

EC : ELECTRONIC 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 instruments printed on the ORS carefully. If you find 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 center and put your signature at the specified location.
4. This Question Booklet contain 16 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 Question carrying 100 marks. All these questions are of objective type. Each question has only one correct answer. Question 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. Question Q. 1 - Q. 25 carry 1 mark each. Questions Q. 26 - Q. 55 carry 2 marks each. The 2 marks question include two pairs of common data questions and two pairs of linked answer questions. The answer of 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. Question Q. 56 - Q. 65 belong to General Aptitude (GA) section and carry a total of 15 marks. Question 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 answer will result in **NEGATIVE** marks. For all 1 mark questions 1/3 mark will be deducted for each wrong answer. For all 2 marks questions, 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 blank ink ball point pen.

Names									
Registration Number	EC								

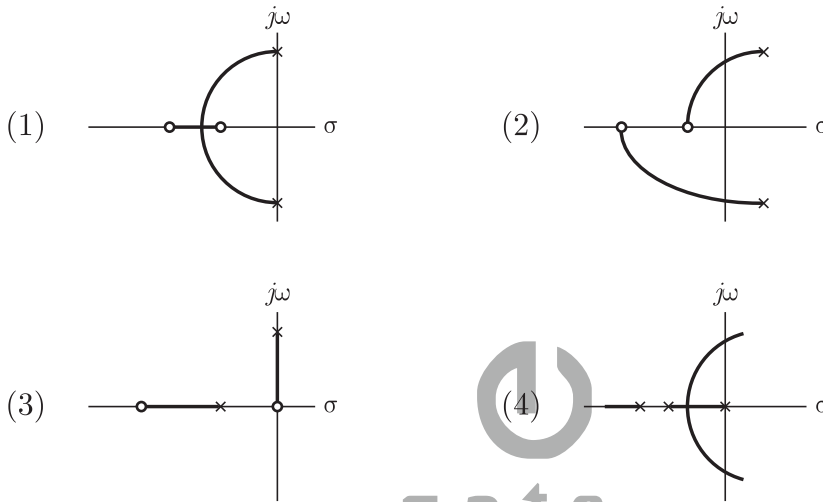
For Answer Key and Full Solution mail to enquiry@nodia.co.in.

Q. 1- Q. 25 carry one mark each.

Q.1 The unit impulse response of a second order system is $\frac{1}{6} e^{-0.8t} \sin 0.6t$. The natural frequency and damping ratio of the system are respectively

- (A) 1 rad/s, 0.8 (B) 0.8 rad/s, 1
(C) 0.64 rad/s, 1.25 (D) 1.25 rad/s, 0.64

Q.2 Consider the sketch shown below



The root locus can be

- (A) (1) and (3) (B) (2) and (3)
(C) (2) and (4) (D) (1) and (4)

Q.3 A PD controller is used to compensate a system. Compared to the uncompensated system, the compensated system has

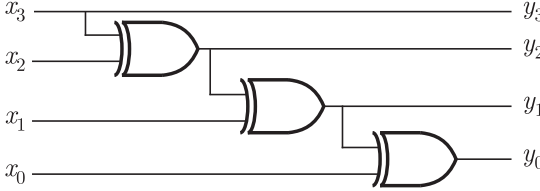
- (A) a higher type number (B) reduced damping
(C) higher noise amplification (D) larger transient overshoot

Q.4 The surface $\rho = 2, \rho = 4, \phi = 45^\circ, \phi = 135^\circ, z = 3$ and $z = 4$ define a closed surface. The total area of the enclosing surface is

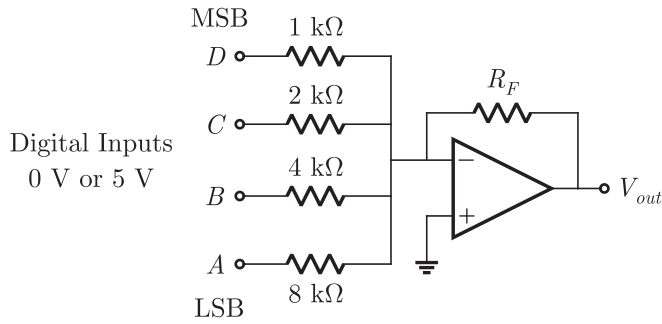
- (A) 34.29 (B) 20.7
(C) 32.27 (D) 16.4

Q.5 A conducting circular loop of radius 20 cm lies in the $z = 0$ plane in a field $\mathbf{B} = 20 \cos 277t \mathbf{u}_z$ mWb/m². The induced voltage in the loop is

- (A) $-0.95 \sin 377t$ V (B) $0.95 \sin 377t$ V
(C) $-0.95 \cos 377t$ V (D) $0.95 \cos 377t$ V

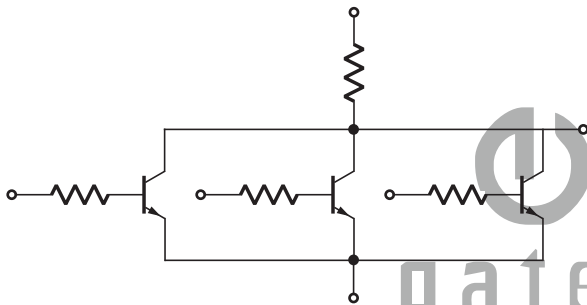
- Q.6** For a Hertz dipole antenna, the half power beam width (HPBW) in the E-plane is
 (A) 360° (B) 180°
 (C) 90° (D) 45°
- Q.7** The residue of $z \cos \frac{1}{z}$ at $z = 0$ is
 (A) $1/2$ (B) $-1/2$
 (C) $1/3$ (D) $-1/3$
- Q.8** A die is thrown 100 times. Getting an even number is considered a success. The variance of the number of successes is
 (A) 50 (B) 25
 (C) 10 (D) None
- Q.9** Integrating factor of $\frac{dy}{dx} + 2y \tan x = \sin x$ is
 (A) $\cos^2 x$ (B) $\sin^2 x$
 (C) $\sec^2 x$ (D) $2 \tan x$
- Q.10** If $\mathbf{A}_{n \times n}$ is a triangular matrix then $\det \mathbf{A}$ is
 (A) $\prod_{i=1}^n (-1) a_{ii}$ (B) $\prod_{i=1}^n a_{ii}$
 (C) $\sum_{i=1}^n (-1) a_{ii}$ (D) $\sum_{i=1}^n a_{ii}$
- Q.11** A computer has the following negative numbers stored in binary form as shown. The wrongly stored number is
 (A) -37 as 1101 1011 (B) -89 as 1010 0111
 (C) -48 as 1110 1000 (D) -32 as 1110 0000
- Q.12** Which of the following conversion is performed by the circuit shown in figure
- 
- (A) Binary to gray code conversion (B) Gray code to binary conversion
 (C) BCD conversion (D) None of these

Q.13 The step size of the following DAC 0.5 V. The value of R_F is



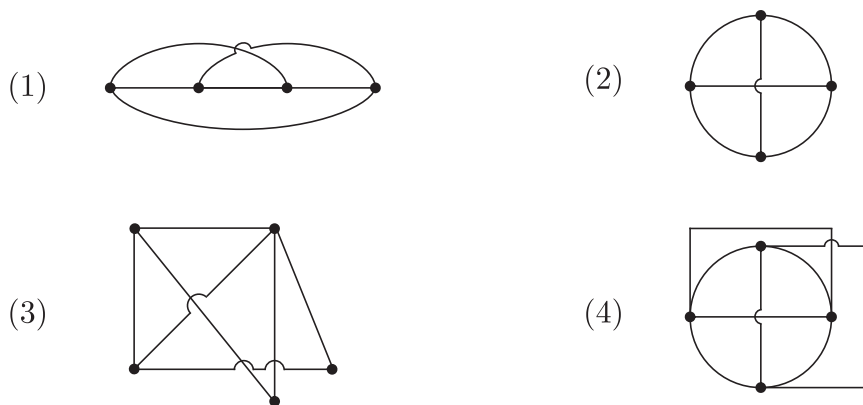
- (A) 1.6 kΩ
- (B) 8 kΩ
- (C) 800 Ω
- (D) 1 kΩ

Q.14 For the circuit shown in fig. the minimum number of isolation regions are



- (A) 2
- (B) 3
- (C) 4
- (D) 7

Q.15 Consider the following graphs

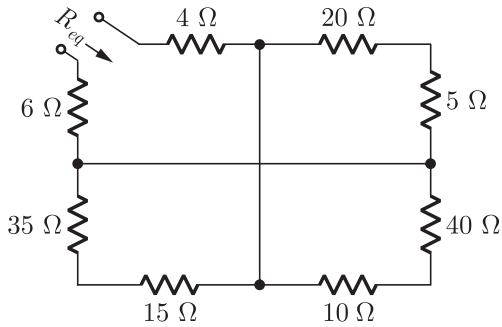


Non-planar graphs are

- (A) 1 and 3
- (B) 4 only
- (D) 3 only
- (D) 3 and 4

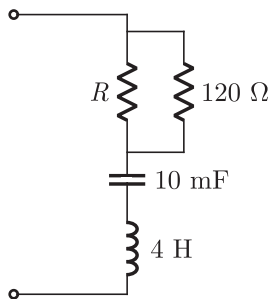
- Q.16** A silicon *pn* junction at $T = 300$ K has $N_d = 10^{14} \text{ cm}^{-3}$ and $N_a = 10^{17} \text{ cm}^{-3}$. The built-in voltage is
 (A) 0.63 V (B) 0.93 V
 (C) 0.026 V (D) 0.038 V

- Q.17** In the circuit of figure the value of resistor R_{eq} is



- (A) 100 Ω (B) 22.5 Ω
 (C) 60 Ω (D) 28.75 Ω

- Q.18** The circuit shown below is critically damped. The value of R is

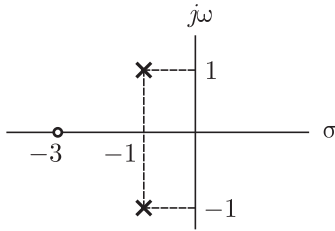


- (A) 40 Ω (B) 60 Ω
 (C) 120 Ω (D) 180 Ω

- Q.19** The impulse response of an LTI system is $h(t) = \delta^{(2)}(t)$. The step response is
 (A) 1 (B) $u(t)$
 (C) $\delta^{(3)}(t)$ (D) $\delta(t)$

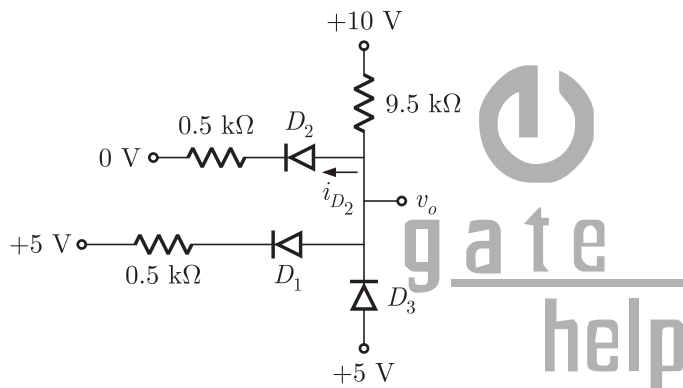
- Q.20** Power of signal $u[n]$ is
 (A) n (B) 1
 (C) 1/2 (D) ∞

- Q.21** The driving point impedance $Z(s)$ of a network has the pole zero location as shown below. If $Z(0) = 3$, the $Z(s)$ is



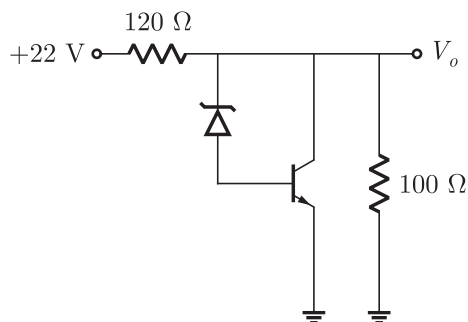
- (A) $\frac{4(s+3)}{s^2+s+1}$ (B) $\frac{2(s+3)}{s^2+2s+2}$
 (C) $\frac{2(s+3)}{s^2+2s+2}$ (D) $\frac{4(s-3)}{s^2+s+2}$

- Q.22** The diodes in the circuit shown below has parameters $V_\gamma = 0.6$ V and $r_f = 0$. The current i_{D_2} is



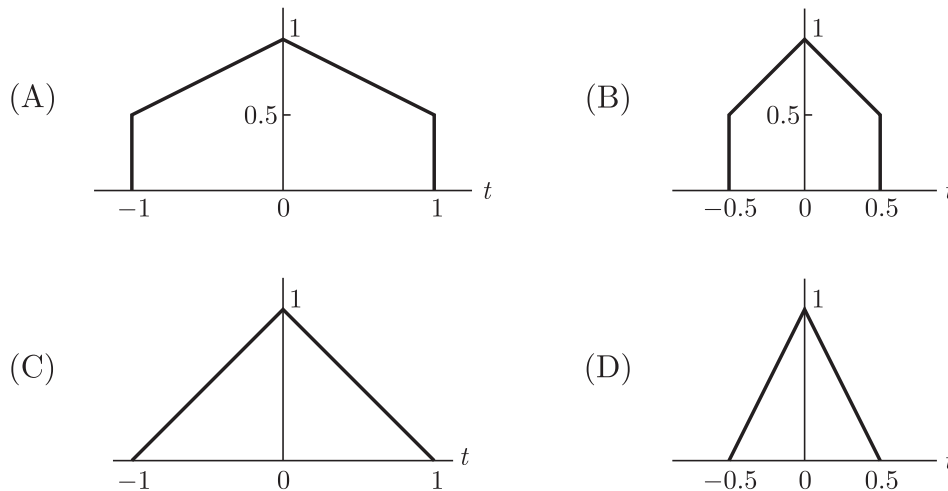
- (A) 8.4 mA (B) 10 mA
 (C) 7.6 mA (D) 0 mA

- Q.23** In the shunt regulator shown below, the $V_Z = 8.2$ V and $V_{BE} = 0.7$ V. The regulated output voltage V_o is



- (A) 11.8 V (B) 7.5 V
 (C) 12.5 V (D) 8.9 V

Q.24 Consider the signal $x(t) = \text{rect}(t) \text{tri}(t)$. The graph of $x(t)$ is



Q.25 In a certain frequency range, the magnitude of the network function can be approximated as $H(\omega) = 1/\omega^2$. The slope of the Bode plot in this range is

- (A) 40 dB/decade (B) -40 dB/decade
(C) 20 dB/decade (D) -20 dB/decade

Q. 26- Q. 55 carry two mark each.

Q.26 If $X(t)$ is a stationary process having a mean value $E[X(t)] = 3$ and auto correlation function $R_{XX}(\tau) = 9 + 2e^{-|\tau|}$. The variance of random variable $Y = \int_0^2 X(t) dt$ will be

- (A) 1 (B) 2.31
(C) 4.54 (D) 0

Q.27 A resistor $R = 1000 \Omega$ is maintained at 290 K and is shunted by a $10 \mu\text{H}$ inductor. The rms noise voltage across the inductor over a frequency bandwidth of 159 kHz is

- (A) $6.4 \times 10^{-6} \text{V}$ (B) $9.2 \times 10^{-8} \text{V}$
(C) $10.4 \times 10^{-10} \text{V}$ (D) $18.4 \times 10^{-12} \text{V}$

Q.28 An angle modulated signal is $s(t) = \cos 2\pi[2 \times 10^6 t + 30 \sin 150t + 40 \cos 150t]$. The maximum frequency and phase deviations of $s(t)$ are

- (A) 10.5 kHz, 140π rad (B) 6 kHz, 80π rad
(C) 10.5 kHz, 100π rad (D) 7.5 kHz, 100π rad

Q.29 A DS/BPSK spread spectrum signal has a processing gain of 500. If the desired error probability is 10^{-5} and (ε_b/J_0) required to obtain an error probability of 10^{-5} for

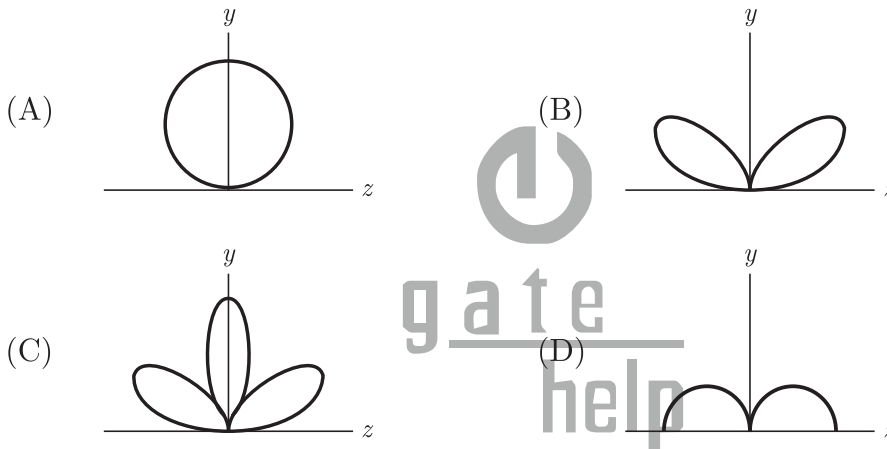
binary PSK is 9.5 dB, then the Jamming margin against a containers tone jammer is

- (A) 23.6 dB (B) 17.5 dB
(C) 117.4 dB (D) 109.0 dB

Q.30 In a material the magnetic field intensity is $H = 1200$ A/m when $B = 2$ Wb/m². When H is reduced to 400 A/m, $B = 1.4$ Wb/m². The change in the magnetization M is

- (A) 164 kA/m (B) 326 kA/m
(C) 476 kA/m (D) 238 kA/m

Q.31 A $\lambda/2$ dipole is kept horizontally at a height of $\lambda_0/2$ above a perfectly conducting infinite ground plane. The radiation pattern in the plane of dipole (\vec{E} plane) looks approximately as



Q.32 If $u = \phi\left(\frac{y}{x}\right) + x\psi\left(\frac{y}{x}\right)$, then the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$, is

- (A) 0 (B) u
(C) $2u$ (D) $-u$

Q.33 $\int \frac{dx}{1 + \sin x}$ is equal to

- (A) $-\cot x + \operatorname{cosec} x + c$ (B) $\cot x + \operatorname{cosec} x + c$
(C) $\tan x - \sec x + c$ (D) $\tan x + \sec x + c$

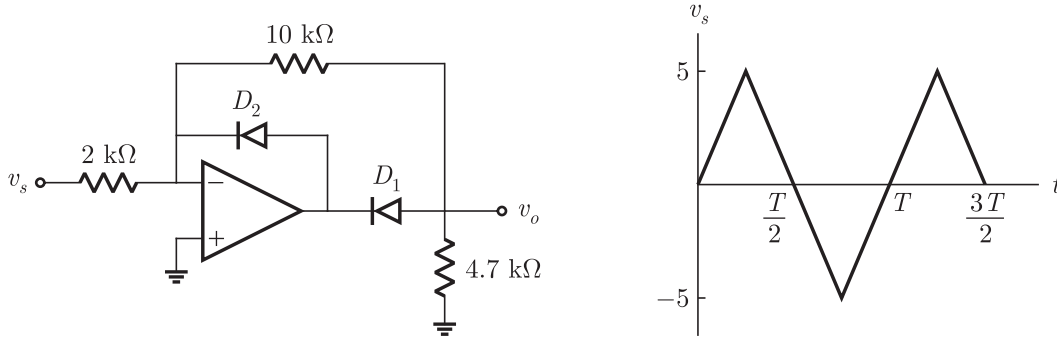
Q.34 $f(z_0) = \int_c \frac{3z^2 + 7z + 1}{(z - z_0)} dz$, where c is the circle $x^2 + y^2 = 4$ The value of $f'(1 - i)$ is

- (A) $7(\pi + i2)$ (B) $6(2 + i\pi)$
(C) $2\pi(5 + i13)$ (D) 0

Q.35 For $dy/dx = x^2 + y^2$ given that $y = 0$ at $x = 0$. The solution of differential equation for $x = 0.4$ using picard's method is

- (A) 0.02193
- (B) 0.02145
- (C) 0.02135
- (D) 0.02199

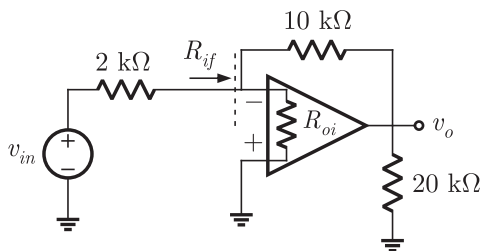
Q.36 Consider the following circuit and input voltage to it.



If op-amp and diodes are ideal, the output voltage waveform is

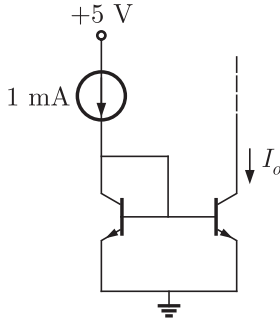
- (A)
- (B)
- (C)
- (D)

Q.37 Consider an op-amp circuit shown in figure, with an open loop gain of $A_{OL} = 10^5$ and open loop input impedance $R_{oi} = 10 \text{ k}\Omega$. If output resistance of op-amp is zero, then closed loop input impedance (R_{if}) at the inverting terminal of op-amp is



- (A) $R_{if} = 10 \text{ k}\Omega$
- (B) $R_{if} = 1 \Omega$
- (C) $R_{if} = 40 \text{ k}\Omega$
- (D) $R_{if} = 0.1 \Omega$

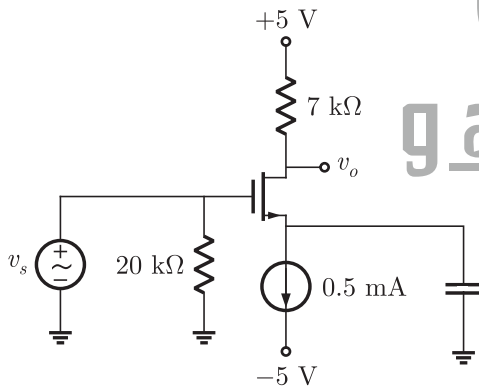
Q.38 In the current mirror circuit shown below the transistor parameters are $V_{BE} = 0.7 \text{ V}$, $\beta = 50$ and the Early voltage is infinite. Assume transistor are matched.



The output current I_o is

- (A) 1.04 mA
- (B) 1.68 mA
- (C) 962 μA
- (D) 432 μA

Q.39 Consider the common-source circuit with source bypass capacitor. The signal frequency is sufficiently large. The transistor parameters are $V_{TN} = 0.8 \text{ V}$, $K_n = 1 \text{ mA/V}^2$ and $\lambda = 0$. The voltage gain is



- (A) -15.6
- (B) -9.9
- (C) -6.8
- (D) -3.2

Q.40 For a particular semiconductor material following parameters are observed:

$$\mu_n = 1000 \text{ cm}^2/\text{V-s}, \mu_p = 600 \text{ cm}^2/\text{V-s} \text{ and } N_c = N_v = 10^{19} \text{ cm}^{-3}.$$

These parameters are independent of temperature. The measured conductivity of the intrinsic material is $\sigma = 10^{-6} (\Omega\text{-cm})^{-1}$ at $T = 300 \text{ K}$. The conductivity at $T = 500 \text{ K}$ is

- (A) $2 \times 10^{-4} (\Omega\text{-cm})^{-1}$
- (B) $4 \times 10^{-5} (\Omega\text{-cm})^{-1}$
- (C) $2 \times 10^{-5} (\Omega\text{-cm})^{-1}$
- (D) $6 \times 10^{-3} (\Omega\text{-cm})^{-1}$

Q.41 The parameters of n -channel depletion mode MOSFET are $V_{TN} = -2 \text{ V}$ and

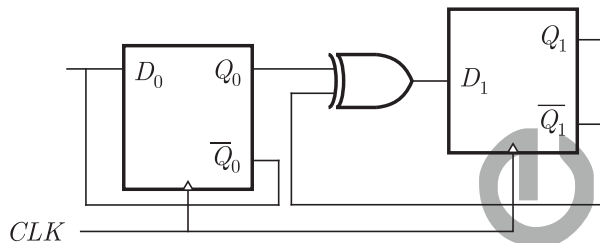
$k'_n = 80 \mu\text{A}/\text{V}^2$. The drain current is $I_D = 1.5 \text{ mA}$ at $V_{GS} = 0$ and $V_{DS} = 3 \text{ V}$. The ratio W/L is

- (A) 7.78 mA
- (B) 15.56 mA
- (C) 9.375 mA
- (D) 4.69 mA

Q.42 A uniformly doped silicon epitaxial *npn* bipolar transistor is fabricated with a base doping of $N_B = 3 \times 10^{16} \text{ cm}^{-3}$ and a heavily doped collector region with $N_C = 5 \times 10^{17} \text{ cm}^{-3}$. The neutral base width is $x_B = 0.7 \mu\text{m}$ when $V_{BE} = V_{BC} = 0$. The V_{BC} at punch-through is

- (A) 26.3 V
- (B) 18.3 V
- (C) 12.2 V
- (D) 6.3 V

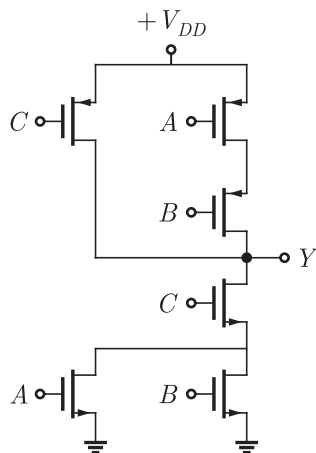
Q.43 Consider the following circuit



The flip-flop are positive edge triggered D FFs. Each state is designated as a two bit string $Q_0 Q_1$. Let the initial state be 00. The state transition sequence is

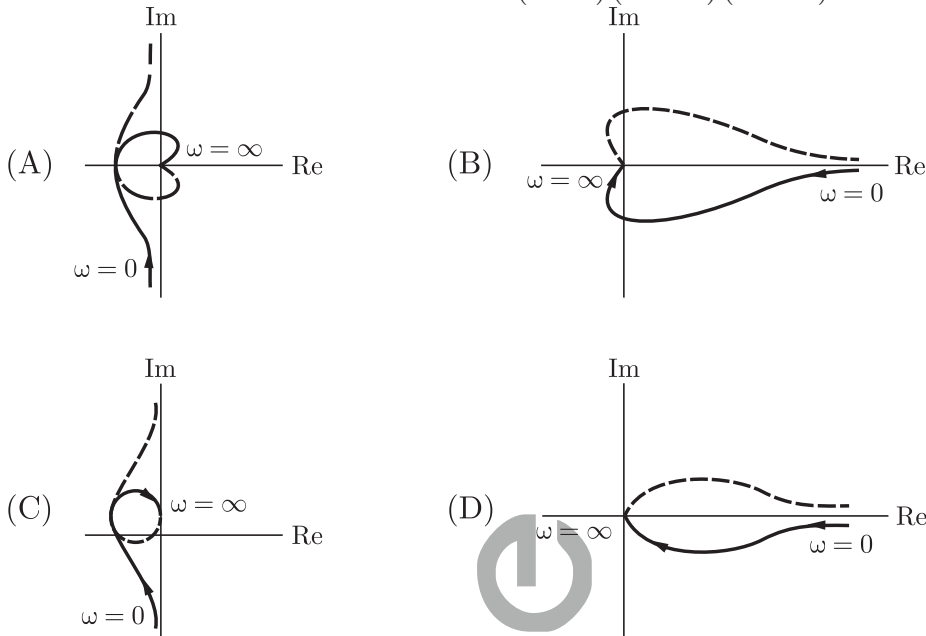
- (A) $00 \rightarrow 11 \rightarrow 01$
- (B) $00 \rightarrow 11$
- (C) $00 \rightarrow 10 \rightarrow 01 \rightarrow 11$
- (D) $00 \rightarrow 11 \rightarrow 01 \rightarrow 10$

Q.44 In the CMOS circuit shown below the output Y is

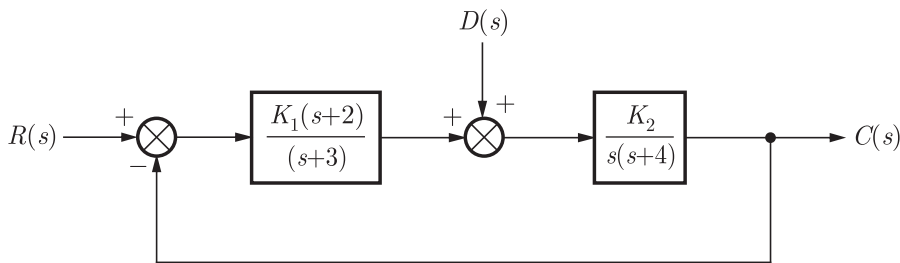


- (A) $\overline{(A + C)}B$ (B) $\overline{(A + B)}\overline{C}$
 (C) $AB + C$ (D) $AB + \overline{C}$

Q.45 For the certain ufb system $G(s) = \frac{K}{s(s+1)(2s+1)(3s+1)}$ The Nyquist plot is



Q.46 For the system shown below the steady state error component due to unit step disturbance is 0.000012 and steady state error component due to unit ramp input is 0.003. The value of K_1 and K_2 are respectively



- (A) 16.4, 1684 (B) 1250, 2.4
 (C) $125 \times 10^3, 0.016$ (D) 463, 3981

Q.47 Following is the segment of a 8085 assembly language program

```
LXI SP, EFFF H
CALL 3000 H
:
:
3000 H LXI H, 3CF 4
```

PUSH PSW
 SPHL
 POP PSW
 RET

On completion of RET execution, the contents of SP is

- (A) 3CF0 H (B) 3CF8 H
 (C) EFFD H (D) EFFF H

Common Data for Q 48-49 :

The discrete Fourier transform of a discrete sequence $x[n]$ is $X_{DFT}[k] = \{1, 2, 3, 4\}$

Q.48 DFT of the sequence $g[n] = x[n - 2]$ is

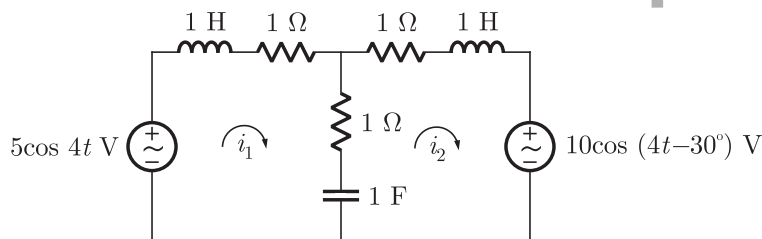
- (A) $\{1, 2, -3, 4\}$ (B) $\{1, -2, 3, -4\}$
 (C) $\{3, -4, 1, -2\}$ (D) $\{-2, 1, -4, 3\}$

Q.49 The discrete Fourier transform of $x[-n]$ is

- (A) $\{-1, -2, -3, -4\}$ (B) $\{1, -2, 3, -4\}$
 (C) $\{4, 3, 2, 1\}$ (D) $\{1, 4, 3, 2\}$

Common Data for Q. 50-51 :

The circuit is as shown below



Q.50 In the circuit below the current $i_1(t)$ is

- (A) $2.36 \cos(4t - 41.07^\circ)$ A (B) $2.36 \cos(4t + 41.07^\circ)$ A
 (C) $1.37 \cos(4t - 41.07^\circ)$ A (D) $2.36 \cos(4t + 41.07^\circ)$ A

Q.51 In the circuit shown below the current $i_2(t)$ is

- (A) $2.04 \sin(4t + 92.13^\circ)$ A (B) $-2.04 \sin(4t + 2.13^\circ)$ A
 (C) $2.04 \cos(4t + 2.13^\circ)$ A (D) $-2.04 \cos(4t + 92.13^\circ)$ A

Statement for Linked Answer Q. 52-53

Determine the state-space representation for the transfer function given in question. Choose the state variable as follows

$$x_1 = c = y, \quad x_2 = \frac{dc}{dt} = \dot{c}, \quad x_3 = \frac{d^2c}{dt^2} = \ddot{c}, \quad x_4 = \frac{d^3c}{dt^3} = \dddot{c}$$

Q.52
$$\frac{C(s)}{R(s)} = \frac{24}{s^3 + 9s^2 + 26s + 24}$$

(A)
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -24 & -26 & -9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 24 \end{bmatrix} r$$

(B)
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 24 & 26 & 9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 24 \end{bmatrix} r$$

(C)
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 9 & 26 & 24 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 24 \end{bmatrix} r$$

(D)
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -9 & -26 & -24 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 24 \end{bmatrix} r$$

Q.53
$$\frac{C(s)}{R(s)} = \frac{100}{s^4 + 20s^3 + 10s^2 + 7s + 100}$$

(A)
$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 100 & 7 & 10 & 20 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 100 \end{bmatrix} r, \quad y = [1 \ 0 \ 0 \ 0]x$$

(B)
$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -100 & -7 & -10 & -20 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 100 \end{bmatrix} r, \quad y = [1 \ 0 \ 0 \ 0]x$$

(C)
$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 20 & 10 & 7 & 100 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} r, \quad y = [100 \ 0 \ 0 \ 0]x$$

(D)
$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -20 & -10 & -7 & -100 \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} r, \quad y = [100 \ 0 \ 0 \ 0]x$$

Statement for Linked Answer Q. 54-55:

A 6 cm × 4 cm rectangular wave guide is filled with dielectric of refractive index 1.25.

Q.54 The range of frequencies over which single mode operation will occur is

(A) 2.24 GHz < f < 3.33 GHz

(B) 2 GHz < f < 3 GHz

(C) 4.48 GHz < f < 7.70 GHz

(D) 4 GHz < f < 6 GHz

- Q.55** The range of frequencies, over which guide support both TE_{10} and TE_{01} modes and no other, is
- (A) $3.35 \text{ GHz} < f < \text{GHz}$ (B) $2.5 \text{ GHz} < f < 3.6 \text{ GHz}$
(C) $3 \text{ GHz} < f < 3.6 \text{ GHz}$ (D) $2.5 \text{ GHz} < f < 4.02 \text{ GHz}$

General Aptitude(GA) Questions

Q.56- Q 60 carry one mark each

- Q.56** Which one of the following is the Antonym of the word SILENCE ?
- (A) attune (B) babble
(C) achromatic (D) aurora
- Q.57** Which one of the following is the synonym of the word ADMONISH ?
- (A) warn (B) escape
(C) worship (D) distribute
- Q.58** One of the four words given in the four options does not fit the set of words. The odd word from the group, is
- (A) Swim (B) Swill
(C) Ablution (D) Bathe
- Q.59** A pair of CAPITALIZED words shown below has four pairs of words. The pair of words which best expresses the relationship similar to that expressed in the capitalized pair, is
NUTS : BOLTS
- (A) Nitty : Gritty (B) Bare : Feet
(C) Naked : Surprise (D) Hard : Soft
- Q.60** In the following sentence, a part of the sentence is left unfinished. Four different ways of completing the sentence are indicated. The best alternative among the four, is
In pursuance of their decision of resist what they saw as anti-labour policies, the company employee's union launched agitation to.....
- (A) Show their virility
(B) reaffirm their commitment of the company
(C) bring down the government
(D) demonstrate their strength.

Q. 61-65 carry two marks each

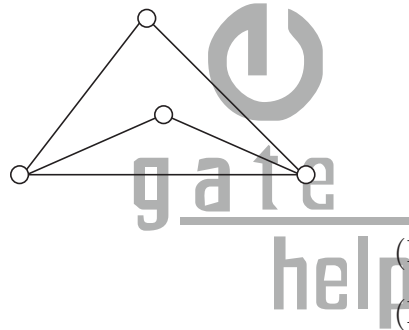
Q.61 Let $N = 1421 \times 1423 \times 1425$. What is the remainder when N is divided by 12 ?

- (A) 0 (B) 9
(C) 3 (D) 6

Q.62 There are 60 students in a class. These students are divided into three groups A , B , and C of 15, 20 and 25 students each. The groups A and C are combined to form group D . What is the average weight of the students in group D ?

- (A) more than the average weight of A (B) more than the average weight of C
(C) less than the average weight of C (D) cannot be determined

Q.63 Four cities are connected by a road network as shown in the figure. In how many ways can you start from any city and come back to it without travelling on the same road more than once ?



- (A) 8 (B) 12
(C) 16 (D) 20

Q.64 The roots of the equation $ax^2 + 3x + 6 = 0$ will be reciprocal to each other if the value of a is

- (A) 3 (B) 4
(C) 5 (D) 6

Q.65 A man starting at a point walks one km east, then two km north, then one km east then one km north, then one km east and then one km north to arrive at the destination. What is the shortest distance from the starting point to the destination ?

- (A) $2\sqrt{2}$ km (B) 7 km
(C) $3\sqrt{2}$ km (D) 5 km

END OF THE QUESTION PAPER

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