 1

(b) –1

(d) 2

Q.24. Two independent random variables X and Y are uniformly distributed in the interval $[-1, 1]$. The probability that $\max[X, Y] < 1/2$ is

[GATE EC 2012]

(a) 3/4

(c) 1/4

(b) 9/16

(d) 1/16

Q.25. If $x = -1$, then the value of x^x is

[GATE EC 2012]

(a) $-e^{\pi/2}$

(c) x

(b) $e^{\pi/2}$

(d) 1

Q.26 – Q.55 carry two marks each.

Q.26. The source of a silicon ($n_i = 10^{10}$ per cm^3) n-channel MOS transistor has an area of $1\ \mu m^2$ and a depth of $1\ \mu m$. If the dopant density in the source is $10^{19}/cm^3$, the number of holes in the source region with the above volume is approximately
[GATE EC 2012]

   i. 10^7 iii. 10

   ii. 100   iv. 0

Q.27. A BPSK scheme operating over an AWGN channel with noise power spectral density $N_0/2$, uses equiprobable signals $s_1(t) = \sqrt{\frac{E}{T}}\sin(\omega_c t)$ and $s_2(t) = -\sqrt{\frac{E}{T}}\sin(\omega_c t)$ over the symbol interval $(0, T)$. If the local oscillator in a coherent receiver is ahead in phase by $45°$ with respect to the received signal, the probability of error in the resulting system is
[GATE EC 2012]

   i. $Q\left(\sqrt{\frac{E}{N_0}}\right)$ iii. $Q\left(\sqrt{\frac{E}{4N_0}}\right)$

   ii. $Q\left(\sqrt{\frac{E}{2N_0}}\right)$ iv. $Q\left(\sqrt{\frac{E}{N_0/2}}\right)$

Q.28. A transmission line with a characteristic impedance of $100\ \Omega$ is used to match a $50\ \Omega$ section to a $200\ \Omega$ section. If the matching is to be done both at 429 MHz and 1 GHz, the length of the transmission line can be approximately
[GATE EC 2012]

   i. 82.5 cm   iii. 1.58 m

   ii. 1.05 m   iv. 1.75 m

Q.29. The input $x(t)$ and output $y(t)$ of a system are related as

$$y(t) = \int_{-\infty}^{t} x(\tau)\cos(3\tau)\,d\tau$$

The system is
[GATE EC 2012]

   i. time-invariant and stable   iii. time-invariant and not stable

   ii. stable and not time-invariant   iv. not time-invariant and not stable

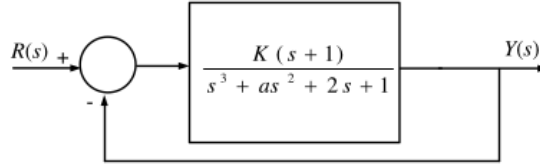**Q.30.** The feedback system shown below oscillates at 2 rad/s when
[GATE EC 2012]

Figure 10: Feedback system for Q.30

i. $K = 2$, $a = 0.75$	iii. $K = 4$, $a = 0.5$
ii. $K = 3$, $a = 0.75$	iv. $K = 2$, $a = 0.5$

Q.31. The Fourier transform of a signal $h(t)$ is

$$H(\omega) = \frac{2\sin(2\omega)}{\omega}\cos(\omega)$$

The value of $h(0)$ is
[GATE EC 2012]

i. 1/4	iii. 1
ii. 1/2	iv. 2

Q.32. The state variable description of an LTI system is given by

$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{pmatrix} = \begin{pmatrix} 0 & 0 & a_1 \\ 0 & 0 & a_2 \\ 0 & 0 & a_3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} u$$

$$y = \begin{pmatrix} 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

The system is controllable for
[GATE EC 2012]

i. $a_1 \neq 0$, $a_2 = 0$, $a_3 \neq 0$	iii. $a_1 = 0$, $a_2 \neq 0$, $a_3 = 0$
ii. $a_1 = 0$, $a_2 \neq 0$, $a_3 \neq 0$	iv. $a_1 \neq 0$, $a_2 \neq 0$, $a_3 = 0$

Q.33. Assuming both the voltage sources are in phase, the value of R for which maximum power is transferred from circuit A to circuit B is
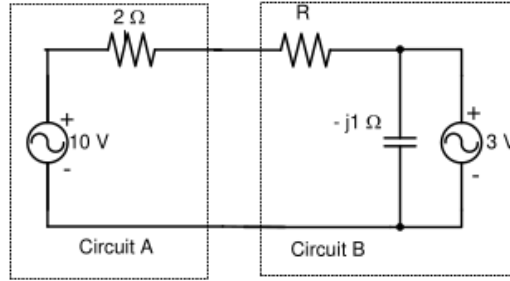**[GATE EC 2012]**

Figure 11: Circuit for Q.33

i. 0.8 Ω   iii. 2 Ω

ii. 1.4 Ω   iv. 2.8 Ω

Q.34. Consider the differential equation

$$\frac{d^2 y(t)}{dt^2} + \frac{dy(t)}{dt} + y(t) = t, \quad y(0) = -2, \; y'(0) = 0$$

The numerical value of $y'(0^+)$ is
[GATE EC 2012]

i. –2   iii. 0

ii. –1   iv. 1

Q.35. The direction of vector **A** is radially outward from the origin, with $\mathbf{A} = kr^n\hat{r}$, where $r = \sqrt{x^2 + y^2 + z^2}$ and k is a constant. The value of n for which $\nabla \cdot \mathbf{A} = 0$ is
[GATE EC 2012]

i. –2   iii. 1

ii. 2   iv. 0

Q.36. A fair coin is tossed till a head appears for the first time. The probability that the number of required tosses is odd, is
[GATE EC 2012]

i. 1/3   iii. 2/3

ii. 1/2   iv. 3/4

Q.37. In the CMOS circuit shown, electron and hole mobilities are equal, and M1 and M2 are equally sized. The device M1 is in the linear region if
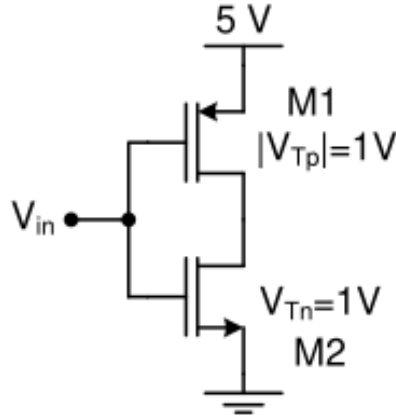**[GATE EC 2012]**

Figure 12: CMOS circuit for Q.37

i. $V_{in} < 1.875$ V	iii. $V_{in} > 3.125$ V
ii. $1.875 < V_{in} < 3.125$ V	iv. $0 < V_{in} < 5$ V

Q.38. A binary symmetric channel (BSC) has a transition probability of $1/8$. If the binary transmit symbol X is such that $P(X = 0) = 9/10$, then the probability of error for an optimum receiver will be

[GATE EC 2012]

i. 7/80	iii. 9/10
ii. 63/80	iv. 1/10

Q.39. The signal $m(t)$ as shown is applied both to a phase modulator (with k_p as the phase constant) and a frequency modulator (with k_f as the frequency constant) having the same carrier frequency. The ratio k_p/k_f (in rad/Hz) for the same maximum phase deviation is
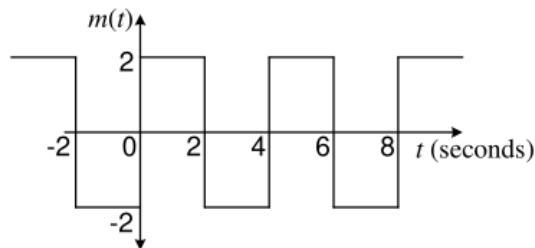
[GATE EC 2012]

Figure 13: Signal $m(t)$ for Q.39

i. 8π iii. 2π

ii. 4π iv. π

Q.40. The magnetic field along the propagation direction inside a rectangular waveguide with the cross-section shown in the figure is

$$H_z = 3\cos(2.94 \times 10^{10}x)\cos(6.18 \times 10^{10}y)\cos(8.36 \times 10^{10}z - \beta z)$$

The phase velocity v_p of the wave inside the waveguide satisfies
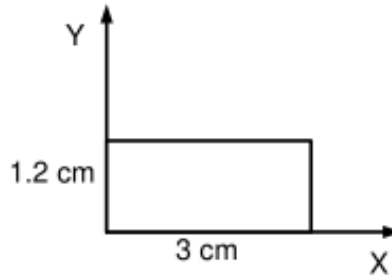**[GATE EC 2012]**

Figure 14: Waveguide cross-section for Q.40

i. $v_p > c$ iii. $v_p < c$

ii. $v_p = c$ iv. $v_p = 0$

Q.41. The circuit shown is a
[GATE EC 2012]
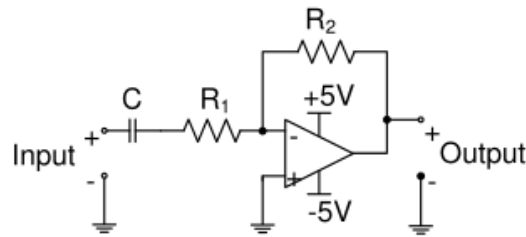

Figure 15: Circuit for Q.41

i. low pass filter with $f_{3dB} = \frac{1}{C(R_1+R_2)}$ rad/s   iii. low pass filter with $f_{3dB} = \frac{1}{CR_1}$ rad/s

iv. high pass filter with $f_{3dB} = \frac{1}{C(R_1+R_2)}$ rad/s

ii. high pass filter with $f_{3dB} = \frac{1}{CR_1}$ rad/s

Q.42. Let $y[n]$ denote the convolution of $h[n]$ and $g[n]$, where $h[n] = (1/2)^n u[n]$ and $g[n]$ is a causal sequence. If $y[0] = 1$ and $y[1] = 1/2$, then $g[1]$ equals

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   i. 0   iii. 1

  ii. 1/2   iv. 3/2

Q.43. The state transition diagram for the logic circuit shown is
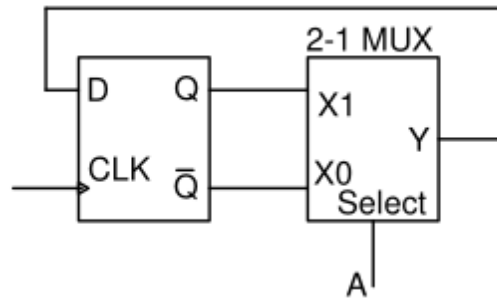
Figure 16: Logic circuit for Q.43

  i. Diagram A   iii. Diagram C

  ii. Diagram B   iv. Diagram D

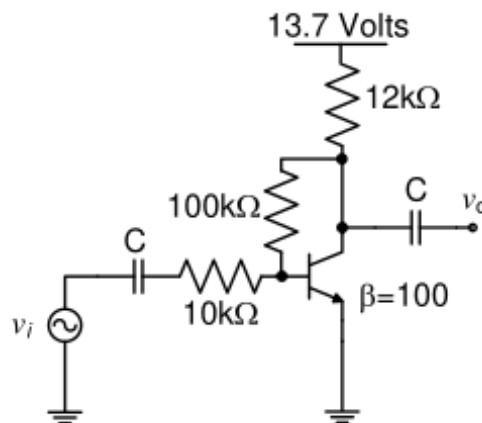**Q.44.** The voltage gain A_v of the circuit shown below is

Figure 17: Amplifier circuit for Q.44

i. $A_v \approx 200$ iii. $A_v \approx 20$

ii. $A_v \approx 100$ iv. $A_v \approx 10$

Q.45. If $V_A = -6$ V and $V_B = V$, then $V_D - V_C$ is
[GATE EC 2012]

Figure 18: Circuit for Q.45

i. –5 V   iii. 3 V

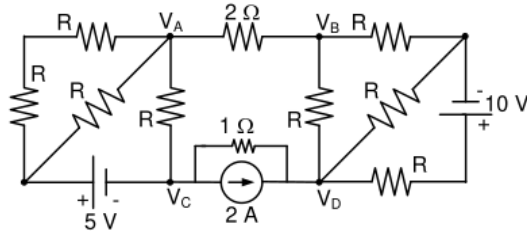ii. 2 V   iv. 6 V

Q.46 – Q.65

Q.46. The maximum value of

$$f(x) = x^3 - 9x^2 + 24x + 5$$

in the interval $[1, 6]$ is **[GATE EC 2012]**

  a. 21   c. 41

  b. 25   d. 46

Q.47. Given that

$$A = \begin{pmatrix} -5 & -3 \\ 2 & 0 \end{pmatrix}, \qquad I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

the value of A^3 is **[GATE EC 2012]**

  a. $15A + 12I$ c. $17A + 15I$

  b. $19A + 30I$ d. $17A + 21I$

Common data for Questions 48 and 49:

With 10 V dc connected at port A in the linear non-reciprocal two-port network shown below, the following were observed:

  i. 1 Ω connected at port B draws a current of 3 A.

  ii. 2.5 Ω connected at port B draws a current of 2 A.

Figure 19: Two-port network (common data for Q.48 and Q.49)

Q.48. With 10 V dc at port A, the current drawn by 7 Ω connected at port B is **[GATE EC 2012]**

  a. 3/7 A   c. 1 A

  b. 5/7 A   d. 9/7 A

Q.49. For the same network (common data), if 6 V dc is connected at port A, 1 Ω at port B draws 7/3 A. If 8 V dc is connected to port A, the open-circuit voltage at port B is **[GATE EC 2012]**

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a. 6 V

c. 8 V

b. 7 V

d. 9 V

Common data for Questions 50 and 51:

(Three-dimensional view of an n-channel MOS transistor; $d = 20$ nm, width $= 1$ μm; depletion width at every p–n junction $= 10$ nm; relative permittivities: Si $= 11.7$, SiO$_2$ $= 3.9$, $\varepsilon_0 = 8.9 \times 10^{-12}$ F/m.)
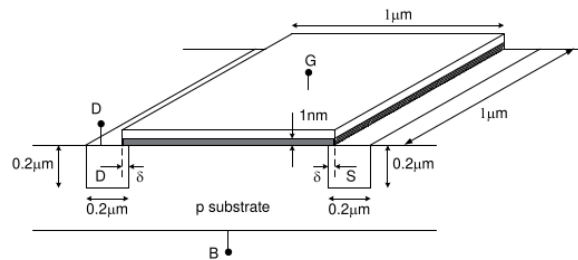

Figure 20: 3D view of MOS transistor (common data for Q.50 and Q.51)

Q.50. The gate–source overlap capacitance is approximately
[GATE EC 2012]

a. 0.7 fF

c. 0.35 fF

b. 0.7 pF

d. 0.24 pF

Q.51. The source–body junction capacitance is approximately
[GATE EC 2012]

a. 2 fF

c. 2 pF

b. 7 fF

d. 7 pF

Linked answer questions 52 and 53 (statement):

An infinitely long uniform solid wire of radius a carries a uniform DC current density $\mathbf{j}$.

Q.52. The magnetic field at a distance r from the center of the wire is proportional to
[GATE EC 2012]

a. r for $r < a$ and $1/r^2$ for $r > a$ c. r for $r < a$ and $1/r$ for $r > a$

b. 0 for $r < a$ and $1/r$ for $r > a$ d. 0 for $r < a$ and $1/r^2$ for $r > a$

Q.53. A hole of radius b ($b < a$) is drilled along the length of the wire at a distance d from the center (see figure). The magnetic field inside the hole is
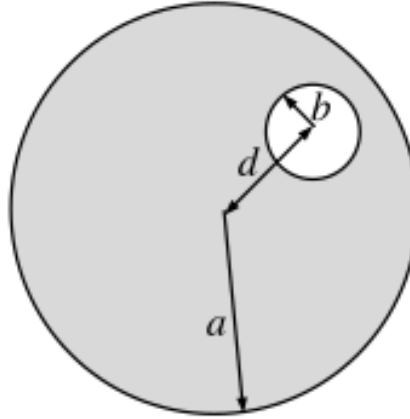
[GATE EC 2012]

Figure 21: Cross-section for Q.53 (hole in wire)

a. uniform and depends only on d c. uniform and depends on both b and d

b. uniform and depends only on b d. non-uniform

Statement for Linked Answer Questions 54 and 55:

The transfer function of a compensator is given by

$$G_c(s) = \frac{bs + 1}{as + 1}.$$

Q.54. $G_c(s)$ is a lead compensator if

[GATE EC 2012]

a. $a = 1,\ b = 2$ c. $a = -3,\ b = -1$

b. $a = 3,\ b = 2$ d. $a = 3,\ b = 1$

Q.55. The phase of the above lead compensator is maximum at

[GATE EC 2012]

a. 2 rad/s

c. $6^{1/2}$ rad/s

b. $3^{1/2}$ rad/s

d. 1/3 rad/s

General Aptitude (GA) — Q.56–Q.65 (compulsory). Q.56–Q.60 carry 1 mark each; Q.61–Q.65 carry 2 marks each.

Q.56. If $(1.001)^{1259} = 3.52$ and $(1.001)^{2062} = 7.85$, then $(1.001)^{3321} =$
[GATE EC 2012]

a. 2.23

c. 11.37

b. 4.33

d. 27.64

Q.57. Choose the most appropriate alternative to complete the sentence:

If the tired soldier wanted to lie down, he ___ the mattress out on the balcony.

[GATE EC 2012]

a. should take

c. should have taken

b. shall take

d. will have taken

Q.58. Choose the most appropriate word to complete the sentence:

Given the seriousness of the situation that he had to face, his ___ was impressive.

[GATE EC 2012]

a. beggary

c. jealousy

b. nomenclature

d. nonchalance

Q.59. Which one of the following options is the closest in meaning to the word **Latitude**?
[GATE EC 2012]

a. Eligibility

c. Coercion

b. Freedom

d. Meticulousness

Q.60. One of the parts (A, B, C, D) in the sentence given below contains an ERROR. Which one is INCORRECT?
I requested that he should be given the driving test today instead of tomorrow.
[GATE EC 2012]

a. requested that

b. should be given

c. the driving test

d. instead of tomorrow

Q.61. One of the legacies of the Roman legions was discipline. (Passage-based question — choose best summary statement.)

[GATE EC 2012]

a. Thorough regimentation was the main reason for the efficiency of the Roman legions even in adverse circumstances.

b. The legions were treated inhumanly as if the men were animals.

c. Discipline was the armies' inheritance from their seniors.

d. The harsh discipline to which the legions were subjected led to the odds and conditions being against them.

Q.62. Raju has 14 currency notes in his pocket consisting only of Rs.20 and Rs.10 notes. The total value is Rs.230. The number of Rs.10 notes Raju has is

[GATE EC 2012]

a. 5

b. 6

c. 9

d. 10

Q.63. There are eight indistinguishable bags of rice; seven have equal weight and one is slightly heavier. Using a weighing balance of unlimited capacity, the minimum number of weighings required to identify the heavier bag is

[GATE EC 2012]

a. 2

b. 3

c. 4

d. 8

Q.64. The data below summarize monthly budget (Rs.) — Food: 4000; Clothing: 1200; Rent: 2000; Savings: 1500; Other expenses: 1800. The approximate percentage of the monthly budget NOT spent on savings is

[GATE EC 2012]

a. 10%

b. 14%

c. 81%

d. 86%

Q.65. A and B decide to meet between 1 PM and 2 PM. Whoever arrives first will not wait more than 15 minutes. The probability they meet is

[GATE EC 2012]

a. 1/4

c. 7/16

b. 1/16

d. 9/16