



GATE-2019

Full Length Test

Electronics and Communication Engineering

Name:

Test ID: ECE-FLT-2019

Duration: 3 hours

Maximum marks : 100

Please read the following instructions carefully

General Instructions

1. Total duration of examination is 180 minutes (3 hours).
2. The clock will be set at the server. The countdown timer in the top right corner of screen will display the remaining time available for you to complete the examination. When the timer reaches zero, the examination will end by itself. You will not be required to end or submit your examination.
3. The Question Palette displayed on the right side of screen will show the status of each question using one of the following:
 - a. You have not visited the question yet.
 - b. You have not answered the question.
 - c. You have answered the question.
 - d. You have NOT answered the question, but have marked the question for review.
 - e. You have answered the question, but marked it for review.

The **Marked for Review** status for a question simply indicates that you would like to look at that question again. If a question is answered and **Marked for Review**, your answer for that question will be considered in the evaluation.

Navigating to a Question

4. To answer a question, do the following:
 - a. Click on the question number in the Question Palette to go to that question directly.
 - b. Select an answer for a multiple choice type question by clicking on the bubble placed before the 4 choices namely A, B, C, D. Use the virtual numeric keypad to enter a number as answer for a numerical type question.
 - c. Click on **Save and Next** to save your answer for the current question and then go to the next question.
 - d. Click on **Mark for Review and Next** to save your answer for the current question, and also mark it for review, and then go to the next question.
 - e. **Caution:** Note that your answer for the current question will not be saved, if you navigate to another question directly by clicking on its question number without saving the answer to the previous questions.
 - f. You can view all the questions by clicking on the **Question Paper** button. This feature is provided, so that if you want you can just see the entire question paper at a glance.

Answering a Question

5. Procedure for answering a multiple choice (MCQ) type question:
 - a. To select your answer, click on the bubble button of one of the options
 - b. To deselect your chosen answer, click on the bubble button of the chosen option again or click on the clear response button
 - c. To change your chosen answer, click on the bubble button of another option
 - d. To save your answer, you MUST click on the **Save and Next** button.
 - e. To mark the question for review, click on the **Mark for Review and Next** button. If an answer is selected for a question that is Marked for Review, that answer will be considered in the evaluation.

6. Procedure for answering a numerical answer type question:

- a. To enter a number as your answer, use the virtual numerical keypad
 - b. A fraction (eg. -0.3 or $-.3$) can be entered as an answer with or without '0' before the decimal point. As many as four decimal points, e.g. 12.5435 or 0.003 or -932.6711 or 12.82 can be entered.
 - c. To clear your answer, click on the Clear Response button
 - d. To save your answer, you MUST click on the **Save and Next** button
 - e. To mark a question for review, click on the **Mark for Review and Next** button. If an answer is selected (for MCQ) or entered (for numerical answer type) for a question that is Marked for Review, that answer will be considered in the evaluation.
7. To change your answer to a question that has already been answered, first select that question for answering and then follow the procedure for answering that type of question.
 8. Note that ONLY Questions for which answers are saved or marked for review after answering will be considered for evaluation.

Paper Specific Instructions:

9. There are a total of 65 questions carrying 100 marks. Questions are of multiple choice type or numerical answer type. A multiple choice type question will have four choices for the answer with only one correct choice. For numerical answer type questions, the answer is a number and no choices will be given. A number as the answer should be entered using the virtual keyboard on the monitor.
10. Questions Q.1 – Q.25 carry 1mark each. Questions Q.26 – Q.55 carry 2marks each.
11. Questions Q.56 – Q.65 belong to General Aptitude (GA) section and carry a total of 15 marks. Questions Q.56 – Q.60 carry 1mark each, and questions Q.61 – Q.65 carry 2marks each.
12. Questions not attempted will result in zero mark. Wrong answers for multiple choice type questions will result in NEGATIVE marks. For all 1 mark questions, $\frac{1}{3}$ mark will be deducted for each wrong answer. For all 2 marks questions, $\frac{2}{3}$ mark will be deducted for each wrong answer. There is no negative marking for questions of numerical answer type.
13. Physical calculator is NOT allowed. All candidates will be provided with an online scientific calculator which has to be used to answer the questions.

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Full Length Test

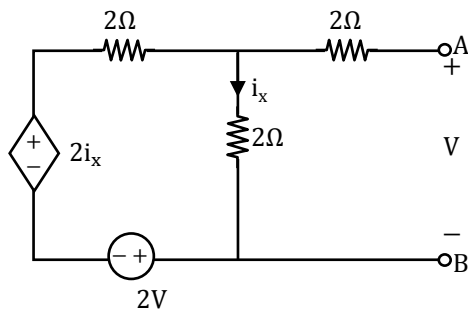
Electronics and Communication Engineering

Q.1 - Q.25 Carry One Mark each.

- Let P, Q, R, S be $m \times m$ matrices each with non-zero determinant
If PQRS = I, then R^{-1} is
 (A) SPQ (C) PQS
 (B) $Q^{-1}P^{-1}S^{-1}$ (D) $S^{-1}P^{-1}Q^{-1}$
- Green's theorem is used to convert
 (A) Line integral to surface integral (C) Line integral to volume integral
 (B) Surface integral to volume integral (D) None of these
- Consider the function $y = x^2 - 6x + 9$. The maximum value of y obtained when x varies over the interval 2 to 5 will be at _____
- Evaluate

$$S = \sum_{r=0}^{n-1} \frac{1}{\sqrt{4n^2 - r^2}}$$
 as $n \rightarrow \infty$
 (A) $\pi/6$ (C) $\pi/2$
 (B) $\pi/3$ (D) π
- The particular solution for a given differential equation $(D^2 + 5D + 6)y = \sin 2x$ is
 (A) $\frac{5\sin 2x - \cos 2x}{104}$ (C) $\frac{10\sin 2x - 2\cos 2x}{-104}$
 (B) $\frac{5\cos 2x - \sin 2x}{104}$ (D) $\frac{10\cos 2x - 2\sin 2x}{-104}$

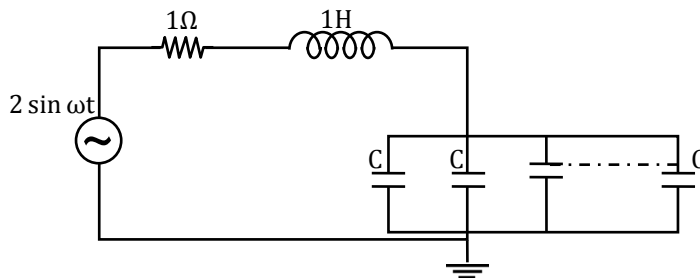
6. A circuit shown below



What is the voltage across terminals A And B?

- (A) 0V (C) -2V
 (B) -1V (D) ∞

7. A circuit as shown below, where $C = 1\text{F}$



Determine the Bandwidth of the above circuit _____ [Hz]

8. If two semiconductor materials have exactly the same properties at room temperature except that the material x has a band gap of 1.0 eV and material y has a band gap of 5.0 eV, then the ratio of intrinsic concentration of material y to x is
[Assume $k = 1.38 \times 10^{-23}$ Joule/kelvin, $V_T = 25.9$ mV]

- (A) 2.22×10^{-22} (C) 1.11×10^{35}
(B) 2.9×10^{-34} (D) 7.28×10^{-68}

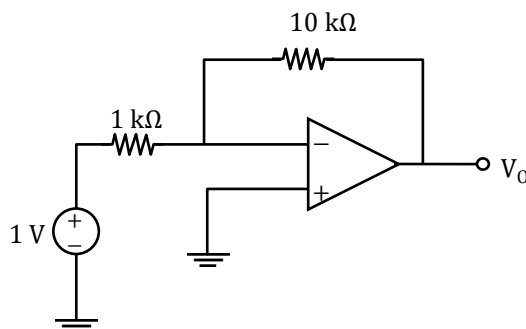
9. Thermal run-away is not possible in FET because as the temperature of FET increases

- (A) The drain current increases
(B) The mobility increases
(C) The mobility decreases
(D) The trans conductance increases

10. A sample of Si at $T = 300^\circ\text{K}$ of length 2.5 cm and cross sectional area of 2 mm^2 is doped with 10^{17} cm^{-3} of phosphorous and $9 \times 10^{16}\text{ cm}^{-3}$ of boron. The resistance of the sample is _____ Ω . [Assume $\mu_p = 200\text{ cm}^2/\text{V-sec}$, $\mu_n = 500\text{ cm}^2/\text{V-sec}$]

11. An amplifier has gain $A = 1000 \pm 10$. A negative feedback is provided such that the gain variation remains within 0.1%. The amount of feedback factor is _____

12. An Op-Amp has a poor gain = 5. Find the output voltage (V_O) _____

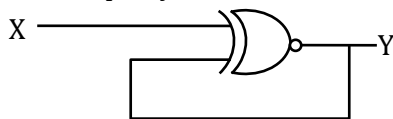


13. A common source amplifier is driven by a voltage source with a internal resistance $R_s = 300\ \Omega$. The load is $R_D = 20\text{ k}\Omega$ FET parameter are $g_m = 2\text{ mS}$, $r_d = 20\text{ k}\Omega$, $C_{gd} = 4\text{ pF}$, $C_{gs} = 8\text{ pF}$. The upper cutoff frequency is _____ MHz

14. The minimized expression for the given K-map is (X: don't care)

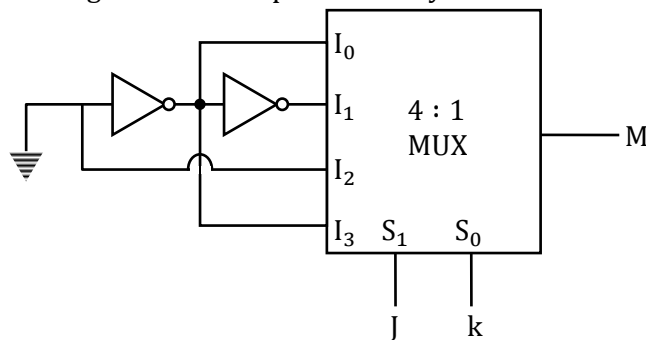
CD \	00	01	11	10
00		1	1	
01		1	X	
11	1	1	X	X
10	1		X	X

- (A) $\bar{C}B + BD + CD$ (C) $C\bar{B} + AC + B\bar{C}$
 (B) $AB + C\bar{B} + B\bar{C}$ (D) $\bar{C}B + CD + C\bar{B}$
15. The output 'y' after 15th clock is



- (A) 1 (C) X
 (B) 0 (D) \bar{X}

16. The logic function implemented by the circuit below is (ground implies a logic '1')



- (A) $M = \text{AND}(J, K)$ (C) $M = X \text{ NOR}(J, K)$
 (B) $M = \text{OR}(J, K)$ (D) $M = \text{XOR}(J, K)$
17. A square wave is defined by

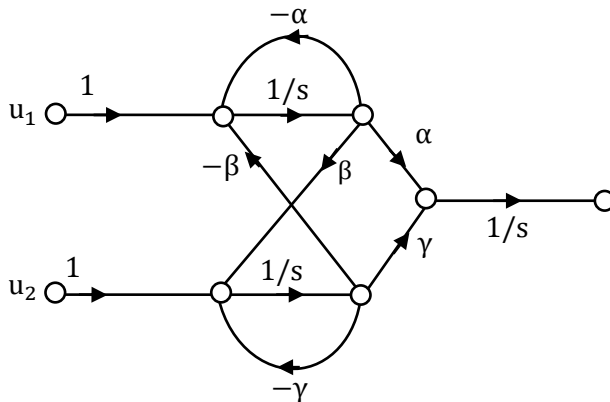
$$x(t) = \begin{cases} A & 0 < t < \frac{T_0}{2} \\ -A & \frac{T_0}{2} < t < T_0 \end{cases}$$

It is periodically extended outside this interval. The general coefficient a_n in the Fourier expansion of this wave is _____

- (A) 1 (C) 5
 (B) 0 (D) 6

18. The impulse response of a discrete time system is given by $h(n) = \frac{1}{2}[\delta(n) + \delta(n - 2)]$
Where $z = r e^{j\Omega}$ and $r = 1$. The magnitude of the response $H(z)$ can be expressed as
(A) $|\cos \Omega|$ (C) $|\sin \Omega|$
(B) $\cos \Omega$ (D) $\sin \Omega$
19. Let $x(t)$ be a continuous time, real valued signal band limited to f Hz. The Nyquist sampling rate, in Hz for $y(t) = x(3t) + x(t) + x(0.5t)$ is a f Hz. Then a is _____
20. Find the first maximum value of the response occurs at a time t_{\max} for given system
$$\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}$$

(A) π (C) $\pi/4$
(B) $\pi/2$ (D) $\pi/8$
21. A signal flow graph of a system is given below



The set of equations that correspond to this signal flow graph is

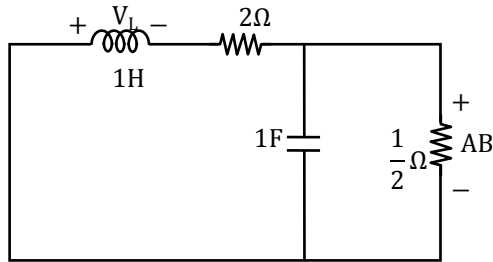
- (A)
$$\frac{d}{dt} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{bmatrix} \beta & -\gamma & 0 \\ \gamma & \alpha & 0 \\ -\alpha & -\beta & 0 \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 0 \\ 0 & 1 \end{bmatrix} \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$$
- (B)
$$\frac{d}{dt} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{bmatrix} 0 & \alpha & \gamma \\ 0 & -\alpha & -\gamma \\ 0 & \beta & -\beta \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$$
- (C)
$$\frac{d}{dt} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{bmatrix} -\alpha & \beta & 0 \\ -\beta & -\gamma & 0 \\ \alpha & \gamma & 0 \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$$
- (D)
$$\frac{d}{dt} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{bmatrix} -\gamma & 0 & \beta \\ \gamma & 0 & \alpha \\ -\beta & 0 & -\alpha \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 1 & 0 \end{bmatrix} \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$$
22. The peak to peak input to an 8 bit PCM codes is 2 volts. The signal power to quantisation noise power ratio (in dB) for an input of $\frac{1}{2} \cos(\omega_m t)$ is _____

23. Consider the amplitude modulated (AM) signal $A_C \cos \omega_c t \times 2 \cos \omega_m t \cos \omega_c t$ for demodulating the signal using envelope detector, the minimum value of A_C should be _____
24. The total charge enclosed in an incremental volume of 10^{-6}m^3 located at the origin, $\vec{D} = e^{-x} \cos y \hat{a}_x - e^{-x} \sin y \hat{a}_y + 3z \hat{a}_z \text{ C/m}^2$ is given by _____ μC
 (A) 1 (C) 3
 (B) 2 (D) 0
25. The electric field of a plane wave propagating through a loss- less medium ($\mu_0, 9\epsilon_0$) is $\vec{E} = 20 \cos(9\pi \times 10^8 t - \beta x) \hat{a}_y$, then the phase constant β of the wave is _____ $\pi \text{ rad/m}$

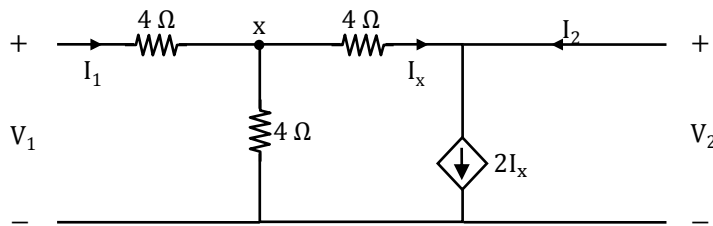
Q.26 - Q.55 Carry Two Mark each.

26. 'x' is the matrix $x = \begin{bmatrix} b^2 & 1 \\ (b^2 + b - 1) & (1 - b) \end{bmatrix}$ and $x^2 - x + I = 0$
 I: Identity matrix
 0: Zero matrix
 Then, which of the following denotes the inverse of x?
 (A) $\begin{bmatrix} -b & (b^2 - 1) \\ (b - 1) & 1 \end{bmatrix}$ (C) $\begin{bmatrix} (b - 1) & b^2 \\ b^2 & (-b^2 + b - 1) \end{bmatrix}$
 (B) $\begin{bmatrix} (1 - b) & (b^2 - 1) \\ b^2 & b \end{bmatrix}$ (D) $\begin{bmatrix} (1 - b^2) & -1 \\ (1 - b - b^2) & b \end{bmatrix}$
27. The number of solution of the equation $a^{f(x)} + g(x) = 0$ Where $a > 0, g(x) \neq 0$ has minimum value $\frac{1}{2}$, is
 (A) Infinitely many (C) Two
 (B) Only One (D) Zero
28. The analytic solution corresponding to the real part is given by $u = e^{-x} \{(x^2 - y^2) \cos y + 2xy \sin y\}$
 (A) $z^2 e^{-z}$ (C) $(z^2 + 2) e^{-z}$
 (B) $(z^2 - 2) e^{-z}$ (D) $z^2 e^z$
29. A standard air filled rectangular wave guide with dimensions $a = 5 \text{ cm}, b = 3 \text{ cm}$ is fed by a 4 GHz carrier from a coaxial cable. Which of the following shows the phase velocity and the group velocity when a TE_{10} mode will be propagated:
 (A) $4.54 \times 10^{10} \text{ m/s}, 1.76 \times 10^{10} \text{ m/s}$ (C) $4.54 \times 10^8 \text{ m/s}, 1.98 \times 10^8 \text{ m/s}$
 (B) $4.54 \times 10^{10} \text{ m/s}, 1.98 \times 10^{10} \text{ m/s}$ (D) None of these

30. Given $V_C = e^{-2t}(\sin t + \cos t)$. The value of V_L is $k_1 e^{-2t} \sin t + k_2 e^{-2t} \cos t$
 $k_1 - k_2$ _____

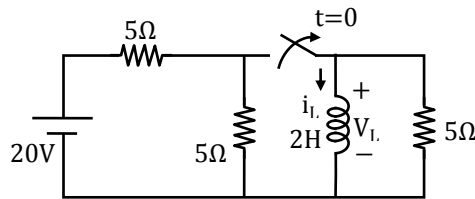


31. A circuit shown below

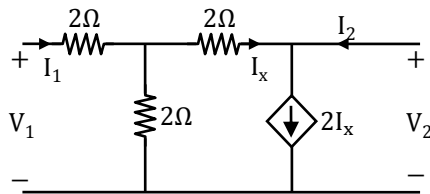


One of the equation of above network is $V_1 = SV_2 + MI_2$, what is the value of $M \times S$

32. Switch opened at $t = 0$ then the value of $V_L(0^+) =$ _____ Volts



33. What are the values of parameters A and C of above network?

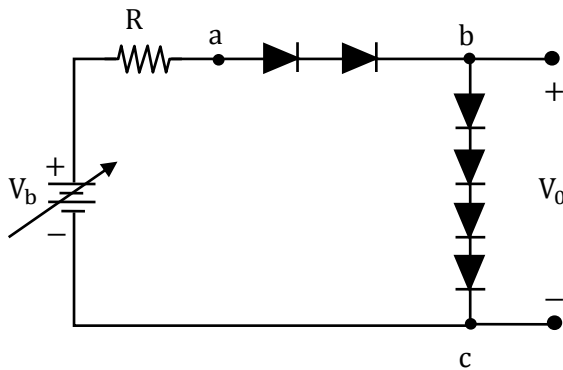


- (A) $2\Omega, 2$ (C) $2, 2\Omega$
 (B) $2, 0.5\Omega$ (D) $0.5\Omega, 0.5$

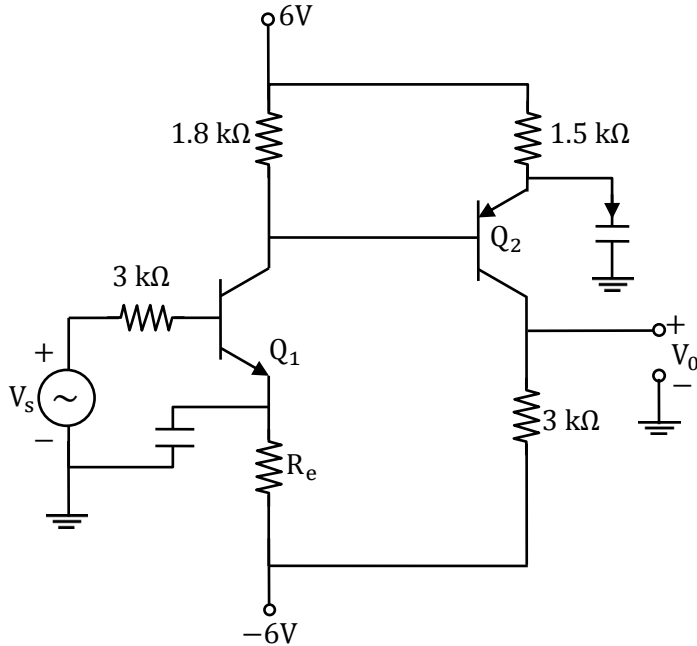
34. What will be thermal equilibrium electron concentration in Si at 27° if the Fermi energy level is 0.25 eV below the conduction band and the effect density of state function for conduction band in silicon at that temperature is $2.8 \times 10^{19} \text{ cm}^{-3}$.
 [Assume $k = 1.38 \times 10^{-23}$ Joule/kelvin]

- (A) $1.8 \times 10^{13} \text{ cm}^{-3}$ (C) $1.8 \times 10^{16} \text{ cm}^{-3}$
 (B) $1.8 \times 10^{15} \text{ cm}^{-3}$ (D) $1.8 \times 10^{14} \text{ cm}^{-3}$

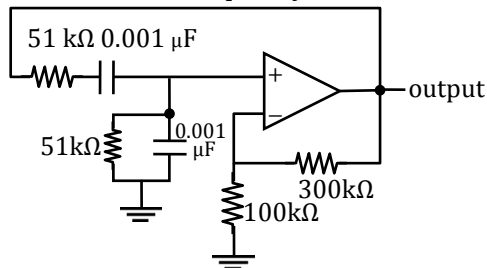
35. Given that at room temperature the volt equivalent of temperature $V_T = 26 \text{ mV}$, hole mobility $\mu_p = 500 \text{ cm}^2/\text{V sec}$ and life time of holes is 130 ns , in a sample of n type Si bar that is exposed to radiation at one end at low injection level. The diffusion length of holes _____ μm .
36. Consider BJT with following specification
Emitter injection efficiency = 0.98, Base transport factor = 0.99
Case I: BJT is connected in CB configuration at 300°K the input current is $20\mu\text{A}$ and $I_{CBO} = 100 \text{ nA}$
Case II: The same BJT is connected in CE configuration at 400°K with the input current $1\mu\text{A}$. The reverse bias across CE junction is same as in CB configuration
The ratio of collector current from CE to CB configuration is
(A) 175 (C) 150
(B) 100 (D) 200
37. For the circuit show below all the diodes are identical and have the characteristic $V_\gamma = 0.5 \text{ V}$ and $R_F = 50 \Omega$. Then the regulation of V_0 when V_b increases from its nominal value of 4 V to the value of 6 V is _____%. [Take $R = 4 \text{ k}\Omega$]



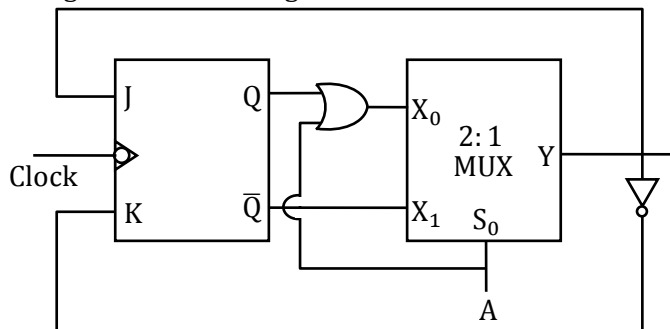
38. The amplifier shown in figure has to be biased so that $V_0 = 0V$ when $V_s = 0V$. Neglecting the base currents of both the transistors and assuming both the emitter-base junctions to have a forward bias of $0.6V$. The required value of $R_e = \underline{\hspace{2cm}}$ k Ω



39. The resonant frequency of the oscillator is

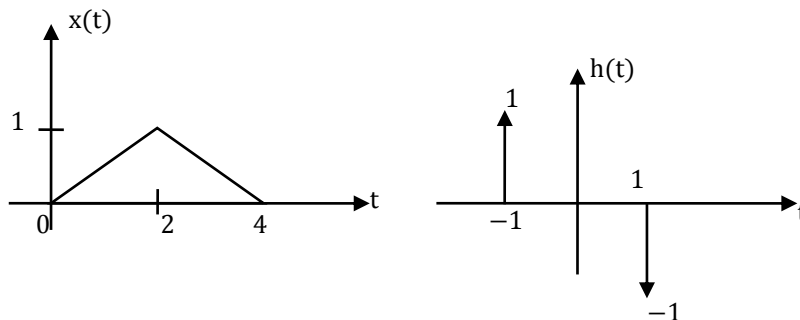


- (A) 2152.6 Hz
(B) 7351.9 Hz
(C) 3120.7 Hz
(D) 1532.8 Hz
40. For a MOD - 12 counter, the FF has a $t_{pd} = 60$ ns. The NAND gate has a t_{pd} of 25 ns. The clock frequency greater than or equal to _____ MHz
41. The given circuit changes its state when $A = \underline{\hspace{2cm}}$



42. Determine the contents of HL and DE pairs after the execution of DAD D instruction
- ```
LXI B, 2100 H
LXI D, 0200 H
LXI SP, 2700 H
PUSH B
PUSH D
LXI H, 0100 H
XTHL
DAD D
HLT
```
- (A) 0400 H and 0400 H  
(B) 0400 H and 0200 H  
(C) 0200 H and 0400 H  
(D) 0200 H and 0200 H

43. The signals  $x(t)$  and  $h(t)$  shown in the figures are convolved to yield  $y(t)$

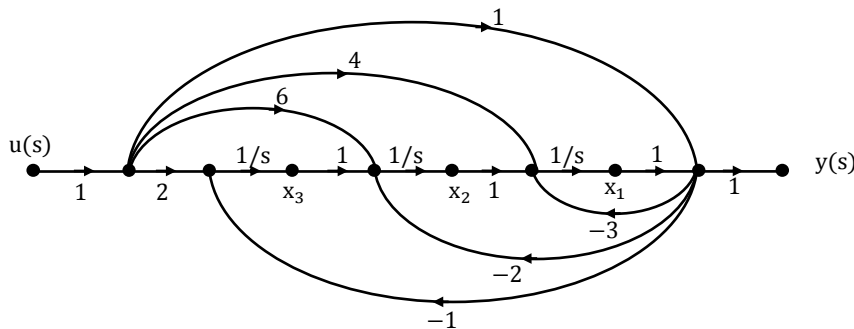


Then  $\int_{-\infty}^{\infty} y(t) dt = \underline{\hspace{2cm}}$

- (A) 1  
(B) 0  
(C) 2  
(D) 4
44. The Z-T of a signal  $f(k)$  is given by
- $$F(z) = \frac{2z^6 - z^5 + 3z^3 + 2z^2}{z^7 + 2z^6 + z^5 + z^4 + 0.5} = \frac{n(z)}{d(z)}$$
- Where  $n(z)$  and  $d(z)$  are the numerator and denominator polynomial respectively. The value of  $f[3] = \underline{\hspace{2cm}}$

45. If  $\vec{F} = 3y\vec{i} - xz\vec{j} + yz^2\vec{k}$  and is the surface of the paraboloid  $2z = x^2 + y^2$  bounded by  $z = 2$  evaluate  $I = \iint_S (\nabla \times \vec{F}) \cdot d\vec{s}$
- (A)  $-10\pi$   
(B)  $-15\pi$   
(C)  $-20\pi$   
(D)  $-25\pi$

46. The signal flow graph shown below,



Which of the following is correct state model for above diagram

- (A)  $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 3 & 1 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 1 \\ 4 \\ 1 \end{bmatrix} [u], y = x_1$
- (B)  $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 3 & 1 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} -1 \\ -4 \\ -1 \end{bmatrix} [u], y = x_1$
- (C)  $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 1 \\ 4 \\ 1 \end{bmatrix} [u], y = x_1$
- (D)  $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} -3 & 1 & 0 \\ -2 & 0 & 1 \\ -1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 1 \\ 4 \\ 1 \end{bmatrix} [u], y = x_1$

47. The transfer function of a phase-lead compensator is given by

$$G_C(s) = \frac{1 + 3Ts}{1 + Ts} \text{ where } T > 0$$

The maximum phase shift that can be obtained by such a compensator is \_\_\_\_\_ degrees.

48.  $A = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 1 \\ 0 & -1 & -2 \end{bmatrix}$

The system matrix of a continuous time system shown above in the state variable form is stable if

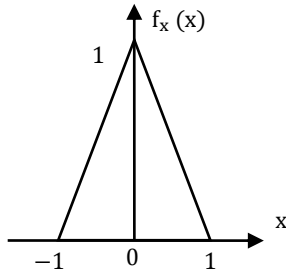
- (A)  $x < 1/2, y < 1/2$  (C)  $x < 0, y < 2$   
(B)  $x > 1/2, y > 1/2$  (D)  $x < 0, y < 1/2$

49. A received single tone sinusoidally modulated SSB - SC signal  $\cos\{(\omega_c + \omega_m)t\}$  has a normalized power of 0.5 volt. The signal is to be detected by carrier reinsertion technique envelope detector. The amplitude of the carrier to be reinserted so that power in the recovered signal at the demodulator output is 90% of the normalized power is (Assume the dc component is neglected)

- (A) 10 Volts (C) 5.5 Volts  
(B) 4.5 Volts (D) 3 Volts

50. Given an AM system with additive thermal noise having a PSD  $n/2 = 10^{-12}$  W/Hz. Assume that baseband message signal  $X(t)$  has a bandwidth of 4 kHz as amplitude distribution as shown in Figure.

The signal is demodulated by envelope detection, Assume  $m=1$



The minimum value of carrier amplitude  $A$  that will yield  $\left(\frac{S}{N}\right)_0 > 40\text{dB}$  is

- (A) 31 mV (C) 15.5 mV  
(B) 62 mV (D) 124 mV
51. For a super heterodyne receiver having no RF amplifier the loaded  $Q$  of the antenna coupling circuit is 100. If the intermediate frequency is 455 kHz. The super heterodyne receiver is to be improved for HF reception so that its image rejection at 25 MHz is as good as it was at 1100 kHz. The value of loaded  $Q$  which an RF amplifier for this receiver would have to have \_\_\_\_\_
52. 32 independent voice sources as TDMed using PCM. Each occupied a band of 300 – 3.5 kHz. The voice signal requires 128 quantizing levels for good quality transmission. In addition to the voice signal, a supervisory signal in the form of direct currents for supervision and addressing and 20 Hz ac current for ringing is to be sent. To provide for this, an extra bit is associated with each voice signal. For synchronization another bit is added at the end of the frame. The BW of PCM system is  
(A) 1644.8 kHz (C) 822.4 kHz  
(B) 411.2 kHz (D) 1233.6 kHz
53. In free-space, the electric field component is given as  $\vec{E}(x, t) = 60 \cos(\omega t - 2x)\hat{a}_y$  volts/m. Then the average power crossing a circular area of 4 meters radius is \_\_\_\_\_ watts.
54. Airline has characteristics impedance of  $70\Omega$  and the phase constant of 3 rad/m at 100 MHz. Then the inductance per meter and capacitance per meter of the line is \_\_\_\_\_ respectively  
(A) 682 nH/m, 334pF/m (C) 68.2 pF/m, 334.2 nH/m  
(B) 682 pH/m, 334pF/m (D) 334.2 nH/m, 68.2 pF/m

55. The potential field between the capacitor plates varies as  $V = 10^5 x \text{ Volts}$ , the distance between the capacitor plates is 0.2 cm and the area of the capacitor plates is  $100\text{m}^2$ , then what is the energy stored in the capacitor \_\_\_\_\_ mJ  
The medium between the plates is air,  $\epsilon_0 = \frac{1}{36\pi} \times 10^{-9} \text{F/m}$

**General Aptitude One Marks Question Q. 56 to Q. 60**

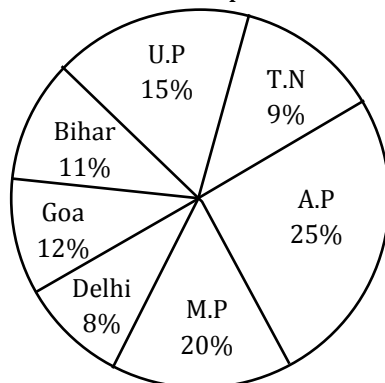
56. Three bells chime at an interval of 18, 24 and 32 minutes respectively. At a certain time they begin to chime together. What length of time will elapse before they chime together again?  
(A) 2 hours 24 minutes (C) 1 hour 36 minutes  
(B) 1 hour 12 minutes (D) 4 hours 48 minutes
57. In a one day cricket match, the total runs made by a team were 200. Out of these 160 runs were made by spinners.  
Conclusion I: 80% of the team consists of spinners.  
Conclusion II: The opening batsmen were spinners.  
(A) Only conclusion I follows (C) Either I or II follows  
(B) Only conclusion II follows (D) Neither I nor II follows
58. In a car race of 12km, a participant covers a distance of the first 3 km in 6 minutes. He then increases his speed and covers twice the distance already covered in 6 minutes. He covers the rest of the distance in 12 minutes. Find his average speed.  
(A) 9.23m/s (C) 6.20m/s  
(B) 7.44m/s (D) 8.33m/s

**Directions for Q. No. 59:** Choose the option which is FARTHEST to the word mentioned in Question

59. **MOROSE**  
(A) Exuberant (C) Mortified  
(B) Moron (D) Crestfallen
60. A team of five is to be selected from amongst five boys A, B, C, D and E and four girls P, Q, R and S. Some criteria for selection are as follows  
C and P have to be together, Q cannot go with R. E cannot go with S. B and D have to be together. Q cannot go with A. Unless stated otherwise, these criteria apply to all the following questions.  
If two of the members have to be boys, the team will consist of  
(A) CEPQS (C) ACPRS  
(B) AEPQS (D) BDPRS

**General Aptitude Two Marks Question Q. 61 to Q. 65**

**Direction for Q. No 61:** Data of different states regarding population of states in the year 1998 is shown in pie chart study the graph and answer the question that follows.



Total population of given states = 32,76,000

Following table shows that sex & literacy wise population ratio

| States         | Sex  |        | Literacy |            |
|----------------|------|--------|----------|------------|
|                | Male | Female | Literate | Illiterate |
| Andhra Pradesh | 5    | 3      | 2        | 7          |
| Madhya Pradesh | 3    | 1      | 1        | 4          |
| Delhi          | 2    | 3      | 2        | 1          |
| Goa            | 3    | 5      | 3        | 2          |
| Bihar          | 3    | 4      | 4        | 1          |
| Uttar Pradesh  | 3    | 2      | 7        | 2          |
| Tamil Nadu     | 3    | 4      | 9        | 4          |

61. What will be the total percentage of total number of males in U.P, M.P & Goa together to the total population of all given states ?  
 (A) 28.5% (C) 23%  
 (B) 18.5% (D) 32%
62. A cube is coloured red on one of the face, green on the opposite face, yellow on another face and blue on a face adjacent to the yellow face. The other two faces are left uncolored. It is then cut into 125 smaller cubes of equal size. How many cubes uncolored on the all the faces?  
 (A) 27 (C) 48  
 (B) 36 (D) 64
63. NOVICE: SEASONED  
 (A) Opulent: Grand (C) Affluent: Impecunious  
 (B) Nefarious : Wicked (D) Filthy: Disgusting

