

PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

CSIR NET Physics - Electronics

All PYQs (2015-2025) with answer key

128 questions . Answer key included

www.physicsbyaaryan.com . www.csirnetphysics.com

Contact: 9501976811

Q1. [Dec 2015] . 3.5 marks

Electronics > Diodes

CSIR NET	2015 Dec	3.5 M
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If the reverse bias voltage of a silicon varactor is increased by a factor of 2 , the corresponding transition capacitance

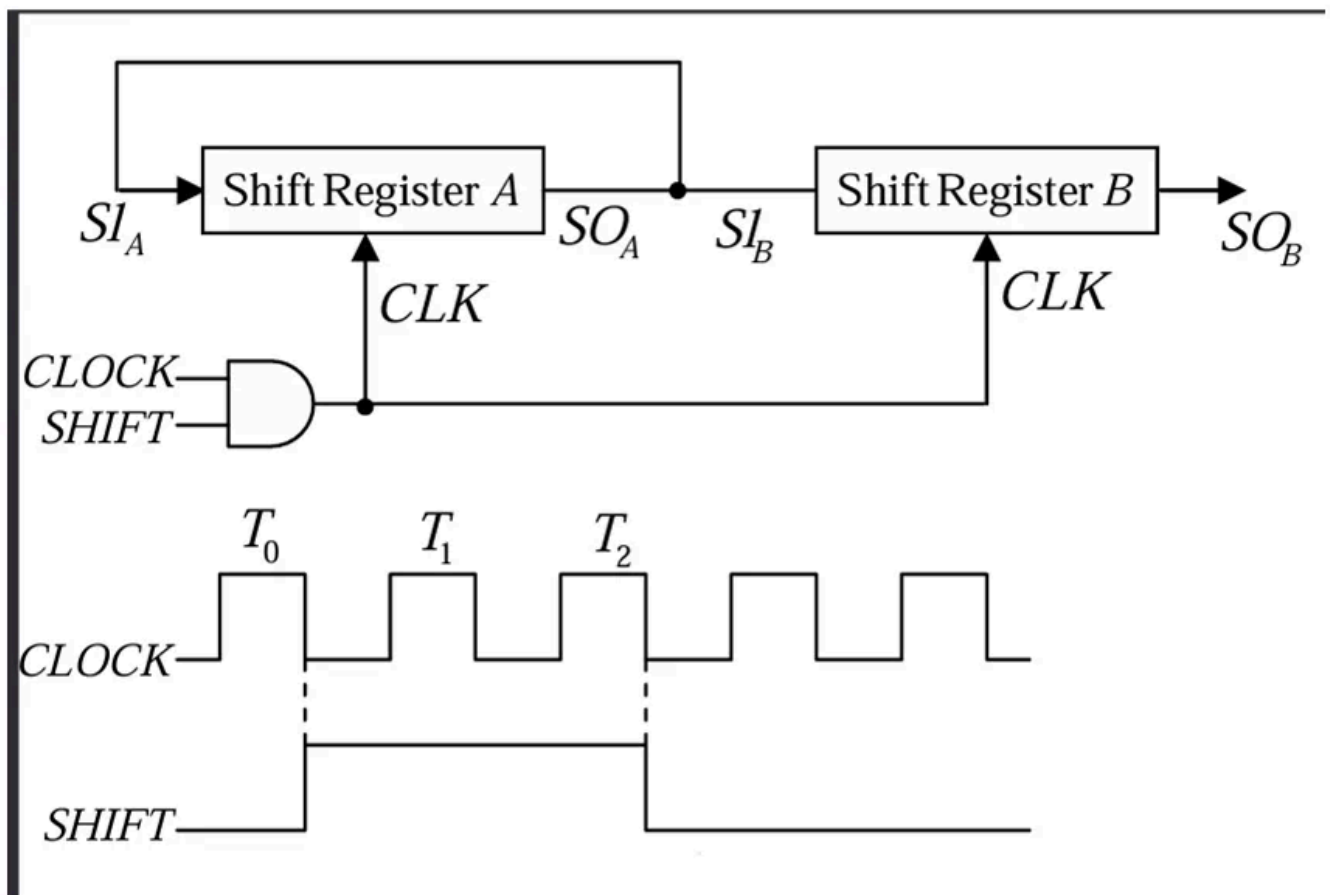
1. increases by a factor of $\sqrt{2}$
2. increase by a factor of 2
3. decreases h a factor of $\sqrt{2}$
4. decreases by a factor of 2

Q2. [Dec 2015] . 3.5 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2015 Dec	3.5 M
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In the schematic figure given below the initial values of 4 bit shift registers *A* and *B* are 1011 and 0010 respectively. The values at SO_A and SO_B after the pulse T_2 are respectively.



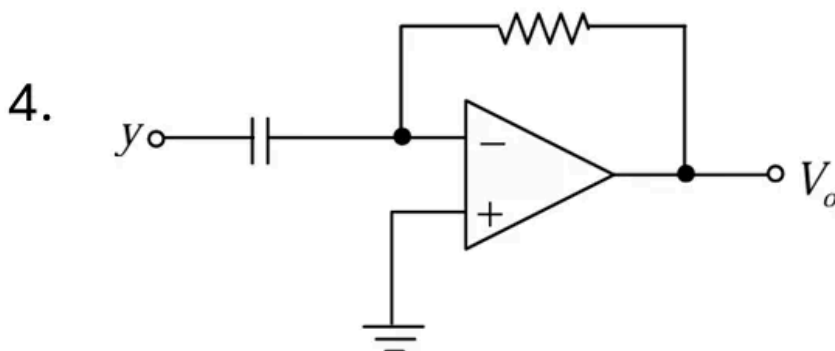
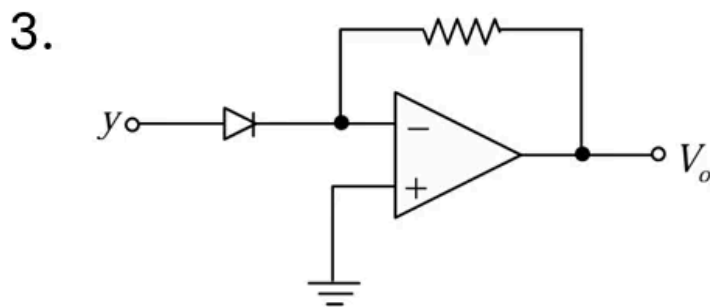
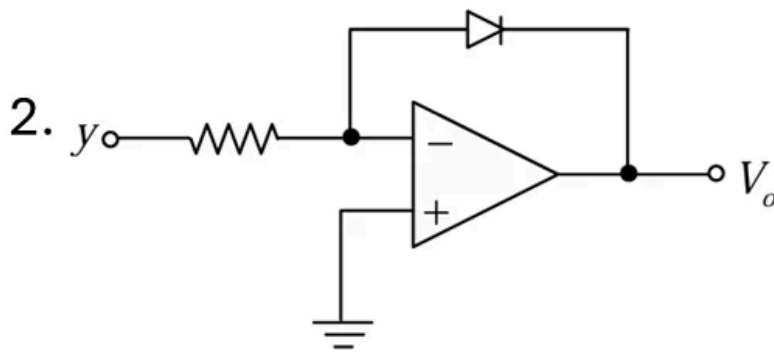
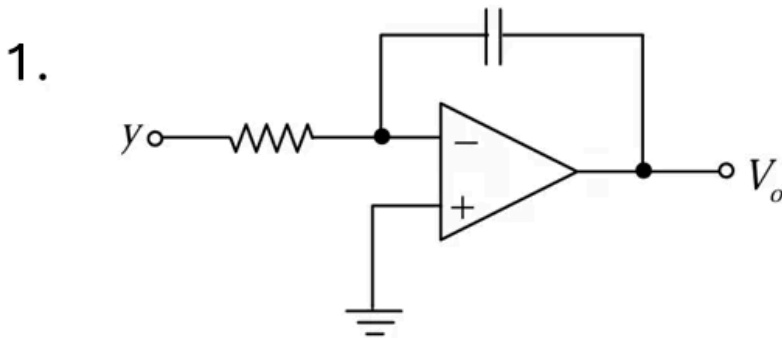
1. 1110 and 1001
2. 1101 and 1001
3. 1101 and 1100
4. 1110 and 1100

Q3. [Dec 2015] . 3.5 marks

Electronics > OPAMP

CSIR NET	2015 Dec	3.5 M
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If the parameters y and x are related by $y = \log(x)$, then the circuit that can be used to produce an output voltage V_o varying linearly with x is



Q4. [Dec 2015] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2015 Dec	3.5 M
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Two data sets A and B consist of 60 and 10 readings of a voltage measured using voltmeters of resolution of 1mV and 0.5mV respectively. The uncertainty in the mean voltage obtained from the data sets A and B are U_A and U_B , respectively. If the uncertainty of the mean of the combined data sets is U_{AB} then which of the following statements is correct?

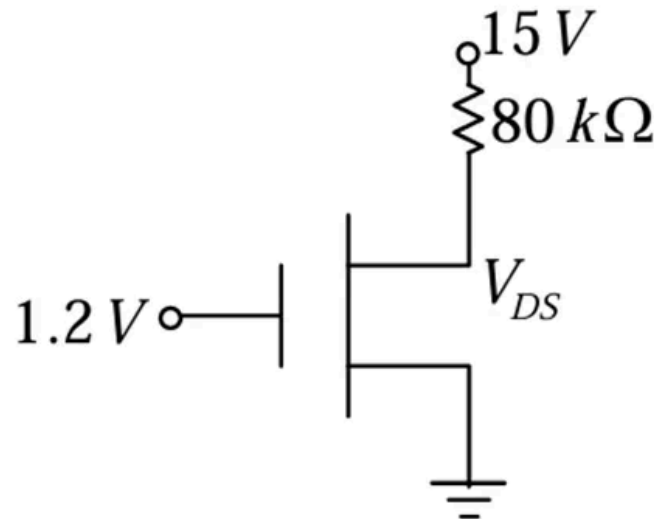
1. $U_{AB} < U_A$ and $U_{AB} > U_B$
2. $U_{AB} < U_A$ and $U_{AB} < U_B$
3. $U_{AB} > U_A$ and $U_{AB} < U_B$
4. $U_{AB} > U_A$ and $U_{AB} > U_B$

Q5. [Dec 2015] . 5.0 marks

Electronics > FET

CSIR NET	2015 Dec	5 M
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Consider an n - MOSFET with the following parameters: current drive strength $K = 60\mu A/V^2$, breakdown voltage $BV_{DS} = 10 V$, ratio of effective gate width to the channel length $\frac{W}{L} = 5$ and threshold voltage $V_{th} = 0.5 V$. In the circuit given below, this n -MOSFET is operating in the



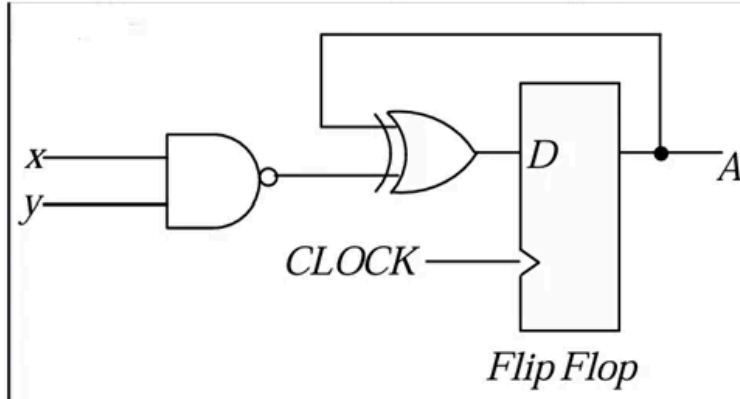
1. ohmic region
2. cut-off region
3. saturation region
4. breakdown

Q6. [Dec 2015] . 5.0 marks

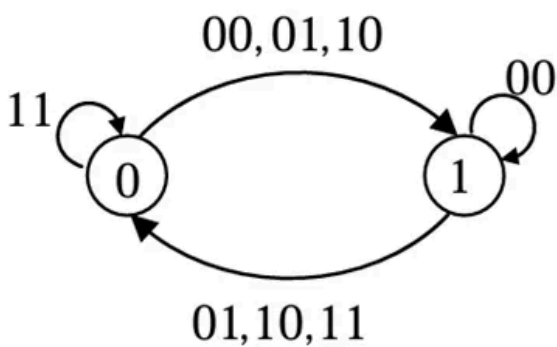
Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2015 Dec	5 M
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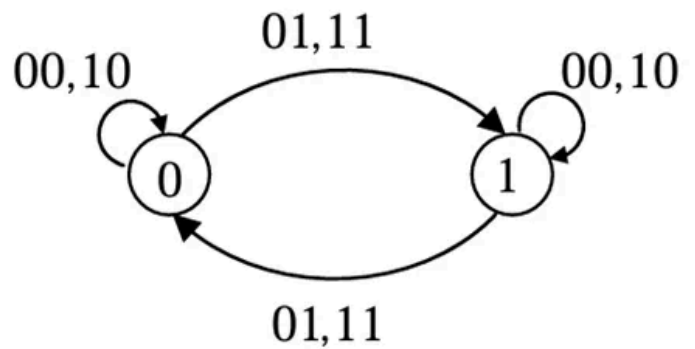
The state diagram corresponding to the following circuit is



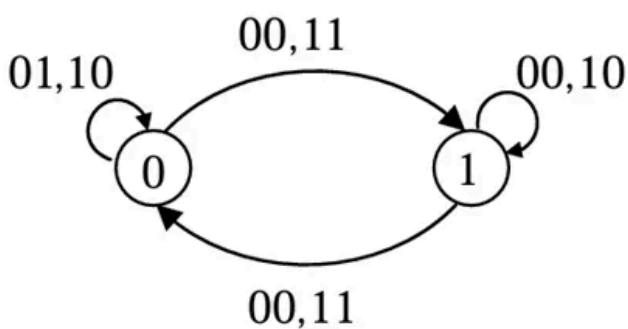
1.



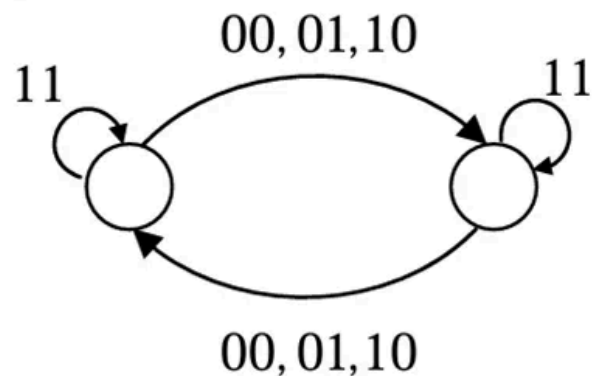
2.



3.



4.

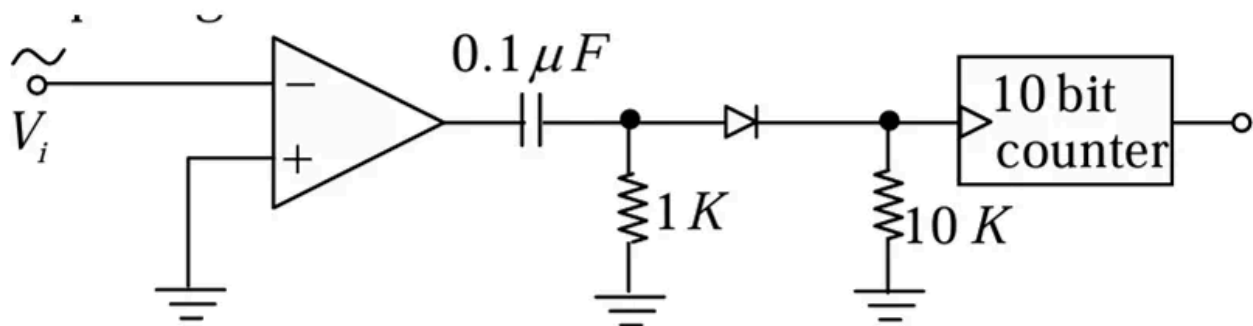


Q7. [Dec 2015] . 5.0 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2015 Dec	5 M
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A sinusoidal signal of peak to peak amplitude 1 V and unknown time period is input to the following circuit for 5 seconds duration. If the counter measures a value $(3E8)_H$ in hexadecimal then the time period of the input signal is



1. $2.5ms$
2. $4ms$
3. $10ms$
4. $5ms$

Q9. [June 2015] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2015 June	3.5 M
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The viscosity η of a liquid is given by Poiseuille's

formula $\eta = \frac{\pi P a^4}{8 l V}$. Assume that l and V can be

measured very accurately, but the pressure P has an rms error of 1% and the radius a has an independent rms error of 3%. The rms error of the viscosity is closest to

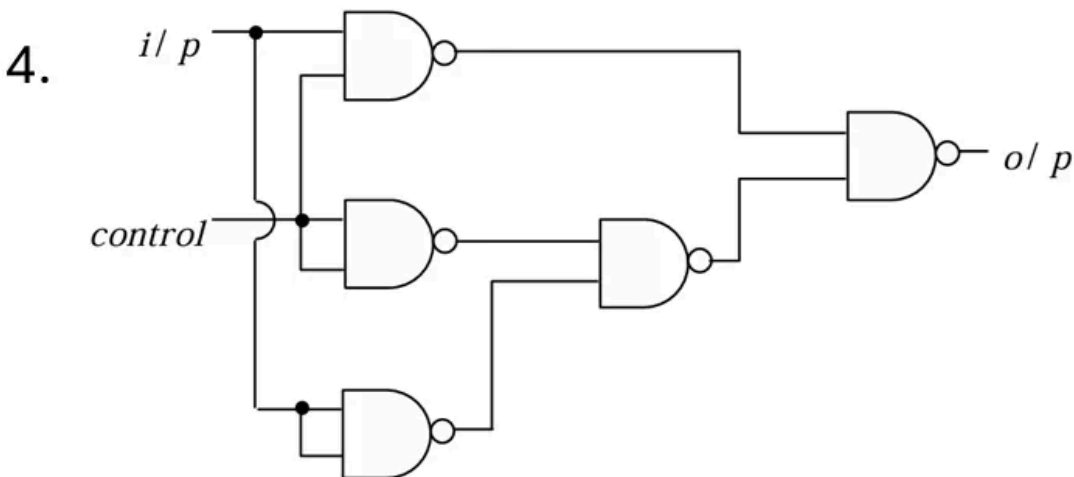
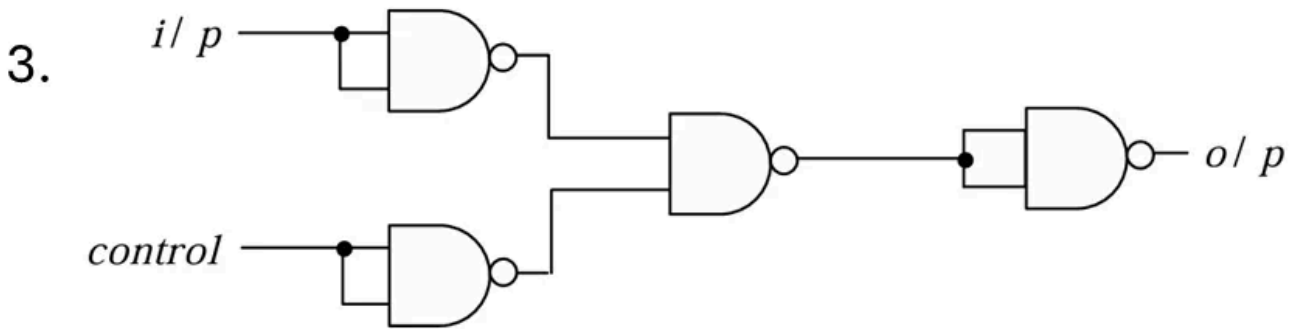
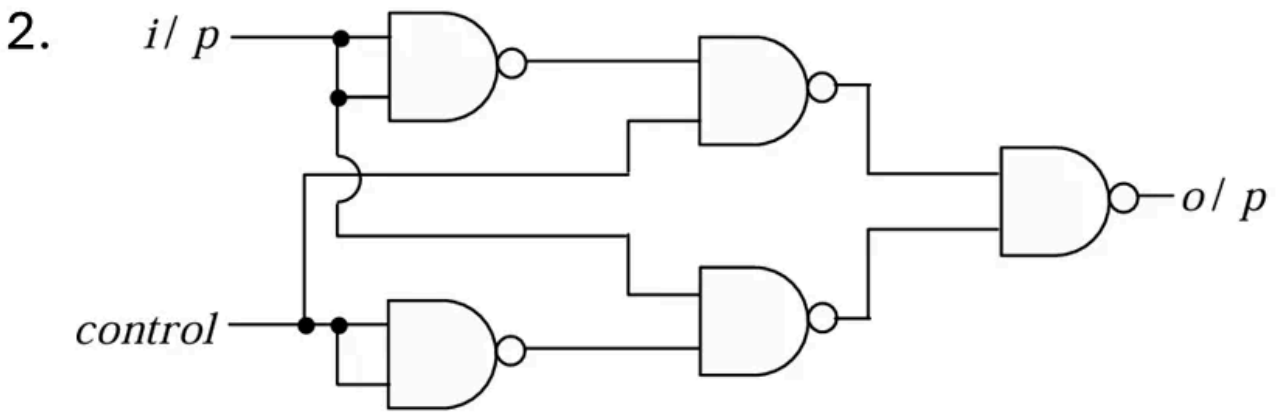
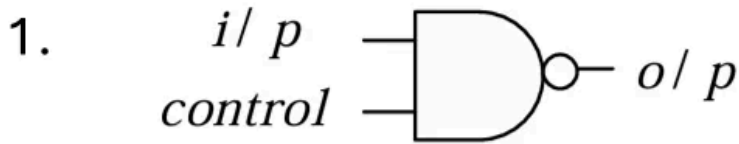
1. 2%
2. 4%
3. 12%
4. 13%

Q10. [June 2015] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2015 June	3.5 M
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Which of the following circuits behaves a control inverter?

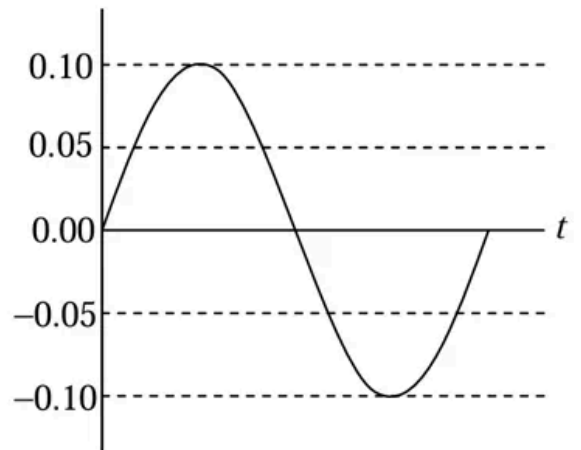
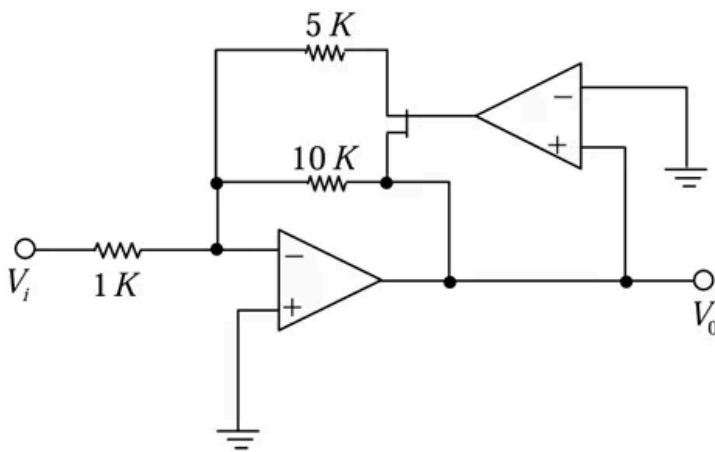


Q11. [June 2015] . 5.0 marks

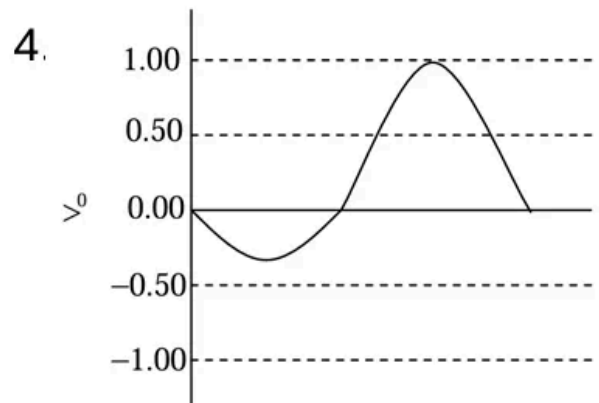
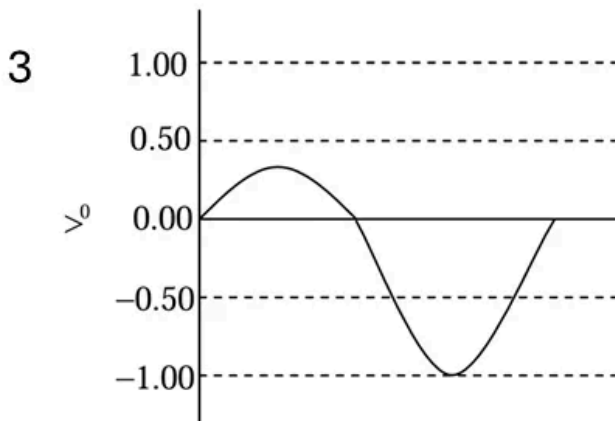
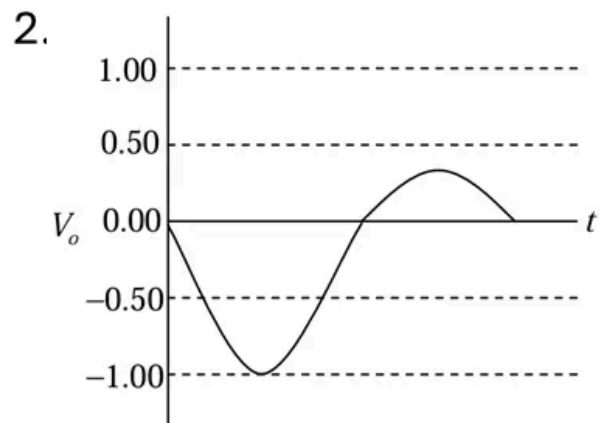
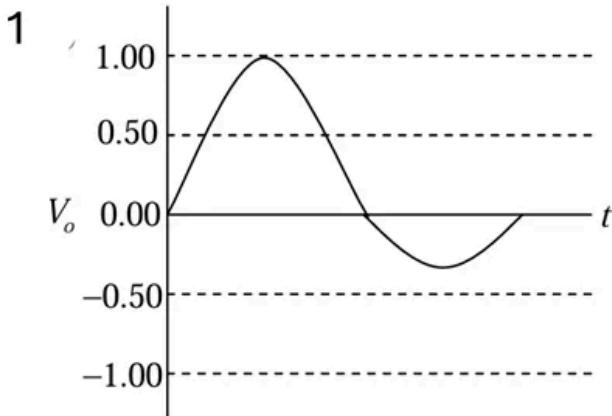
Electronics > FET

CSIR NET	2015 June	5 M
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For the circuit and the input sinusoidal waveform shown in the figures below, which is the correct waveform at the output?



(The time scales in all plots are the same.)

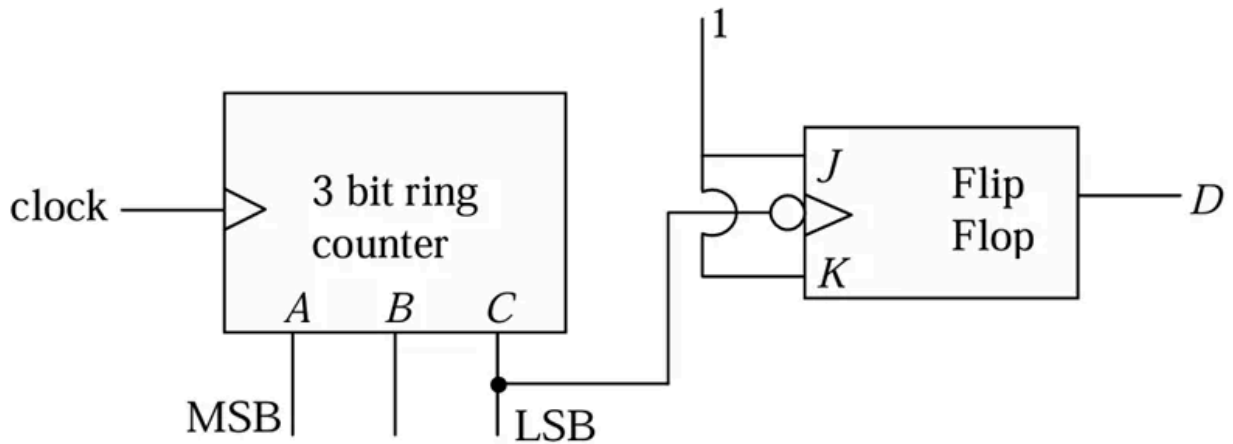


Q12. [June 2015] . 5.0 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2015 June	5 M
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For the logic circuit given below, the decimal count sequence and the modulus of the circuit corresponding to A B C D are



1. $8 \rightarrow 4 \rightarrow 2 \rightarrow 1 \rightarrow 9 \rightarrow 5(mod6)$
2. $8 \rightarrow 4 \rightarrow 2 \rightarrow 9 \rightarrow 5 \rightarrow 3(mod6)$
3. $2 \rightarrow 5 \rightarrow 9 \rightarrow 1 \rightarrow 3(mod5)$
4. $8 \rightarrow 5 \rightarrow 1 \rightarrow 3 \rightarrow 7(mod5)$

Q13. [June 2015] . 5.0 marks

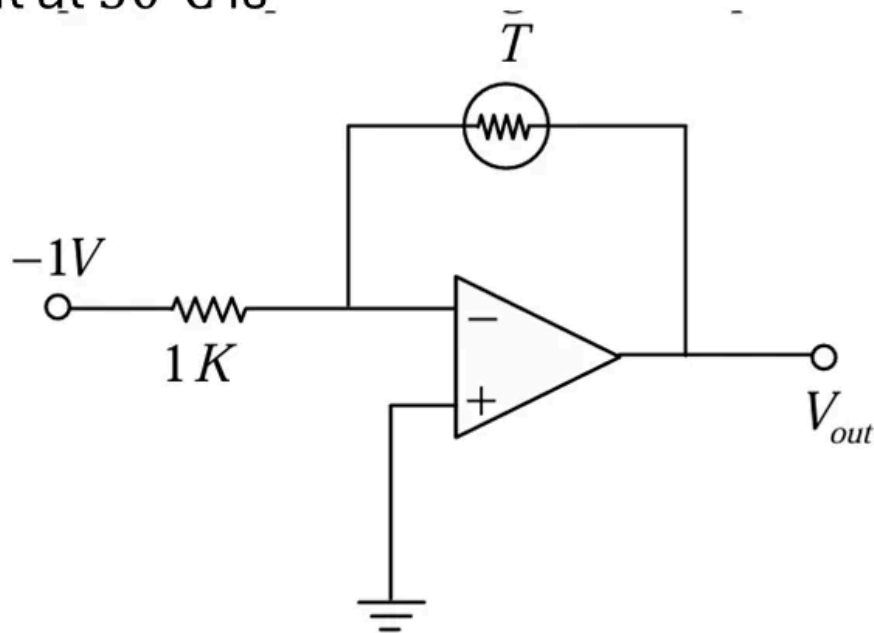
Electronics > OPAMP

CSIR NET

2015 June

5 M

In the circuit given below, the thermistor has a resistance $3\text{k}\Omega$ at 25°C . Its resistance decreases by 150Ω per $^\circ\text{C}$ upon heating. The output voltage of the circuit at 30°C is



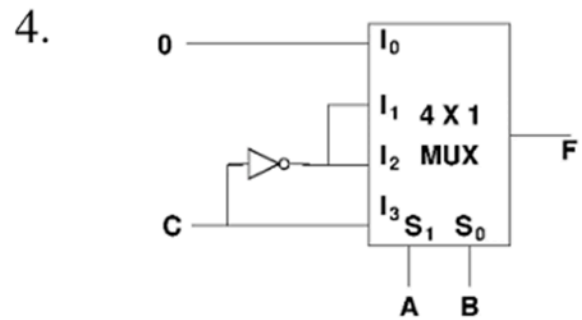
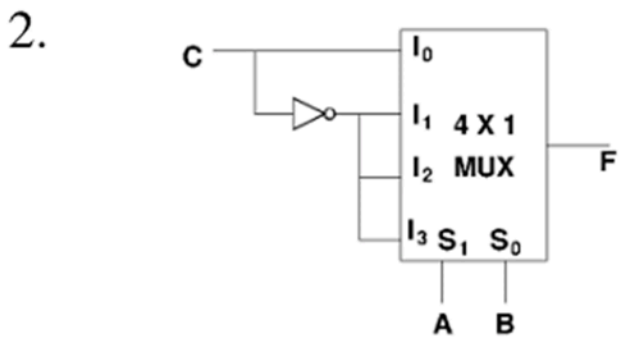
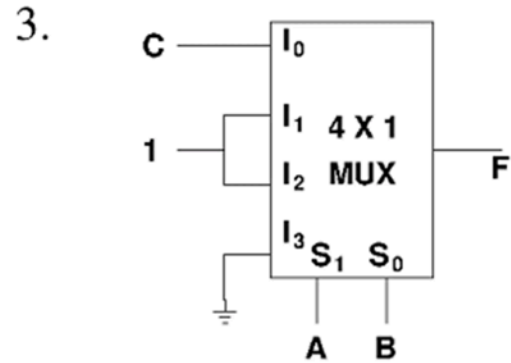
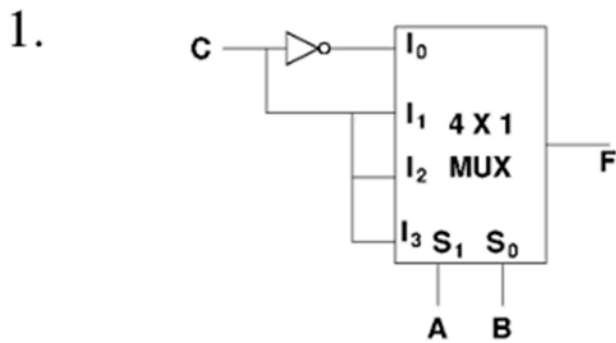
1. -3.75 V
2. -2.25 V
3. 2.25 V
4. 3.75 V

Q14. [Dec 2016] . 3.5 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2016 Dec	3.5M
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Which of the following circuits implements the Boolean function $F(A, B, C) = \sum(1,2,4,6)$?



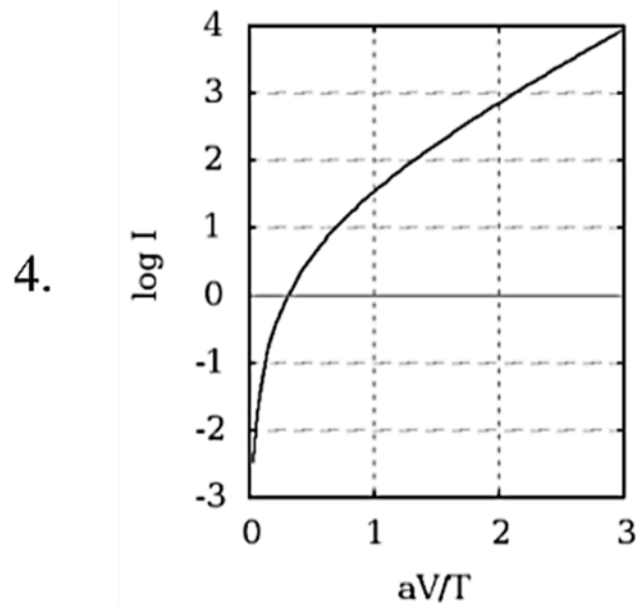
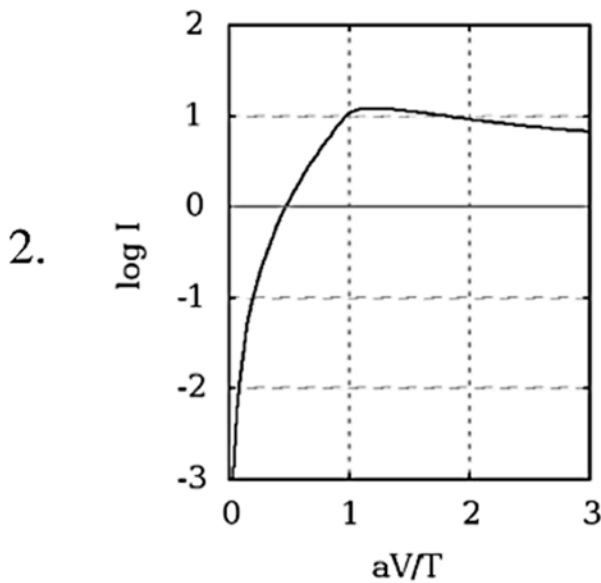
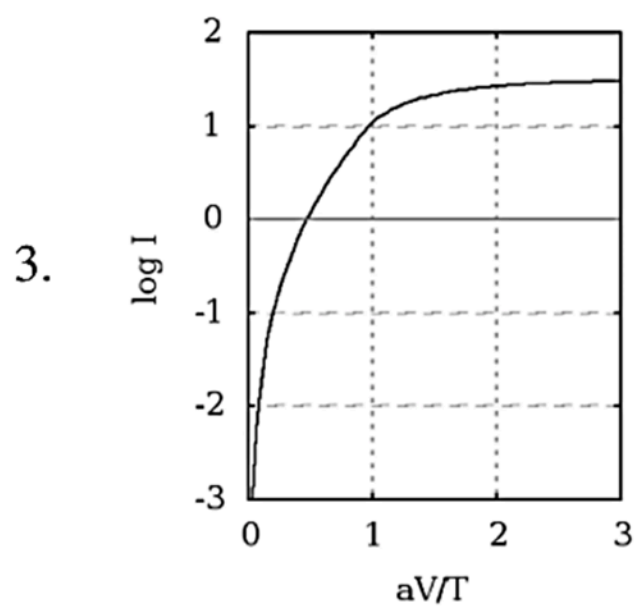
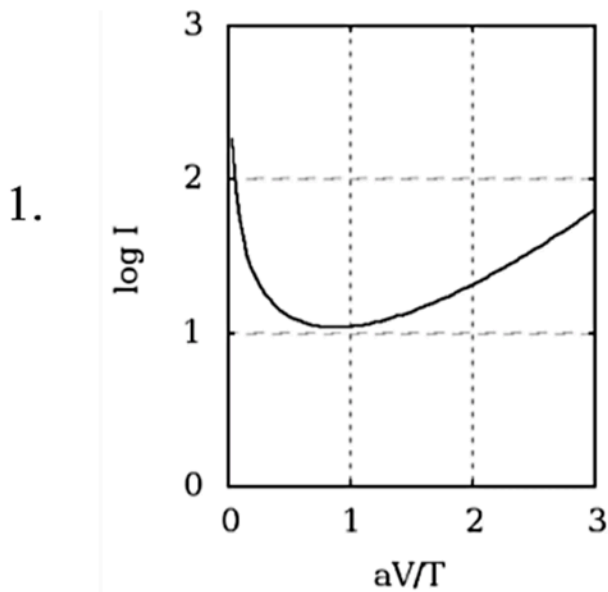
Q15. [Dec 2016] . 3.5 marks

Electronics > Basic Electronics

CSIR NET	2016 Dec	3.5M
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The $I - V$ characteristics of a device is

$I = I_s \left[\exp\left(\frac{aV}{T}\right) - 1 \right]$, where T is the temperature and a and I_s are constants independent of T and V . Which one of the following plots is correct for a fixed applied voltage V ?



Q16. [Dec 2016] . 3.5 marks

Electronics > Diodes

CSIR NET	2016 Dec	3.5M
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The active medium in a blue LED (light emitting diode) is a $\text{Ga}_x\text{In}_{1-x}\text{N}$ alloy. The band gaps of GaN and InN are 3.5 eV and 1.5 eV respectively. If the band gap of $\text{Ga}_x\text{In}_{1-x}\text{N}$ varies approximately linearly with x , the value of x required for the emission of blue light of wavelength 400 nm is (take $hc \approx 1200\text{eV} - \text{nm}$)

1. 0.95
2. 0.75
3. 0.50
4. 0.33

Q17. [Dec 2016] . 5.0 marks

Electronics > OPAMP

CSIR NET

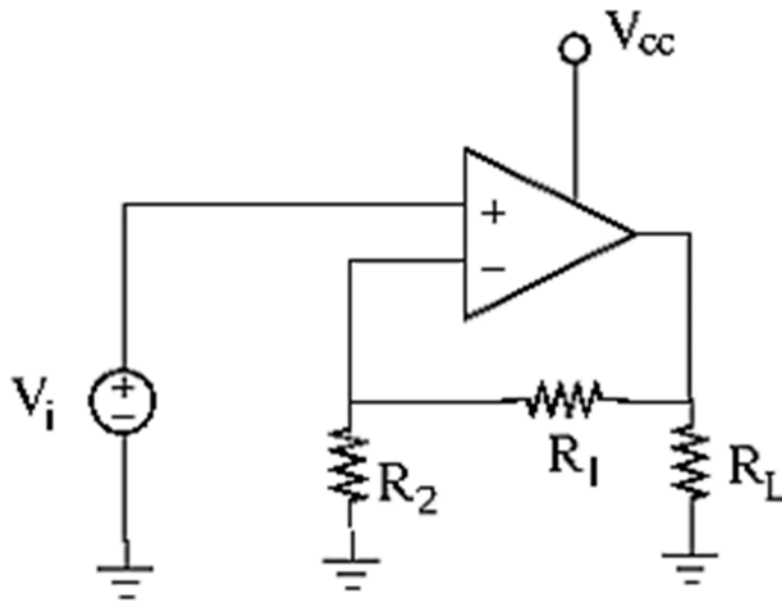
2016 Dec

5M

In the circuit below, the input voltage V_i is 2 V,
 $V_{cc} = 16$ V, $R_2 = 2$ k Ω and $R_L = 10$ k Ω .

The value of R_1 required to deliver 10 mW of power across R_L is

1. 12 k Ω
2. 4 k Ω
3. 8 k Ω
4. 14 k Ω



Q18. [Dec 2016] . 5.0 marks

Electronics > Instruments

CSIR NET

2016 Dec

5M

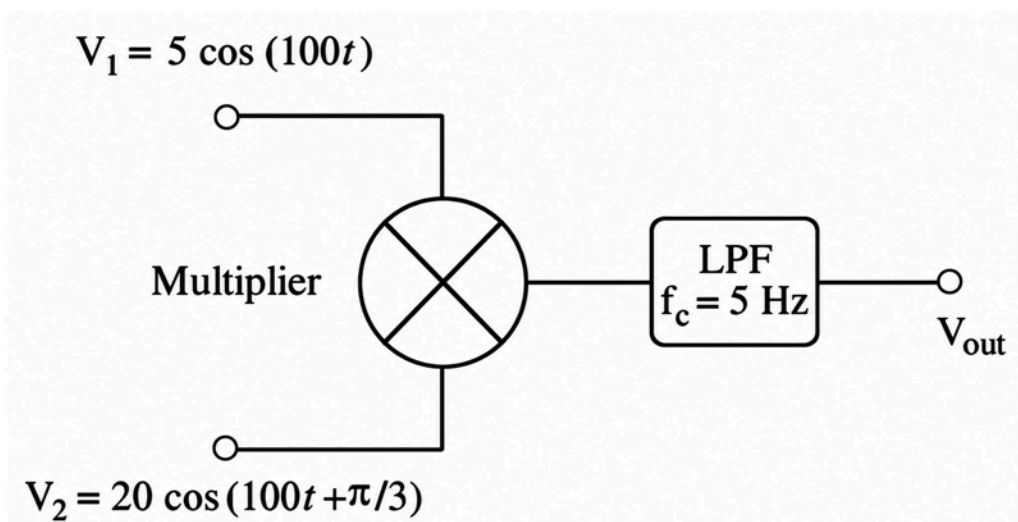
Two sinusoidal signals are sent to an analog multiplier of scale factor 1 V^{-1} followed by a low pass filter (LPF). If the roll-off frequency of the LPF is $f_c = 5 \text{ Hz}$, the output voltage V_{out} is

1.5 V

2.25 V

3. 100 V

4. 50 V



Q19. [Dec 2016] . 5.0 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2016 Dec	5M
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The resistance of a sample is measured as a function of temperature, and the data are shown below.

$T(^{\circ}\text{C})$	2	4	6	8
$R(\Omega)$	90	105	110	115

The slope of R vs T graph, using a linear least-squares fit to the data, will be

1. $6\Omega/^{\circ}\text{C}$
2. $4\Omega/^{\circ}\text{C}$
3. $2\Omega/^{\circ}\text{C}$
4. $8\Omega/^{\circ}\text{C}$

Q20. [June 2016] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2016 June	3.5M
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Using dimensional analysis, Planck defined a characteristic temperature T_P from powers of the gravitational constant G , Planck's constant h , Boltzmann constant k_B and the speed of light c in vacuum. The expression for T_P is proportional to

1. $\sqrt{\frac{hc^5}{k_B^2 G}}$

2. $\sqrt{\frac{hc^3}{k_B^2 G}}$

3. $\sqrt{\frac{G}{hc^4 k_B^2}}$

4. $\sqrt{\frac{hk_B^2}{Gc^3}}$

Q21. [June 2016] . 3.5 marks

Electronics > Basic Electronics

CSIR NET	2016 June	3.5M
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The dependence of current I on the voltage V of a certain device is given by

$$I = I_0 \left(1 - \frac{V}{V_0} \right)^2$$

where I_0 and V_0 are constants. In an experiment the current I is measured as the voltage V applied across the device is increased. The parameters V_0 and $\sqrt{I_0}$ can be graphically determined as

1. the slope and the y -intercept of the $I - V^2$ graph
2. the negative of the ratio of the y -intercept and the slope, and the y -intercept of the $I - V^2$ graph
3. the slope and the y -intercept of the $\sqrt{I} - V$ graph
4. the negative of the ratio of the y -intercept and the slope, and the y -intercept of the $\sqrt{I} - V$ graph

Q22. [June 2016] . 3.5 marks

Electronics > Digital Electronics

CSIR NET

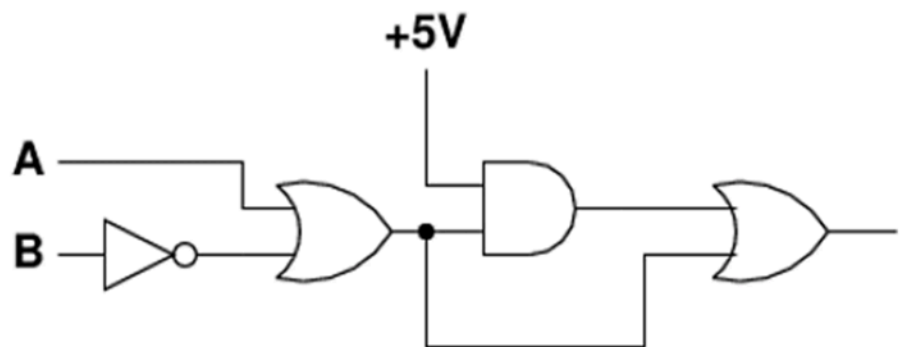
2016 June

3.5M

In the schematic figure given below, assume that the propagation delay of each logic gate is t_{gate} .

The propagation delay of the circuit will be maximum when the logic inputs A and B make the transition

1. (0,1) \rightarrow (1,1)
2. (1,1) \rightarrow (0,1)
3. (0,0) \rightarrow (1,1)
4. (0,0) \rightarrow (0,1)

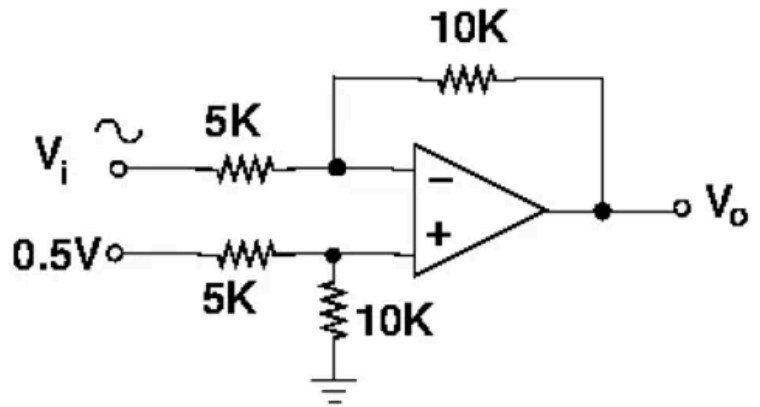
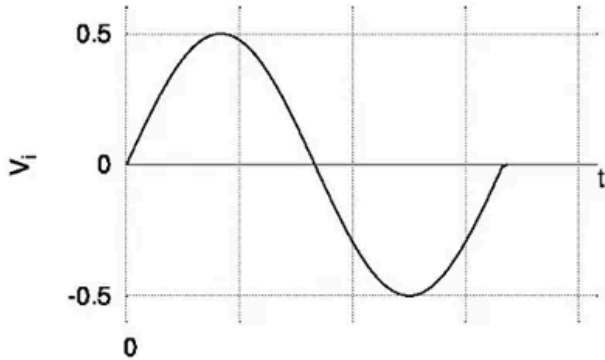


Q23. [June 2016] . 3.5 marks

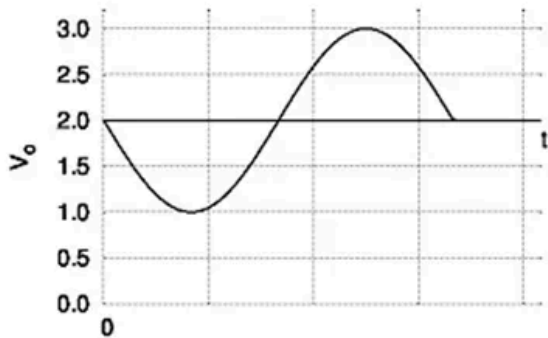
Electronics > OPAMP

CSIR NET	2016 June	3.5M
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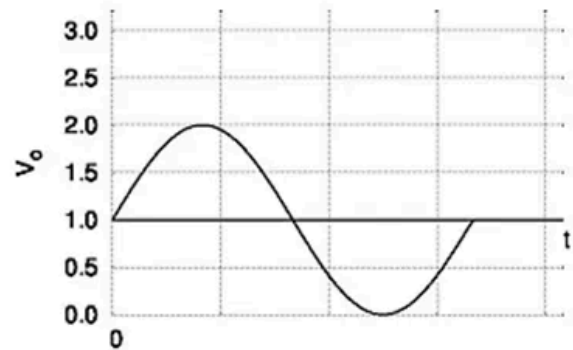
Given the input voltage V_i , which of the following waveforms correctly represents the output voltage V_o in the circuit shown below?



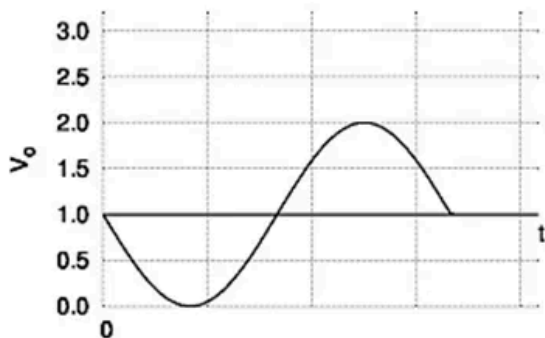
1.



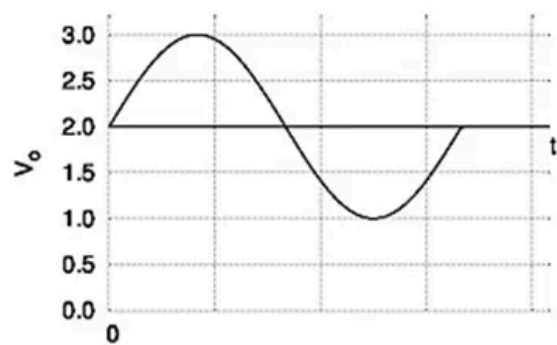
3.



2.



4.



Q24. [June 2016] . 3.5 marks

Electronics > Diodes

CSIR NET	2016 June	3.5M
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The intensity distribution of a red LED on an absorbing layer of material is a Gaussian centred at the wavelength $\lambda_0 = 660 \text{ nm}$ and width 20 nm . If the absorption coefficient varies with wavelength as $\alpha_0 - K(\lambda - \lambda_0)$, where α_0 and K are positive constants, the light emerging from the absorber will be

1. blue shifted retaining the Gaussian intensity distribution
2. blue shifted with an asymmetric intensity distribution
3. red shifted retaining the Gaussian intensity distribution
4. red shifted with an asymmetric intensity distribution

Q25. [June 2016] . 5.0 marks

Electronics > Instruments

CSIR NET	2016 June	5M
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Two completely overlapping semi-circular parallel plates comprise a capacitive transducer. One of the plates is rotated by an angle of 10° relative to their common centre. Ignoring edge effects, the ratio, $I_n:I_o$, of sensitivity of the transducer in the new configuration with respect to the original one, is

1. 8:9
2. 11:12
3. 17:18
4. 35:36

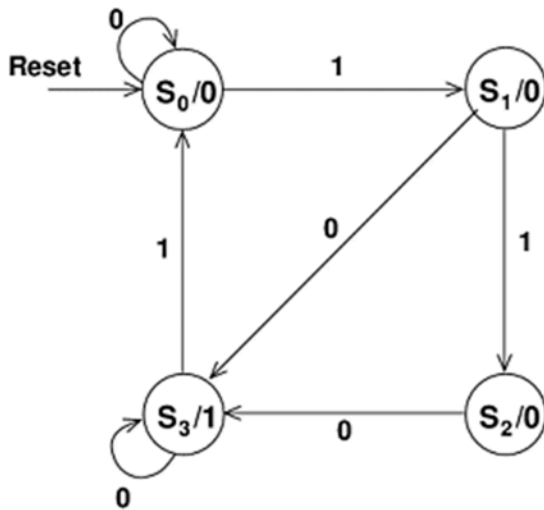
Q26. [June 2016] . 5.0 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

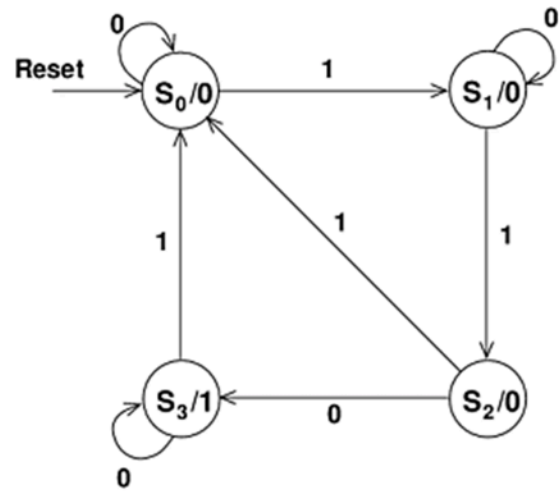
CSIR NET	2016 June	5M
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The state diagram that detects three or more consecutive 1's in a serial bit stream is

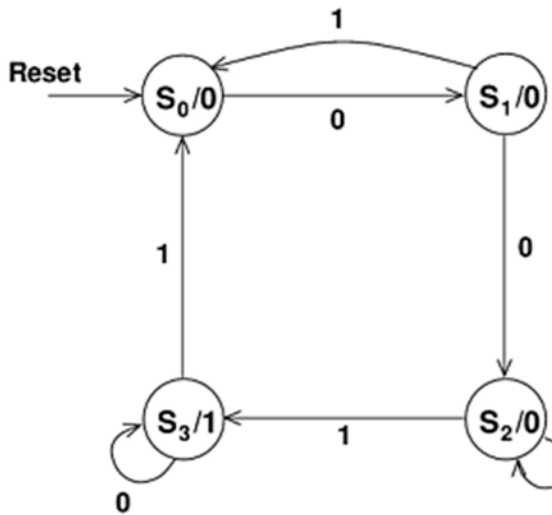
1.



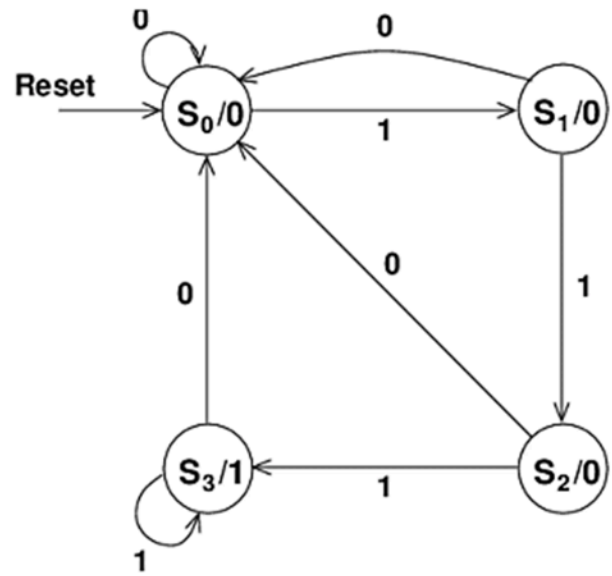
3.



2.



4.



Q27. [June 2016] . 5.0 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2016 June	5M
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The decay constants f_p of the heavy pseudo-scalar mesons, in the heavy quark limit, are related to their masses m_p by the relation $f_p = \frac{a}{\sqrt{m_p}}$, where a is an empirical parameter to be determined. The values $m_p = 6400 \pm 160 \text{ MeV}$ and $f_p = 180 \pm 15 \text{ MeV}$ correspond to uncorrelated measurements of a meson. The error on the estimate of a is

1. $175(\text{MeV})^{3/2}$
2. $900(\text{MeV})^{3/2}$
3. $1200(\text{MeV})^{3/2}$
4. $2400(\text{MeV})^{3/2}$

Q28. [Dec 2017] . 3.5 marks

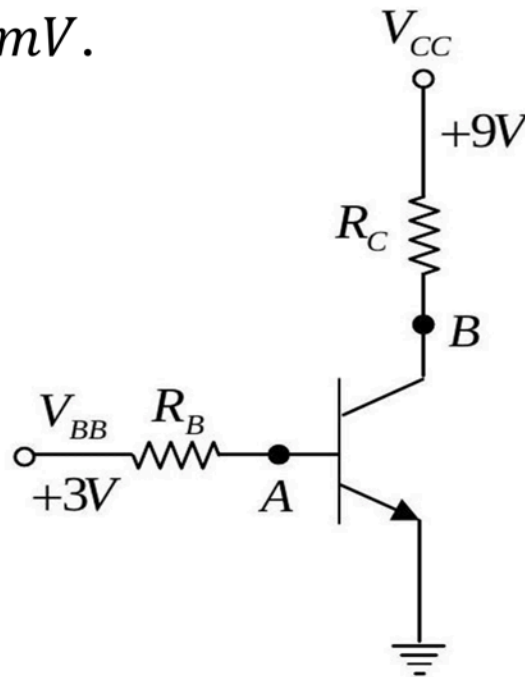
Electronics > Transistors

CSIR NET

2017 Dec

3.5M

In the circuit below the voltages V_{BB} and V_{CC} are kept fixed, the voltage measured at B is a constant, but that measured at A fluctuates between a few μV to a few mV .



From these measurements it may be inferred that the

1. base is open internally
2. emitter is open internally
3. collector resistor is open
4. base resistor is open

Q29. [Dec 2017] . 3.5 marks

Electronics > AD/DA Conversion

CSIR NET	2017 Dec	3.5M
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The full scale voltage of an n -bit Digital-to-Analog Converter is V . The resolution that can be achieved in it is

1. $\frac{V}{(2^n - 1)}$
2. $\frac{V}{(2^n + 1)}$
3. $\frac{V}{2^{2n}}$
4. $\frac{V}{n}$

Q30. [Dec 2017] . 3.5 marks

Electronics > Diodes

CSIR NET	2017 Dec	3.5M
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A Zener diode with an operating voltage of 10 V at 25°C has a positive temperature coefficient of 0.07% per °C of the operating voltage. The operating voltage of this Zener diode at 125°C is

1. 12.0 V
2. 11.7 V
3. 10.7 V
4. 9.3 V

Q31. [Dec 2017] . 5.0 marks

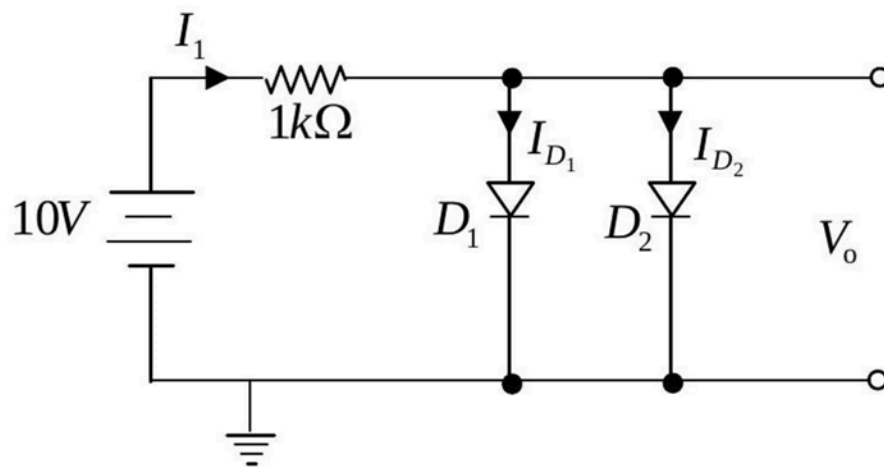
Electronics > Diodes

CSIR NET

2017 Dec

5M

In the circuit below, D_1 and D_2 are two silicon diodes with the same characteristics. If the forward voltage drop of a silicon diode is $0.7V$ then the value of the current $I_1 + I_{D_1}$ is



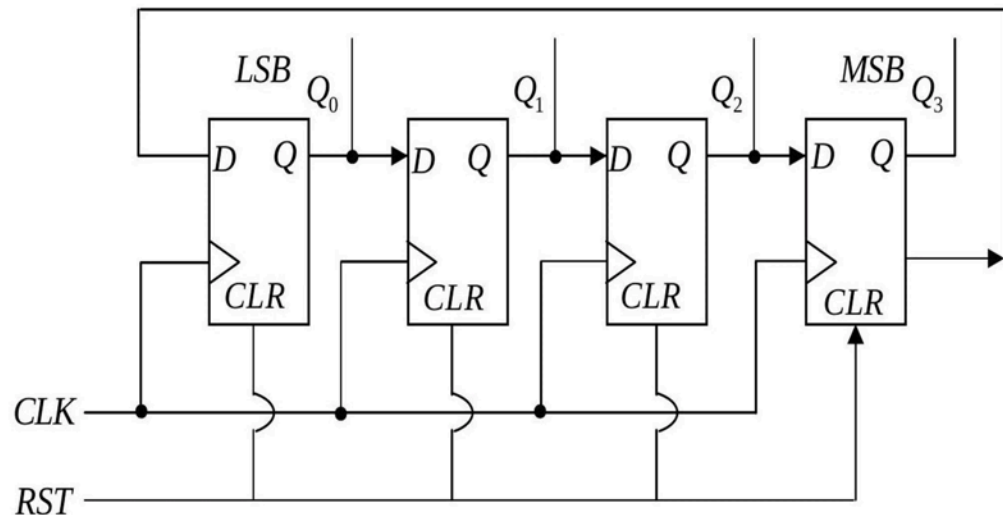
1. 18.6 mA
2. 9.3 mA
3. 13.95 mA
4. 14.65 mA

Q32. [Dec 2017] . 5.0 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2017 Dec	5M
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The circuit below comprises of D -flip flops. The output is taken from Q_3, Q_2, Q_1 and Q_0 as shown in the figure.



The binary number given by the string Q_3, Q_2, Q_1, Q_0 changes for every clock pulse that is applied to the CLK input. If the output is initialized at 0000, the corresponding sequence of decimal numbers that repeats itself, is

1. 3,2,1,0
2. 1,3,7,14,12,8
3. 1,3,7,15,12,14,0
4. 1,3,7,15,14,12,8,0

Q33. [Dec 2017] . 5.0 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2017 Dec	5M
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Two physical quantities T and M are related by the

equation $T = \frac{2\pi}{a} \sqrt{\frac{M+b}{2}}$, where a and b are constant

parameters. The variation of T as a function of M was recorded in an experiment to determine the value of a graphically. Let m be the slope of the straight line when T^2 is plotted vs M , and δm be the uncertainty in determining it. The uncertainty in determining a is

1. $\frac{a}{2} \left(\frac{\delta m}{m} \right)$
2. $a \left(\frac{\delta m}{m} \right)$
3. $\frac{b}{2a} \left(\frac{\delta m}{m} \right)$
4. $\frac{2\pi}{a} \left(\frac{\delta m}{m} \right)$

Q34. [Dec 2017] . 5.0 marks

Electronics > Instruments

CSIR NET	2017 Dec	5M
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The sensitivity of a hot cathode pressure gauge is 10mbar^{-1} . If the ratio between the numbers of the impinging charged particles to emitted electrons is 1: 10, then the pressure

1. 10 mbar
2. 10^{-1}mbar
3. 10^{-2}mbar
4. 10^2 mbar

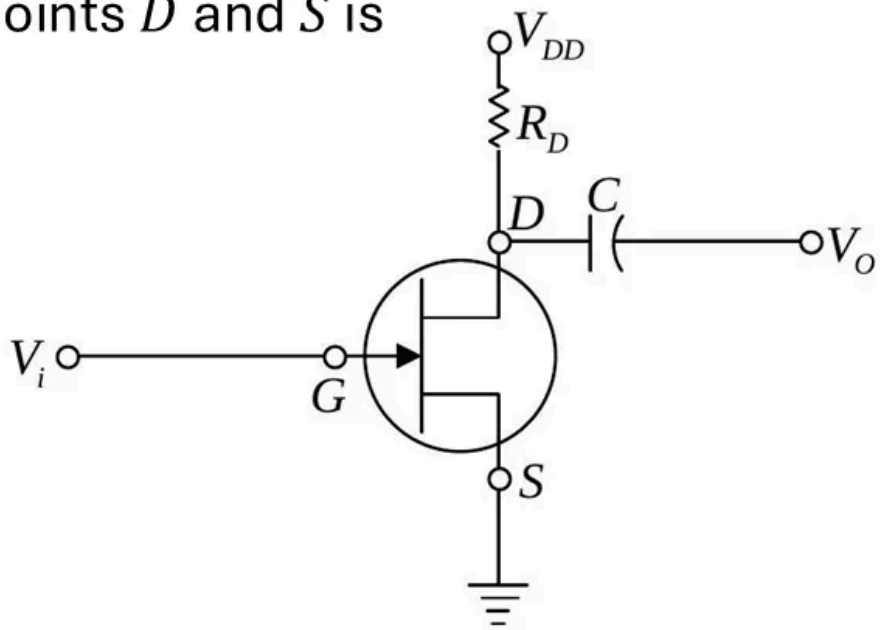
Q35. [June 2017] . 3.5 marks

Electronics > FET

CSIR NET	2017 June	3.5M
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In the n -channel JFET shown in figure below, $V_i = -2V$, $C = 10pF$, $V_{DD} = +16V$ and $R_D = 2k\Omega$. If the drain D - source S saturation current I_{DSS} is $10mA$ and the pinch-off voltage V_P is $-8V$, then the voltage across points D and S is

1. 11.125 V
2. 10.375 V
3. 5.75 V
4. 4.75 V

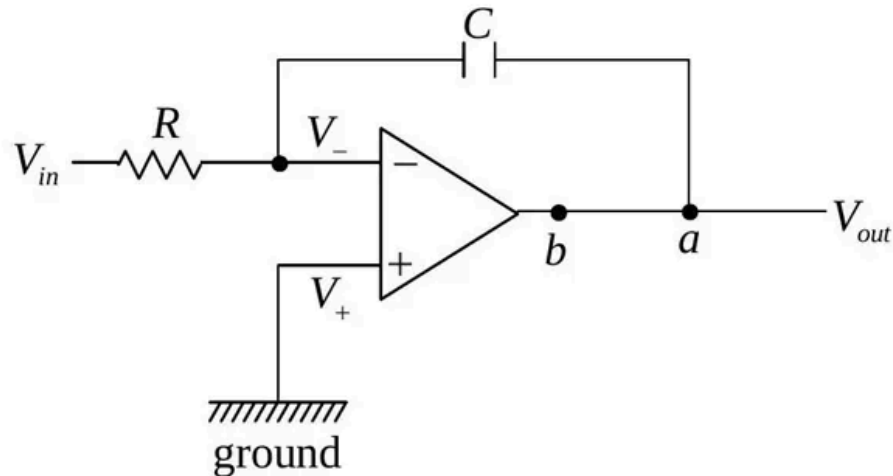


Q36. [June 2017] . 3.5 marks

Electronics > OPAMP

CSIR NET	2017 June	3.5M
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The gain of the circuit given below is $-\frac{1}{\omega RC}$.



The modification in the circuit required to introduce a dc feedback is to add a resistor

1. between a and b
2. between positive terminal of the op-amp and ground
3. in series with C
4. parallel to C

Q37. [June 2017] . 3.5 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2017 June	3.5M
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A 2×4 decoder with an enable input can function as a

1. 4×1 multiplexer
2. 1×4 demultiplexer
3. 4×2 encoder
4. 4×2 priority encoder

Q38. [June 2017] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2017 June	3.5M
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The experimentally measured values of the variables x and y are 2.00 ± 0.05 and 3.00 ± 0.02 respectively. What is the error in the calculated value of $z = 3y - 2x$ from the measurements?

1. 0.12
2. 0.05
3. 0.03
4. 0.07

Q39. [June 2017] . 5.0 marks

Electronics > Diodes

CSIR NET	2017 June	5M
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Let I_0 be the saturation current, η the ideality factor and v_F and v_R the forward and reverse potentials respectively, for a diode. The ratio R_R/R_F of its reverse and forward resistances R_R and R_F , respectively, varies as (In the following k_B is the Boltzmann constant, T is the absolute temperature and q is the charge.)

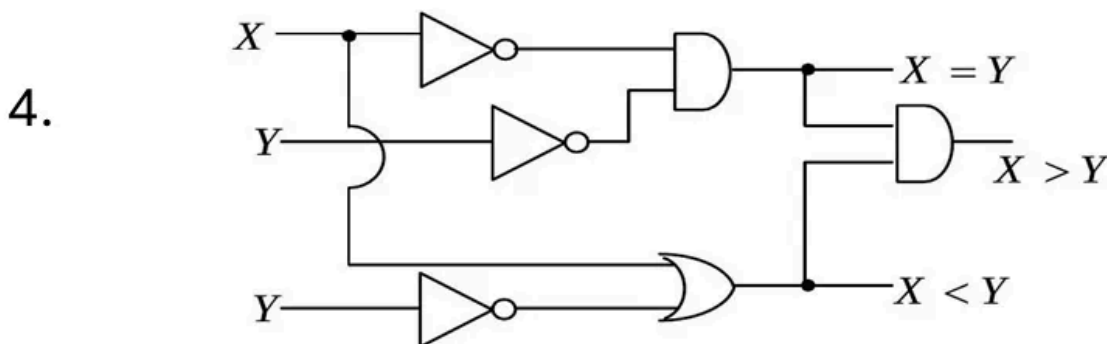
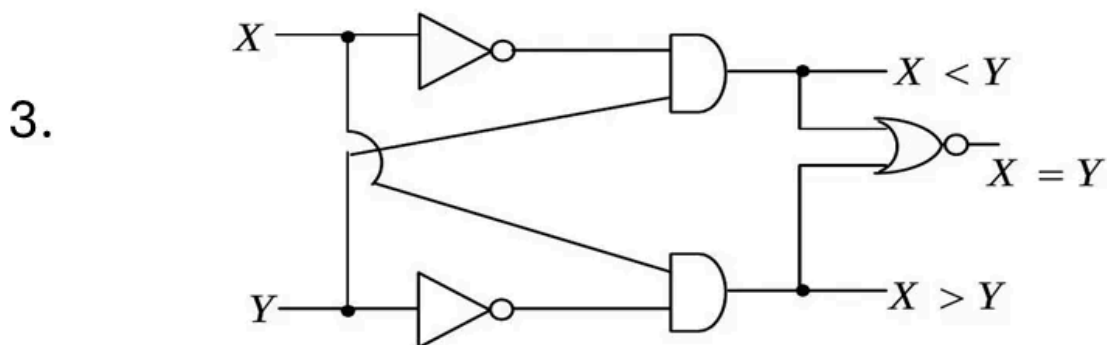
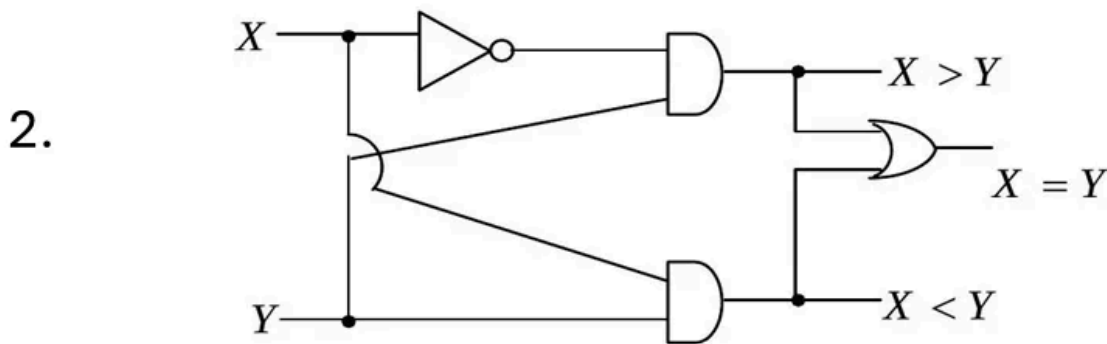
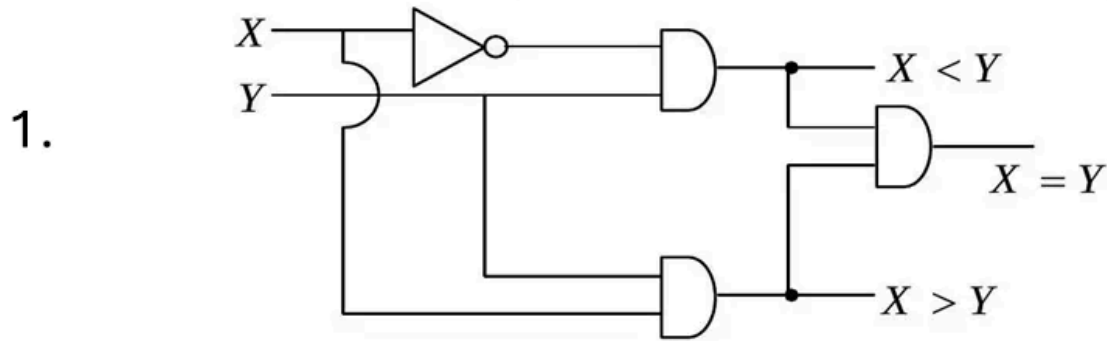
1. $\frac{v_R}{v_F} \exp\left(\frac{qv_F}{\eta k_B T}\right)$
2. $\frac{v_F}{v_R} \exp\left(\frac{qv_F}{\eta k_B T}\right)$
3. $\frac{v_R}{v_F} \exp\left(-\frac{qv_F}{\eta k_B T}\right)$
4. $\frac{v_F}{v_R} \exp\left(-\frac{qv_F}{\eta k_B T}\right)$

Q40. [June 2017] . 5.0 marks

Electronics > Digital Electronics

CSIR NET	2017 June	5M
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In the figures below, X and Y are one bit inputs. The circuit which corresponds to a one bit comparator is

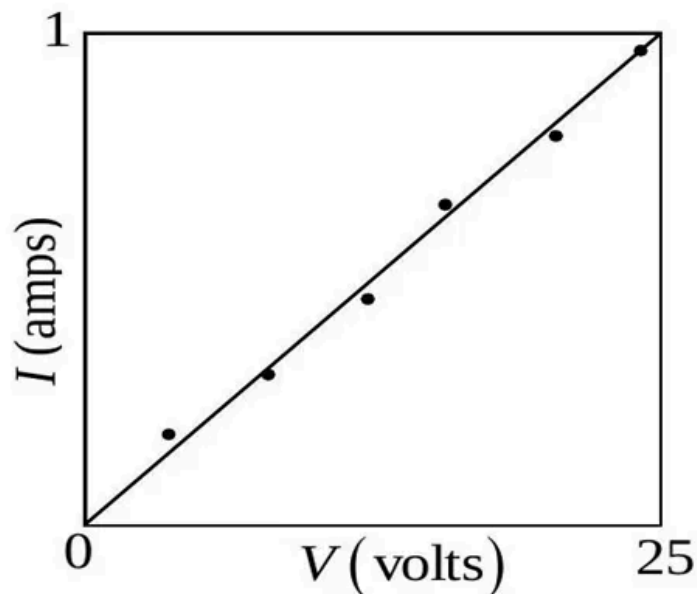


Q41. [June 2017] . 5.0 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2017 June	5M
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Both the data points and a linear fit to the current vs voltage of a resistor are shown in the graph below.



If the error in the slope is $1.255 \times 10^{-3} \Omega^{-1}$, then the value of resistance estimated from the graph is

1. $(0.04 \pm 0.8) \Omega$
2. $(25.0 \pm 0.8) \Omega$
3. $(25 \pm 1.25) \Omega$
4. $(25 \pm 0.0125) \Omega$

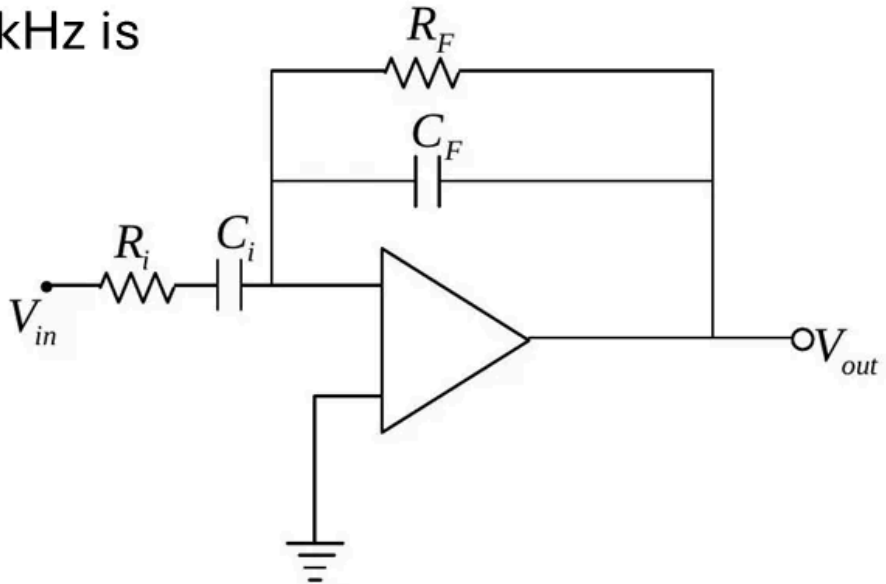
Q42. [June 2017] . 5.0 marks

Electronics > OPAMP

CSIR NET	2017 June	5M
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In the following operational amplifier circuit $C_{in} = 10nF$, $R_{in} = 20k\Omega$, $R_F = 200k\Omega$ and $C_F = 100pF$. The magnitude of the gain at a input signal frequency of 16 kHz is

1. 67
2. 0.15
3. 0.3
4. 3.5

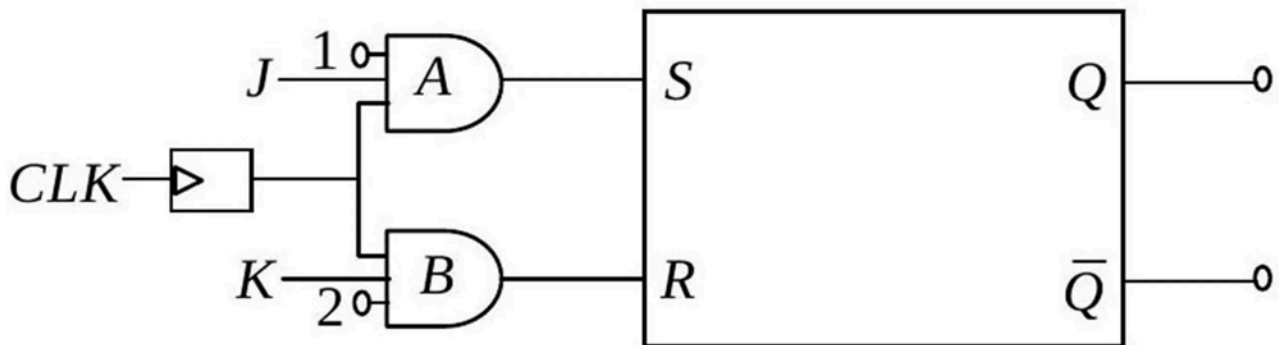


Q43. [Dec 2018] . 3.5 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2018 Dec	3.5M
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Consider the following circuit, consisting of an RS flip-flop and two AND gates.



Which of the following connections will allow the entire circuit to act as a JK flip-flop?

1. connect Q to pin 1 and \bar{Q} to pin 2
2. connect Q to pin 2 and \bar{Q} to pin 1
3. connect Q to K input and \bar{Q} to J input
4. connect Q to J input and \bar{Q} to K input

Q44. [Dec 2018] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2018 Dec	3.5M
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The truth table below gives the value $Y(A, B, C)$ where A, B and C are binary variables. The output Y can be represented by

1. $Y = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}C + ABC\bar{C}$

2. $Y = \bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}\bar{C} + ABC$

3. $Y = \bar{A}\bar{B}C + \bar{A}BC + A\bar{B}C + ABC$

4. $Y = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC\bar{C}$

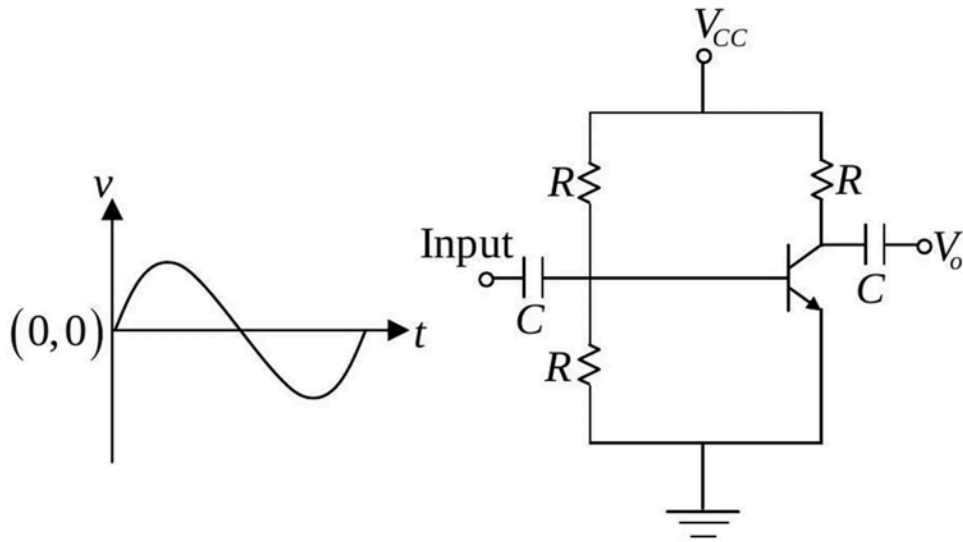
A	B	C	Y
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	1	0	0
1	1	1	1

Q45. [Dec 2018] . 3.5 marks

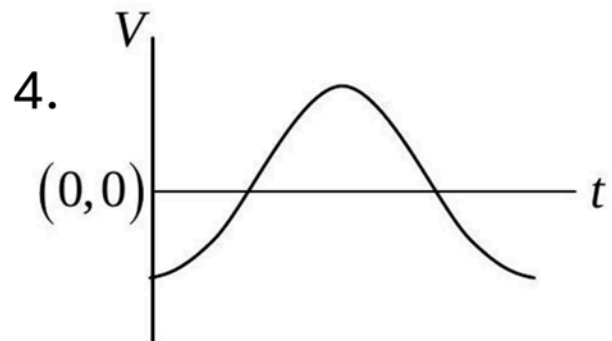
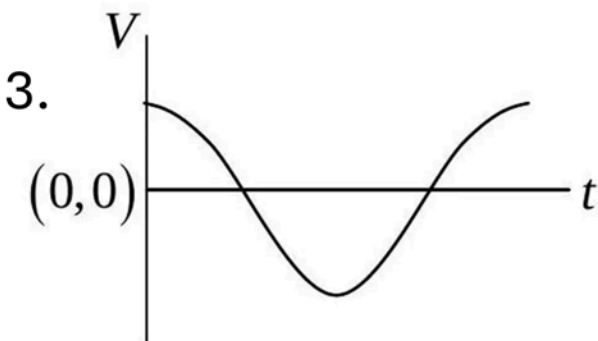
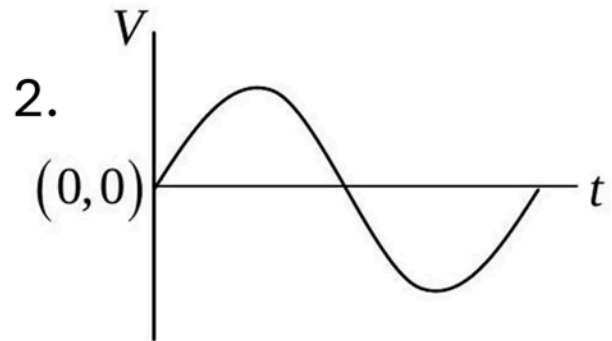
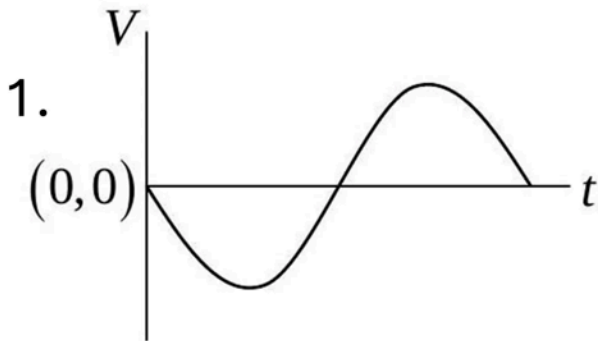
Electronics > Transistors

CSIR NET	2018 Dec	3.5M
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A sinusoidal signal is an input to the following circuit



Which of the following graphs best describes the output wave function?

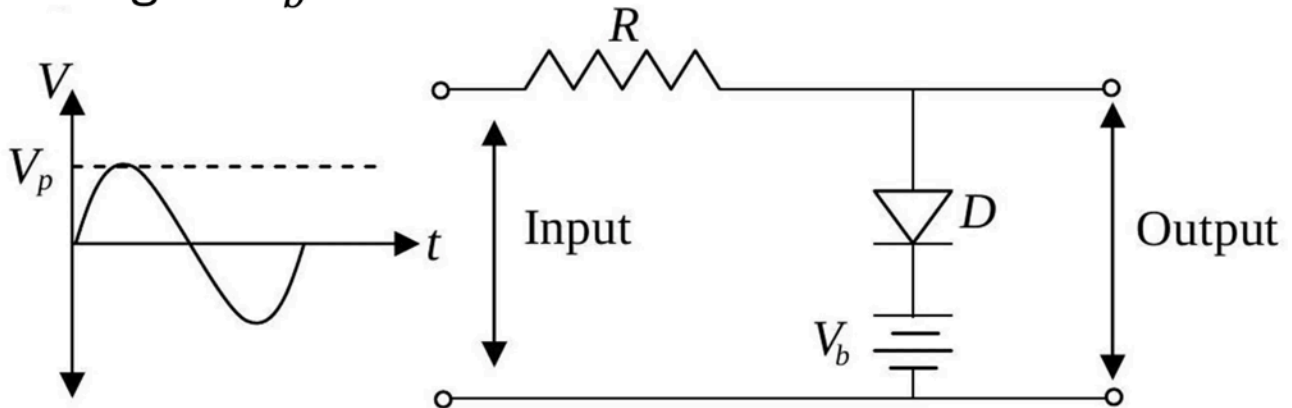


Q46. [Dec 2018] . 3.5 marks

Electronics > Diodes

CSIR NET	2018 Dec	3.5M
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A sinusoidal voltage having a peak value of V_p is an input to the following circuit, in which the DC voltage is V_b



Assuming an ideal diode which of the following best describes the output waveform?

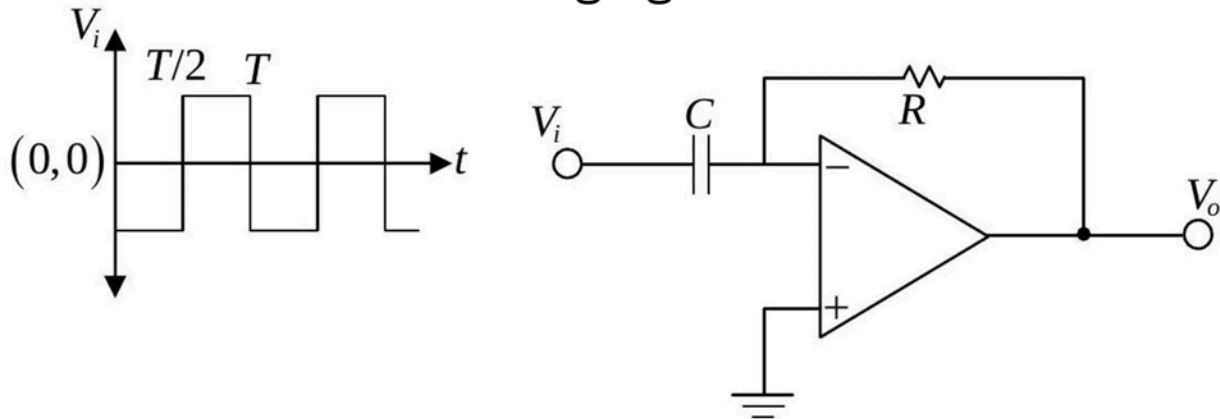
- 1.
- 2.
- 3.
- 4.

Q47. [Dec 2018] . 5.0 marks

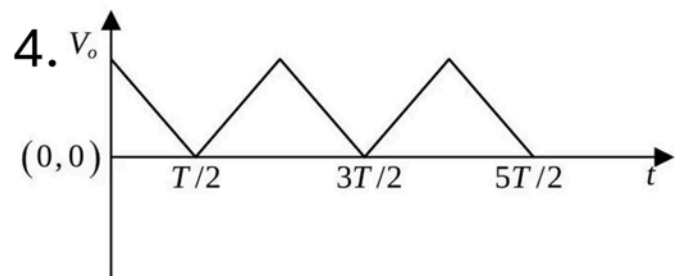
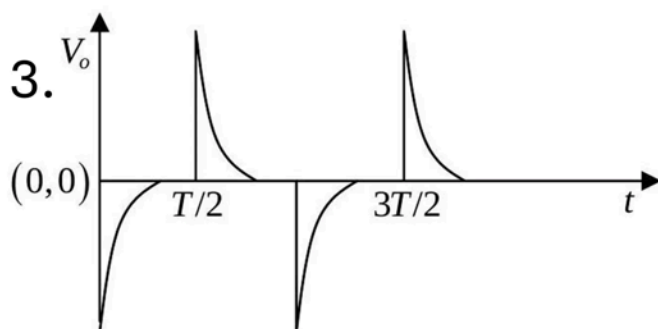
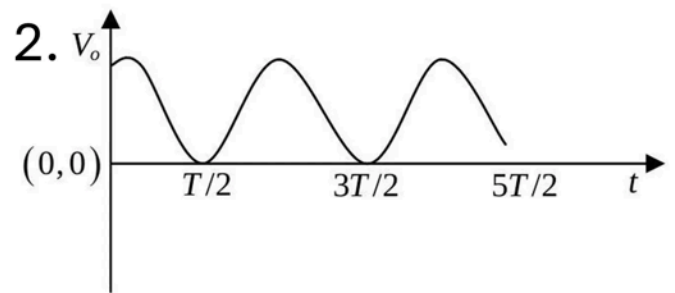
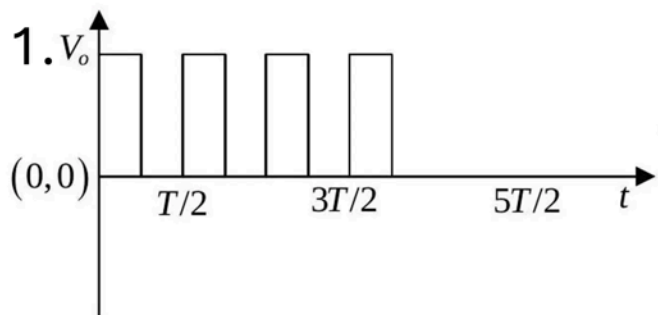
Electronics > OPAMP

CSIR NET	2018 Dec	5M
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The input V_i to the following circuit is a square wave as shown in the following figure.



which of the waveforms best describes the output?

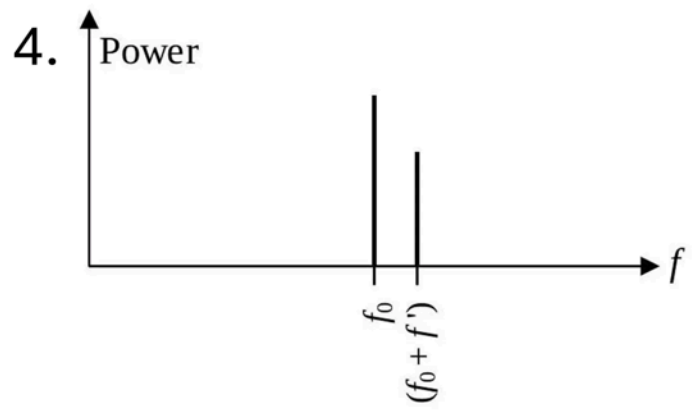
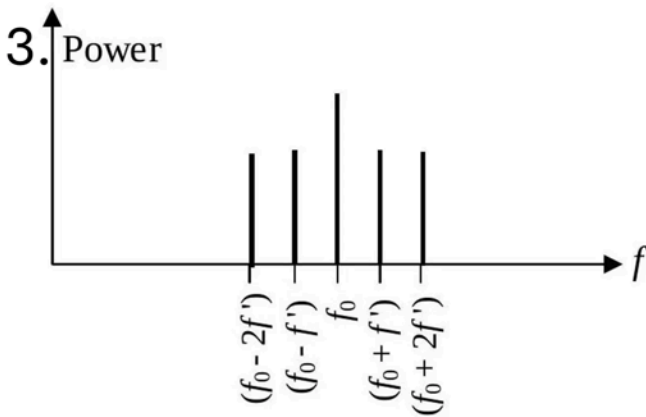
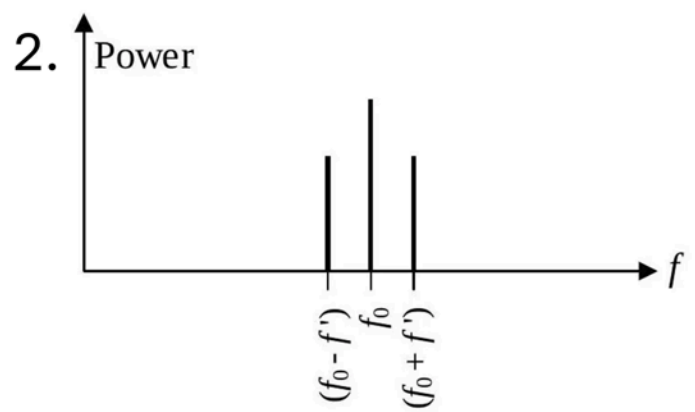
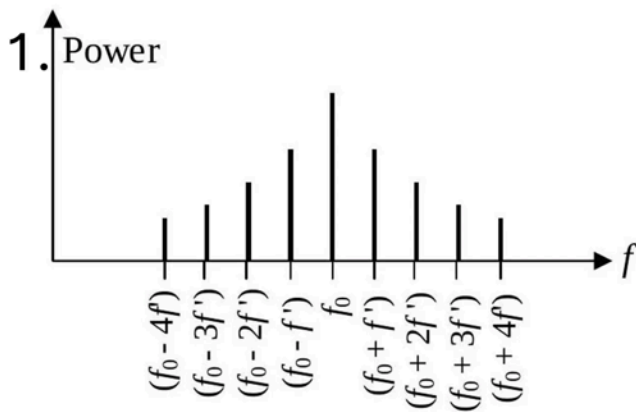


Q48. [Dec 2018] . 5.0 marks

Electronics > Instruments

CSIR NET	2018 Dec	5M
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The amplitude of a carrier signal of frequency f_0 is sinusoidally modulated at a frequency $f' \ll f_0$. Which of the following graphs best describes its power spectrum?



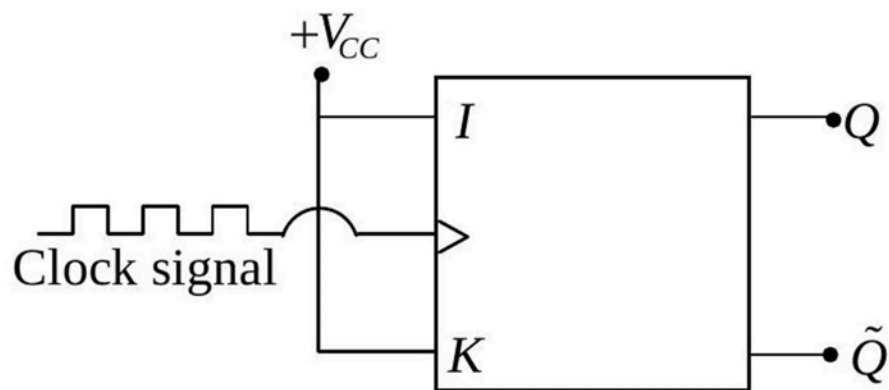
Q49. [June 2018] . 3.5 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2018 June	3.5M
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In the following JK flip-flop circuit, J and K inputs are tied together to $+V_{CC}$. If the input is a clock signal of frequency f , the frequency of the output Q is

1. f
2. $2f$
3. $4f$
4. $\frac{f}{2}$

**Q50. [June 2018] . 3.5 marks**

Electronics > Digital Electronics

CSIR NET	2018 June	3.5M
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Which of the following gates can be used as a parity checker?

1. an OR gate
2. a NOR gate
3. an exclusive OR (XOR) gate
4. an AND gate

Q51. [June 2018] . 3.5 marks

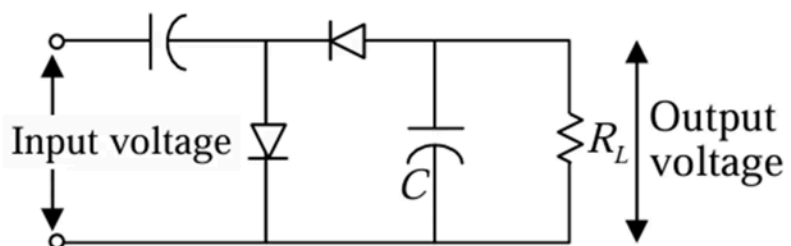
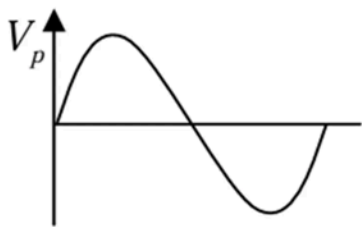
Electronics > Diodes

CSIR NET

2018 June

3.5M

In A sinusoidal signal with a peak voltage V_p and average value zero, is an input to the following circuit. Assuming ideal diodes, the peak value of the output voltage across the load resistor R_L is



1. V_p
2. $\frac{V_p}{2}$
3. $2V_p$
4. $\sqrt{2}V_p$

Q52. [June 2018] . 3.5 marks

Electronics > Transistors

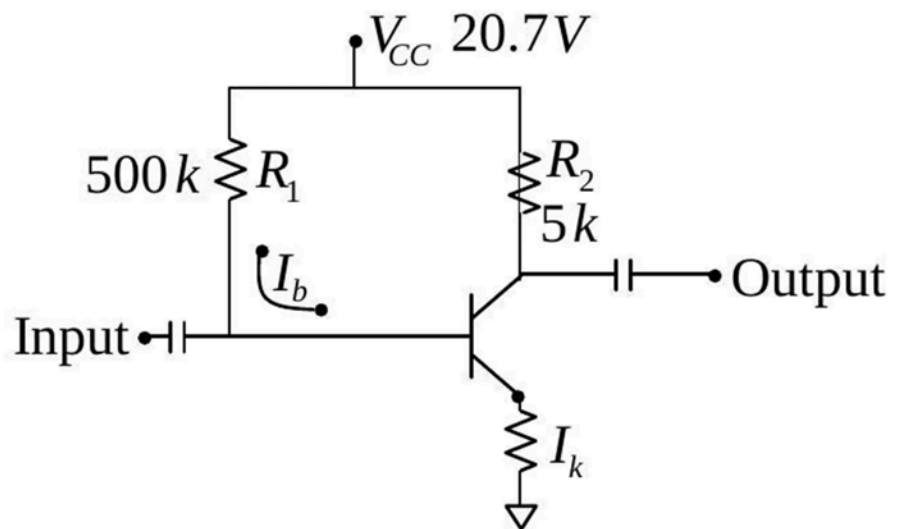
CSIR NET

2018 June

3.5M

In the following circuit, the value of the common-emitter forward current amplification factor β for the transistor is 100 and V_{BE} is $0.7V$. The base current I_B is

1. $40\mu A$
2. $30\mu A$
3. $44\mu A$
4. $33\mu A$



Q53. [June 2018] . 5.0 marks

Electronics > AD/DA Conversion

CSIR NET	2018 June	5M
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The full scale of a 3 -bit digital-to-analog (DAC) converter is $7V$. Which of the following tables represents the output voltage of this 3 -bit DAC for the given set of input bits?

1.

Input bits	Output voltage
000	0
001	1
010	2
011	3

2.

Input bits	Output voltage
000	0
001	1.25
010	2.5
011	3.75

3.

Input bits	Output voltage
000	1.25
001	2.5
010	3.75
011	5

4.

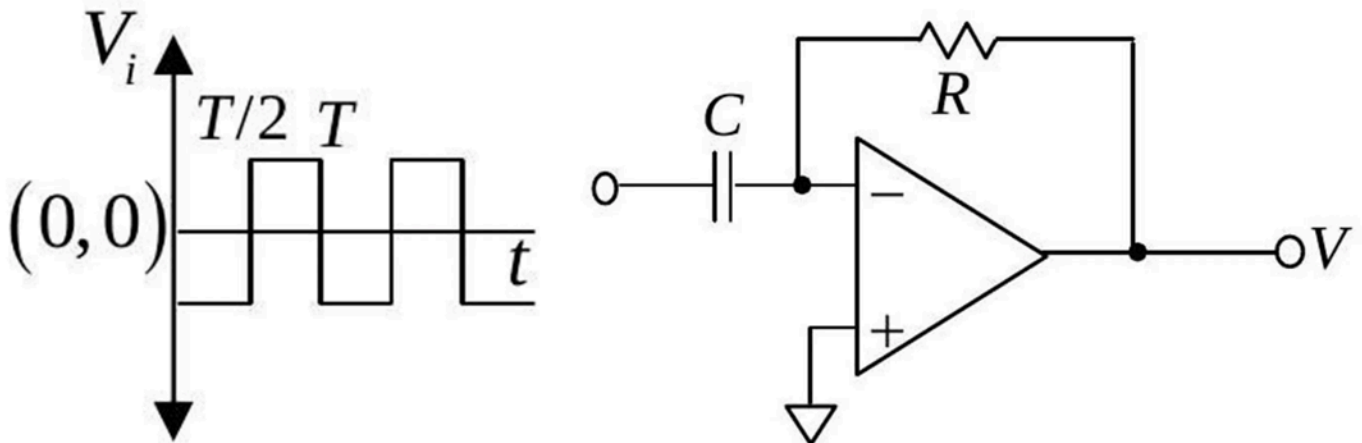
Input bits	Output voltage
000	1
001	2
010	3
011	4

Q54. [June 2018] . 5.0 marks

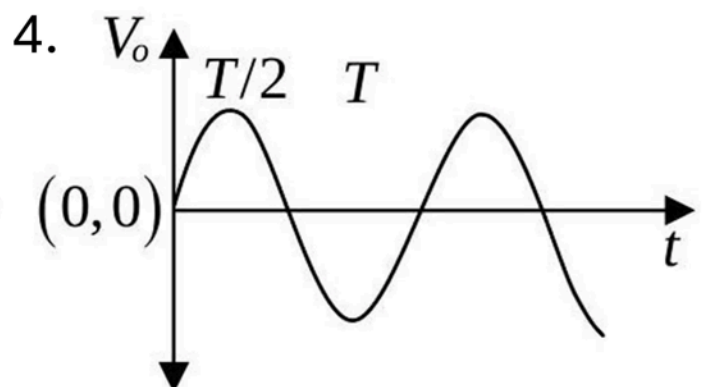
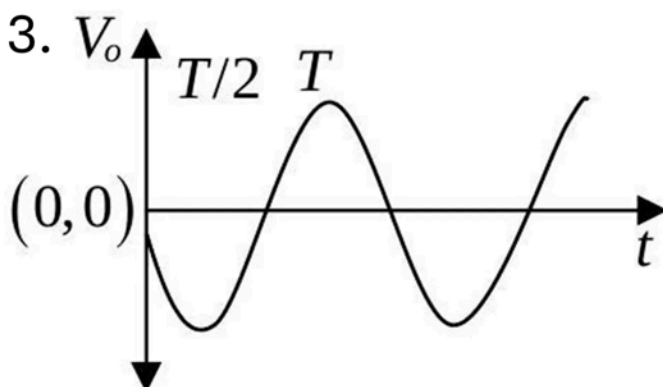
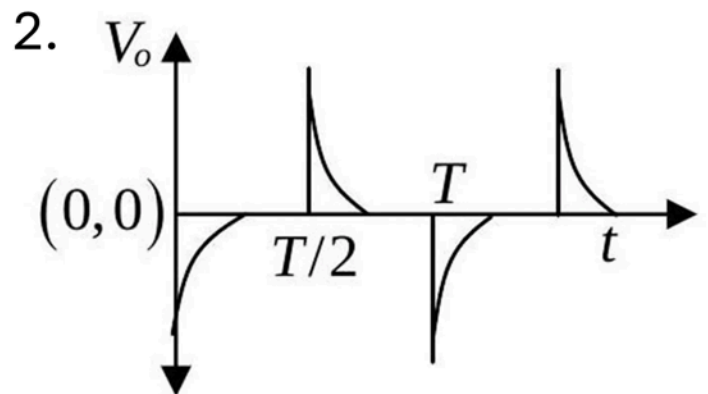
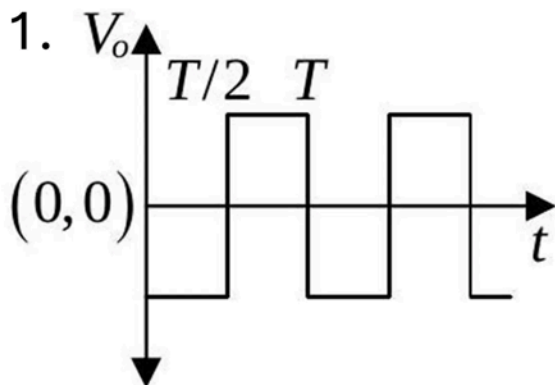
Electronics > OPAMP

CSIR NET	2018 June	5M
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The input V_i to the following circuit is a square wave as shown in the following figure.



Which of the waveforms V_o best describes the output?



Q55. [June 2018] . 5.0 marks

Electronics > Instruments

CSIR NET	2018 June	5M
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Two signals $A_1 \sin(\omega t)$ and $A_2 \cos(\omega t)$ are fed into the input and the reference channels, respectively, of a lock-in amplifier. The amplitude of each signal is 1 V . The time constant of the lock-in amplifier is such that any signal of frequency larger than ω is filtered out. The output of the lock-in amplifier is

1. 2V
2. 1V
3. 0.5V
4. 0V

Q56. [Dec 2019] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2019 Dec	3.5M
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A student measures the displacement x from the equilibrium of a stretched spring and reports it be $100\mu\text{ m}$ with a 1% error. The spring constant k is known to be 10 N/m with 0.5% error.

The percentage error in the estimate of the potential

energy $V = \frac{1}{2}kx^2$ is

1. 0.8%
2. 2.5%
3. 1.5%
4. 3.0%

Q57. [Dec 2019] . 3.5 marks

Electronics > AD/DA Conversion

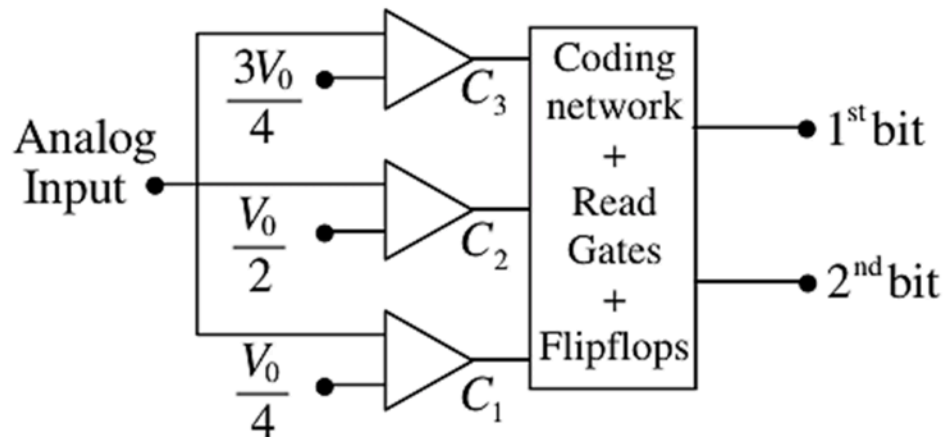
CSIR NET

2019 Dec

3.5M

The figure below shows a 2-bit simultaneous analog-to-digital (A/D) converter operating in the voltage range 0 to V_0 . The output of the comparators are C_1 , C_2 and C_3 with the reference inputs $V_0/4$, $V_0/2$ and $3V_0/4$, respectively. The logic expression for the output corresponding to the less significant bit is

1. $C_1 C_2 C_3$
2. $C_2 \bar{C}_3 + \bar{C}_1$
3. $C_1 \bar{C}_2 + C_3$
4. $C_2 \bar{C}_3 + C_2$



Q58. [Dec 2019] . 3.5 marks

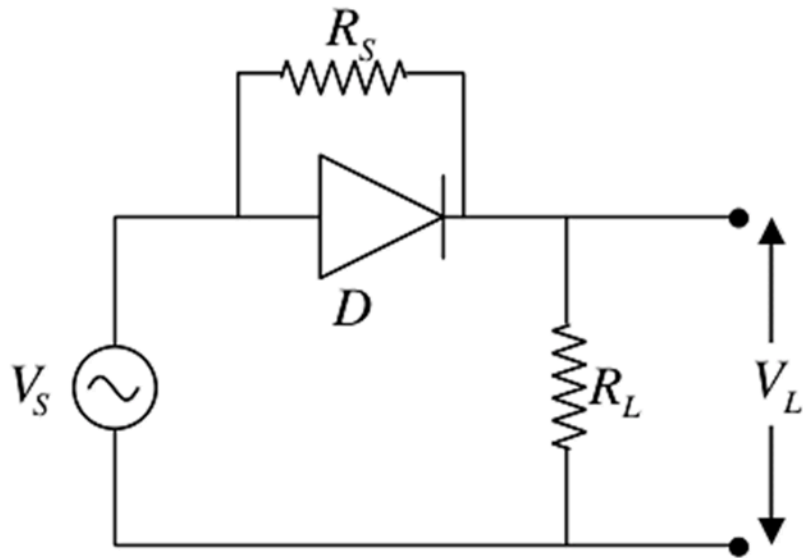
Electronics > Diodes

CSIR NET	2019 Dec	3.5M
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In the circuit below, D is an ideal diode, the source voltage $V_S = V_0 \sin \omega t$ is a unit amplitude sine wave and $R_S = R_L$

The average output voltage, V_L , across the load resistor R_L is

1. $\frac{1}{2\pi} V_0$
2. $\frac{3}{2\pi} V_0$
3. $3V_0$
4. V_0



Q59. [Dec 2019] . 5.0 marks

Electronics > Instruments

CSIR NET	2019 Dec	5M
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Assume that the noise spectral density, at any given frequency, in a current amplifier is independent of frequency. The bandwidth of measurement is changed from 1 Hz to 10 Hz . The ratio A/B of the RMS noise current before (A) and after (B) the bandwidth modification is

1. $1/10$
2. $1/\sqrt{10}$
3. $\sqrt{10}$
4. 10

Q60. [Dec 2019] . 5.0 marks

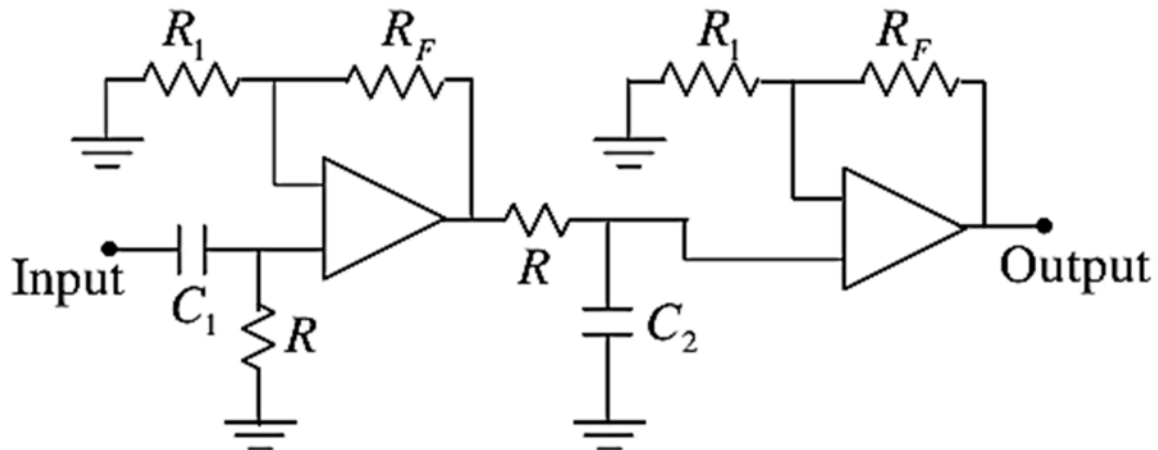
Electronics > OPAMP

CSIR NET

2019 Dec

5M

In the circuit diagram of a band pass filter shown below, $R = 10k\Omega$.



In order to get a lower cut-off frequency of 150 Hz and an upper cut-off frequency of 10 kHz, the appropriate values of C_1 and C_2 respectively are

1. $0.1\mu F$ and $1.5nF$
2. $0.3\mu F$ and $5.0nF$
3. $1.5nF$ and $0.1\mu F$
4. $5.0nF$ and $0.3\mu F$

Q61. [Dec 2019] . 5.0 marks

Electronics > Transistors

CSIR NET

2019 Dec

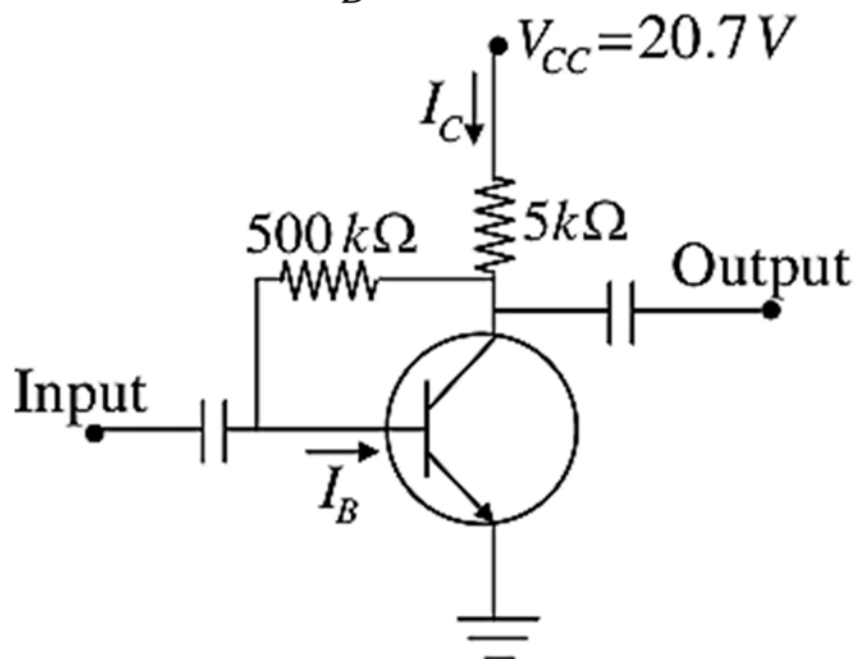
5M

In a collector feedback circuit shown in the figure below, the base emitter voltage $V_{BE} = 0.7 \text{ V}$ and

current gain $\beta = \frac{I_C}{I_B} = 100$ for the transistor

The value of the base current I_B is

1. $20 \mu \text{ A}$
2. $40 \mu \text{ A}$
3. $10 \mu \text{ A}$
4. $100 \mu \text{ A}$



Q62. [June 2019] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2019 June	3.5M
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In an experiment to measure the acceleration due to gravity g using a simple pendulum, the length and time period of the pendulum are measured to three significant figures. The mean value of g and the uncertainty δg of the measurements are then estimated using a calculator from a large number of measurements and found to be 9.82147 m/s^2 and 0.02357 m/s^2 , respectively. Which of the following is the most accurate way of presenting the experimentally determined value of g ?

1. $9.82 \pm 0.02 \text{ m/s}^2$
2. $9.8215 \pm 0.02 \text{ m/s}^2$
3. $9.82147 \pm 0.02357 \text{ m/s}^2$
4. $9.82 \pm 0.02357 \text{ m/s}^2$

Q63. [June 2019] . 3.5 marks

Electronics > RLC Circuits

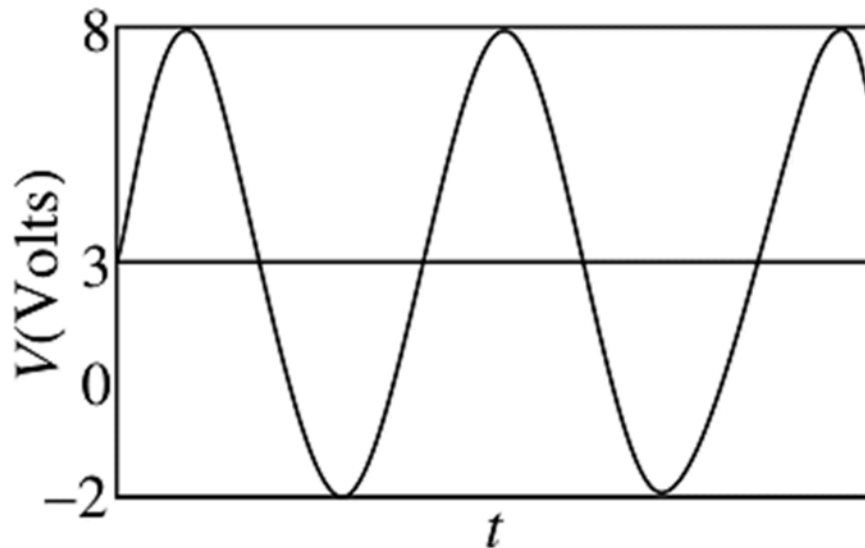
CSIR NET

2019 June

3.5M

An ac signal of the type as shown in the figure, is applied across a resistor $R = 1\Omega$. The power dissipated across the resistor is

1. 12.5 W
2. 9 W
3. 25 W
4. 21.5 W



Q64. [June 2019] . 3.5 marks

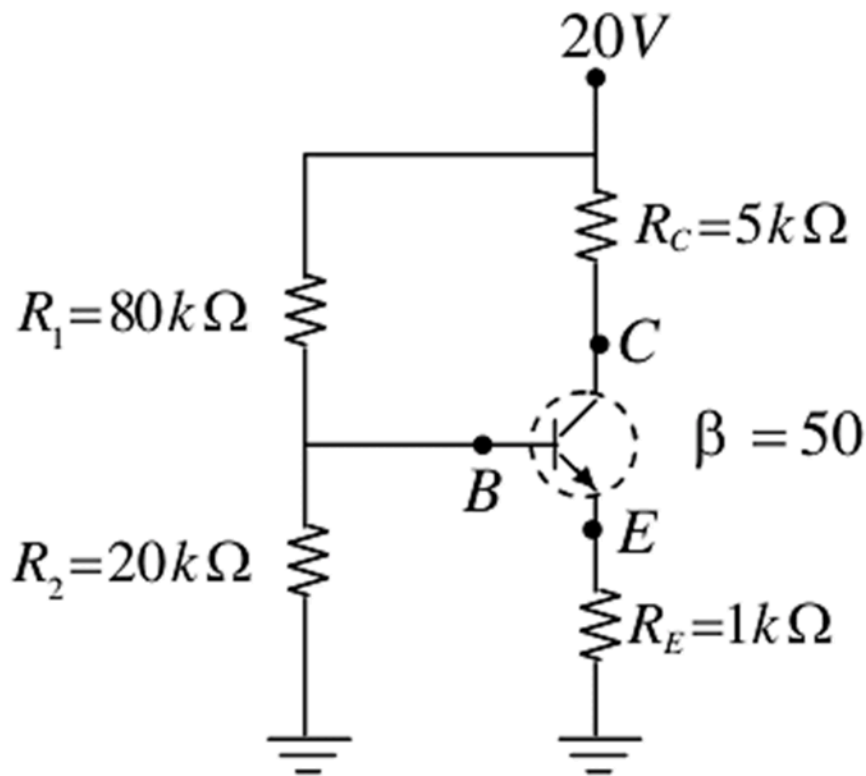
Electronics > Transistors

CSIR NET

2019 June

3.5M

An npn -transistor is connected in a voltage divider configuration as shown in the figure below.



If the resistor R_2 is disconnected, the voltages V_B at the base and V_C at the collector change as follows.

1. both V_B and V_C increase
2. both V_B and V_C decrease
3. V_B decreases, but V_C increases
4. V_B increases, but V_C decreases

Q65. [June 2019] . 3.5 marks

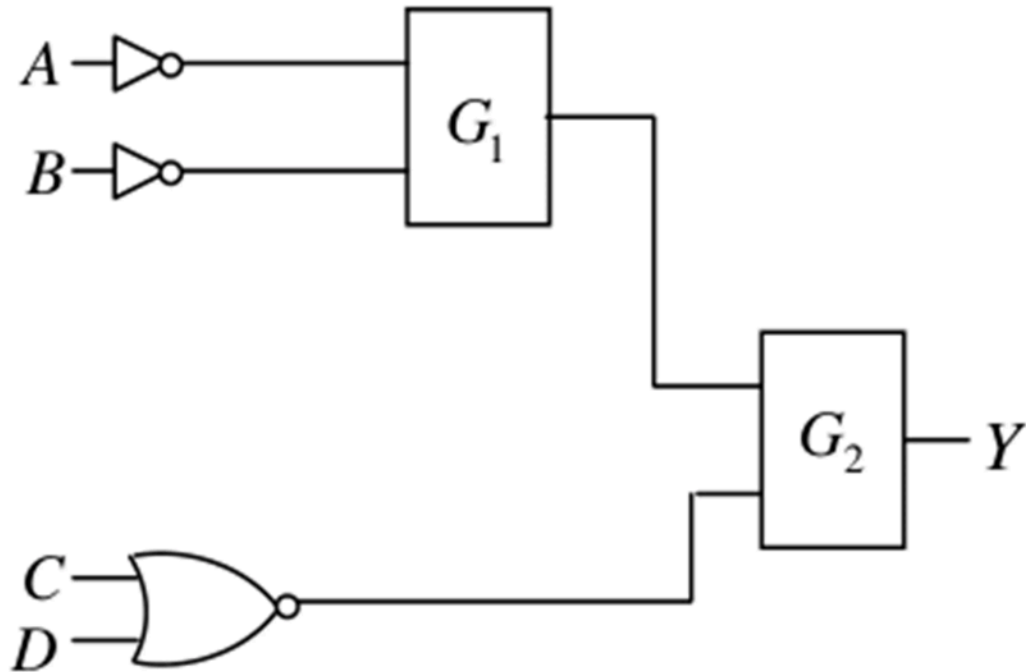
Electronics > Digital Electronics

CSIR NET

2019 June

3.5M

Let Y denote the output in the following logical Circuit.



If $Y = AB + \bar{C}D$, the gates G_1 and G_2 must, respectively, be

1. OR and NAND
2. NOR and OR
3. AND and NAND
4. NAND and OR

Q66. [June 2019] . 5.0 marks

Electronics > OPAMP

CSIR NET	2019 June	5M
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For optimal performance of an op-amp based current-to-voltage converter circuit, the input and output impedance should be

1. Low input impedance and high output impedance
2. low input impedance and low output impedance
3. high input impedance and high output impedance
4. high input impedance and low output impedance

Q67. [June 2019] . 5.0 marks

Electronics > Diodes

CSIR NET	2019 June	5M
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The forward diode current is given by

$I = kT^\alpha e^{-E_g/k_B T} (\exp(eV/k_B T) - 1)$, where E_g is the band gap of the semiconductor, V is the voltage drop across the diode, T is the temperature of the diode operating near room temperature and, α and K are constants. A diode is used as a thermal sensor in the circuit shown below.

If V is measured using an ideal voltmeter to estimate T , the variation of the voltage V as a function of T is best approximated by (in the following a and b are constants)

1. $aT^2 + b$
2. $aT + b$
3. $aT^3 + b$
4. $aT + bT^2$

Q68. [June 2019] . 5.0 marks

Electronics > OPAMP

CSIR NET

2019 June

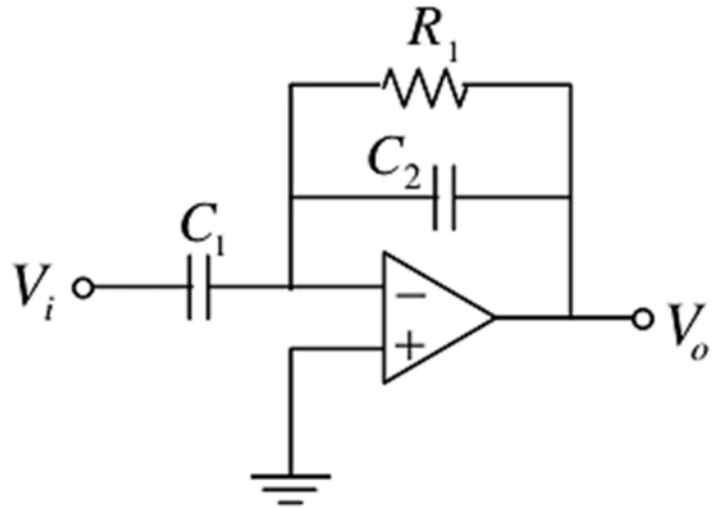
5M

A circuit constructed using op-amp, resistor

$R_1 = 1k\Omega$ and capacitors $C_1 = 1\mu F$ and $C_2 = 0.1\mu F$ is shown in the figure below.

This circuit will act as a

1. high pass filter
2. low pass filter
3. band pass filter
4. band reject filter



Q69. [June 2020] . 3.5 marks

Electronics > RLC Circuits

CSIR NET	2020 June	3.5M
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An inductor L , a capacitor C and a resistor R are connected in series to an AC source, $V = V_0 \sin \omega t$. If the net current is found to depend only on R , then

1. $C = 0$

2. $L = 0$

3. $\omega = 1/\sqrt{LC}$

4. $\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}}$

Q70. [June 2020] . 3.5 marks

Electronics > RLC Circuits

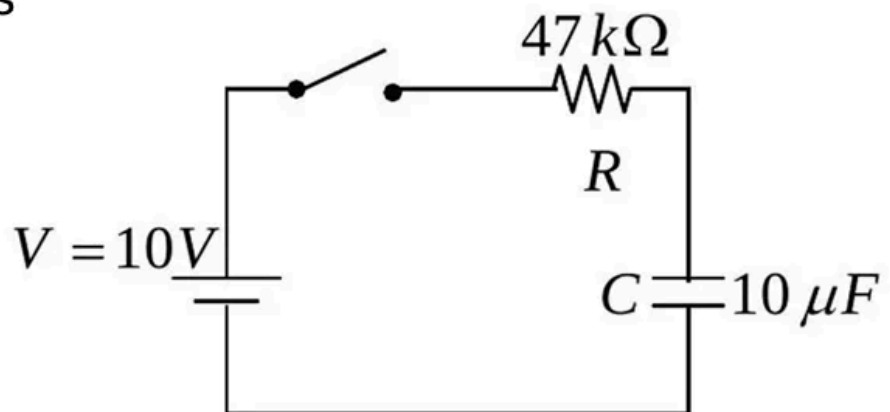
CSIR NET

2020 June

3.5M

A 10 V battery is connected in series to a resistor R and a capacitor C , as shown the figure. The initial charge on the capacitor is zero. The switch is turned on and the capacitor is allowed to charge to its full capacity. The total work done by the battery in this process is

1. 10^{-3} J
2. 2×10^{-3} J
3. 5×10^{-4} J
4. 47×10^{-2} J

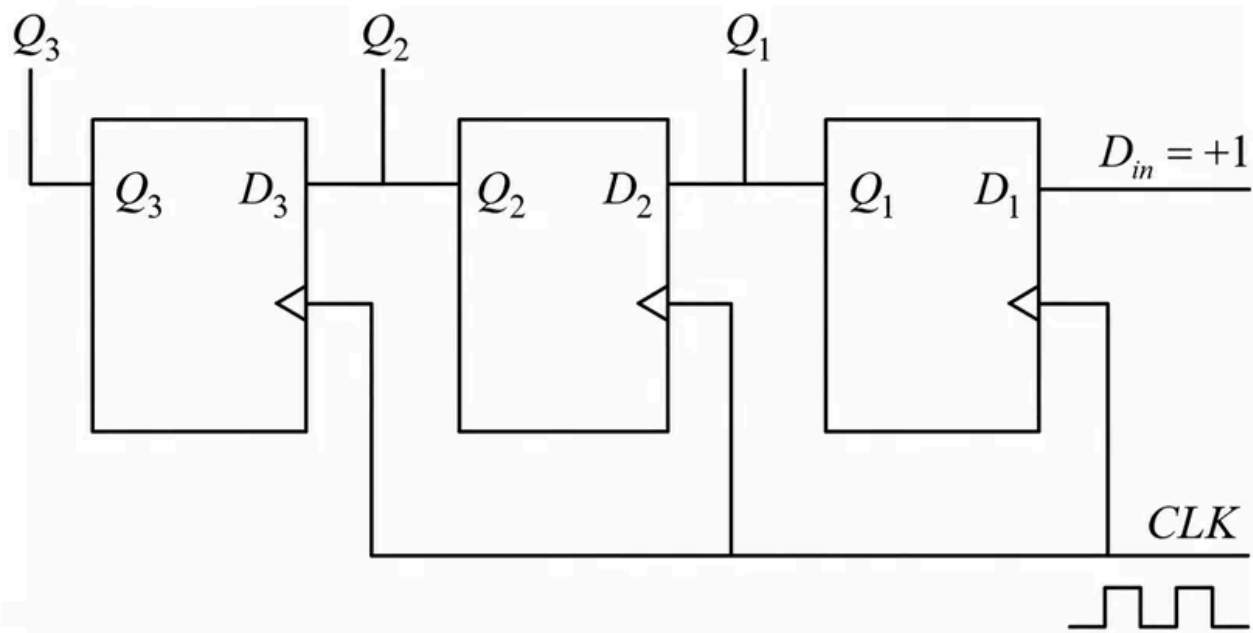


Q71. [June 2020] . 3.5 marks

Electronics > Flip flops/Counters/Registers/microcontroller etc.

CSIR NET	2020 June	3.5M
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In the 3-bit register shown below, Q_1 and Q_3 are the least and the most significant bits of the output, respectively.



If Q_1 , Q_2 and Q_3 are set to zero initially, then the output after the arrival of the second falling clock (CLK) edge is

1. 001
2. 100
3. 011
4. 110

Q72. [June 2020] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2020 June	3.5M
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The Boolean equation $Y = \bar{A}BC + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C$ is to be implemented using only two-input NAND gates. The minimum number of gates required is

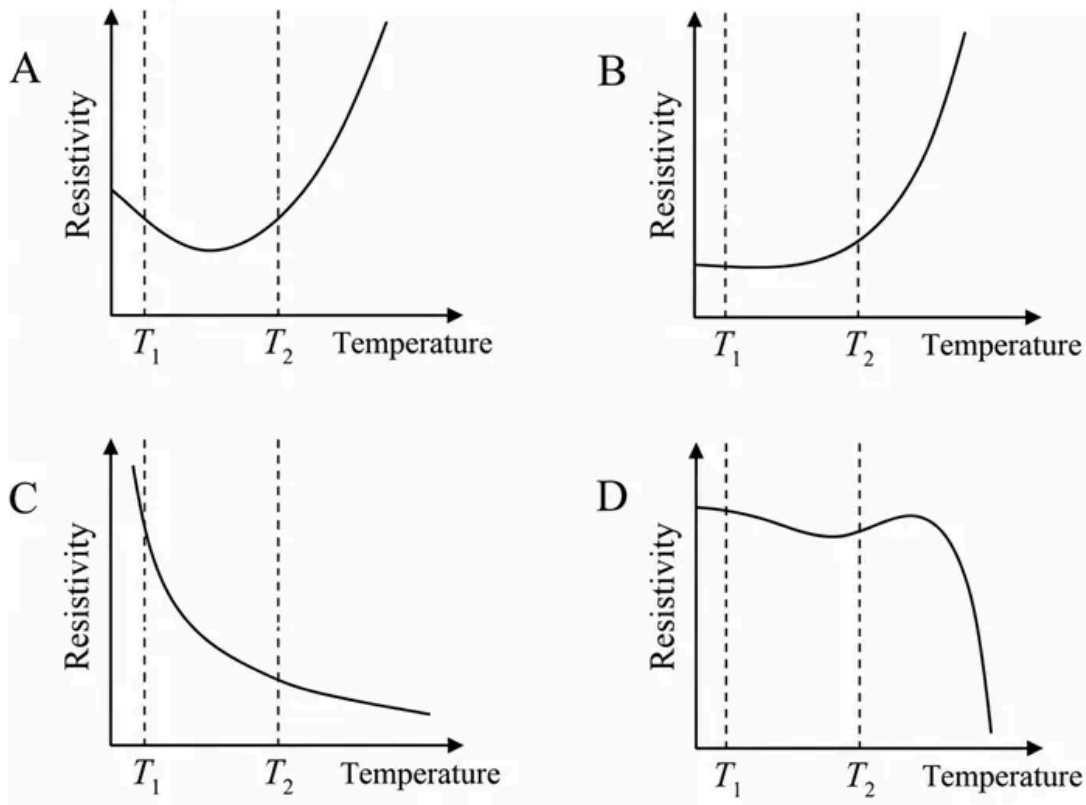
1. 3
2. 4
3. 5
4. 6

Q73. [June 2020] . 3.5 marks

Electronics > Instruments

CSIR NET	2020 June	3.5M
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The temperature variation of the resistivity of four materials are shown in the following graphs.



The material that would make the most sensitive temperature sensor, when used at temperatures between T_1 and T_2 , is

1. A
2. B
3. C
4. D

Q74. [June 2020] . 5.0 marks

Electronics > Instruments

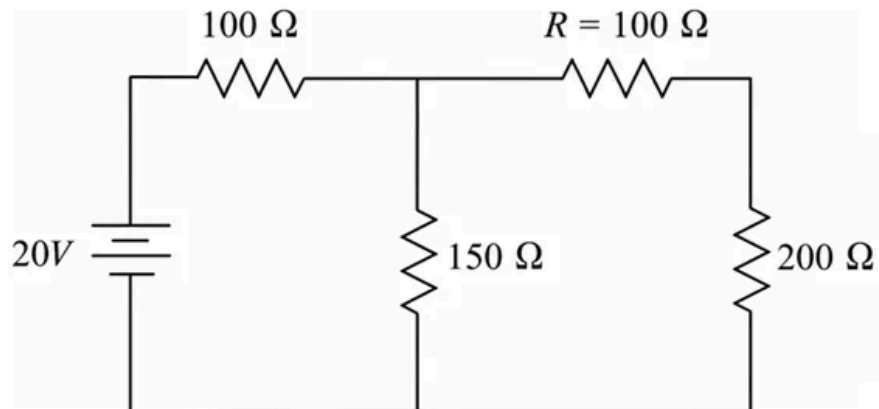
CSIR NET

2020 June

5M

Two voltmeters A and B with internal resistances $2\text{ M}\Omega$ and $0.1\text{ k}\Omega$ are used to measure the voltage drops V_A and V_B , respectively, across the resistor R in the circuit shown below. The ratio V_A/V_B is

1. 0.58
2. 1.73
3. 1
4. 2

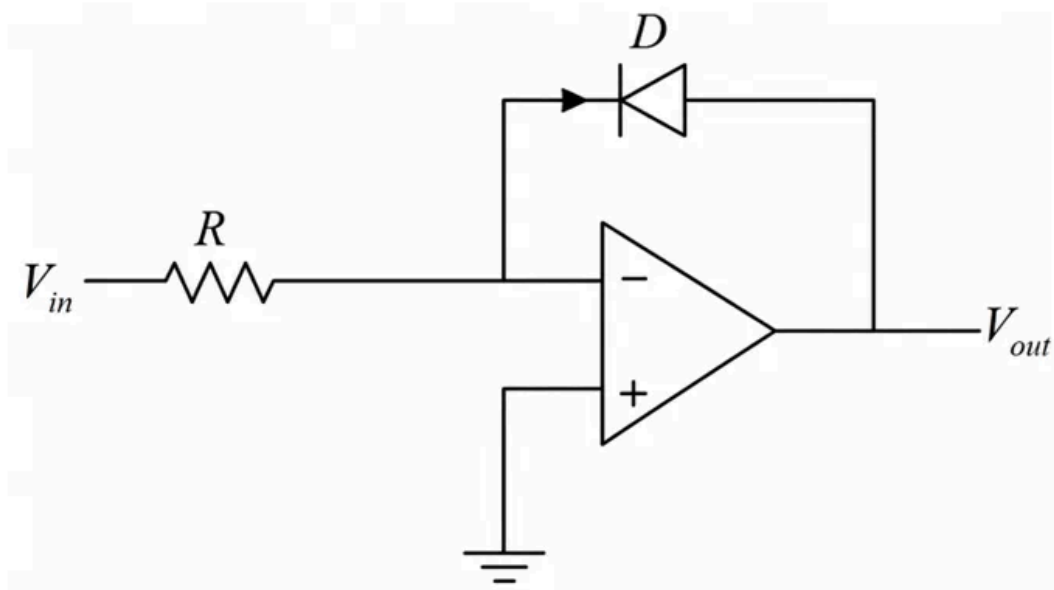


Q75. [June 2020] . 5.0 marks

Electronics > OPAMP

CSIR NET	2020 June	5M
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The $I - V$ characteristics of the diode D in the circuit below is given by $I = I_s \left(e^{\frac{qV}{k_B T}} - 1 \right)$ where I_s is the reverse saturation current, V is the voltage across the diode and T is the absolute temperature.



If the input voltage is V_{in} , then the output voltage V_{out} is

1. $I_s R \ln \left(\frac{qV_{in}}{k_B T} + 1 \right)$
2. $\frac{1}{q} k_B T \ln \left(\frac{q(V_{in} + I_s R)}{k_B T} \right)$
3. $\frac{1}{q} k_B T \ln \left(\frac{V_{in}}{I_s R} + 1 \right)$
4. $-\frac{1}{q} k_B T \ln \left(\frac{V_{in}}{I_s R} + 1 \right)$

Q76. [June 2020] . 5.0 marks

Electronics > Instruments

CSIR NET	2020 June	5M
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A rod pivoted at one end is rotating clockwise 25 times a second in a plane. A video camera which records at a rate of 30 frames per second is used to film the motion. To someone watching the video, the apparent motion of the rod will seem to be

1. 10 rotations per second in the clockwise direction
2. 10 rotations per second in the anticlockwise direction
3. 5 rotations per second in the clockwise direction
4. 5 rotations per second in the anticlockwise direction

Q77. [June 2020] . 5.0 marks

Electronics > OPAMP

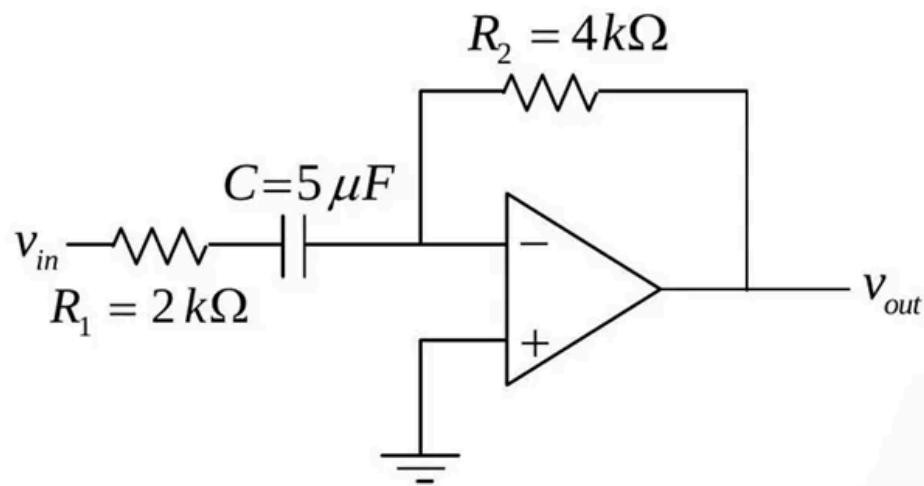
CSIR NET

2020 June

5M

In the circuit shown below, the gain of the op-amp in the middle of its bandwidth is 10^5 . A sinusoidal voltage with angular frequency $\omega = 100 \text{ rad/s}$ is applied to the input of the op-amp. The phase difference between the input and the output voltage is

1. $5\pi/4$
2. $3\pi/4$
3. $\pi/2$
4. π



Q78. [June 2021] . 3.5 marks

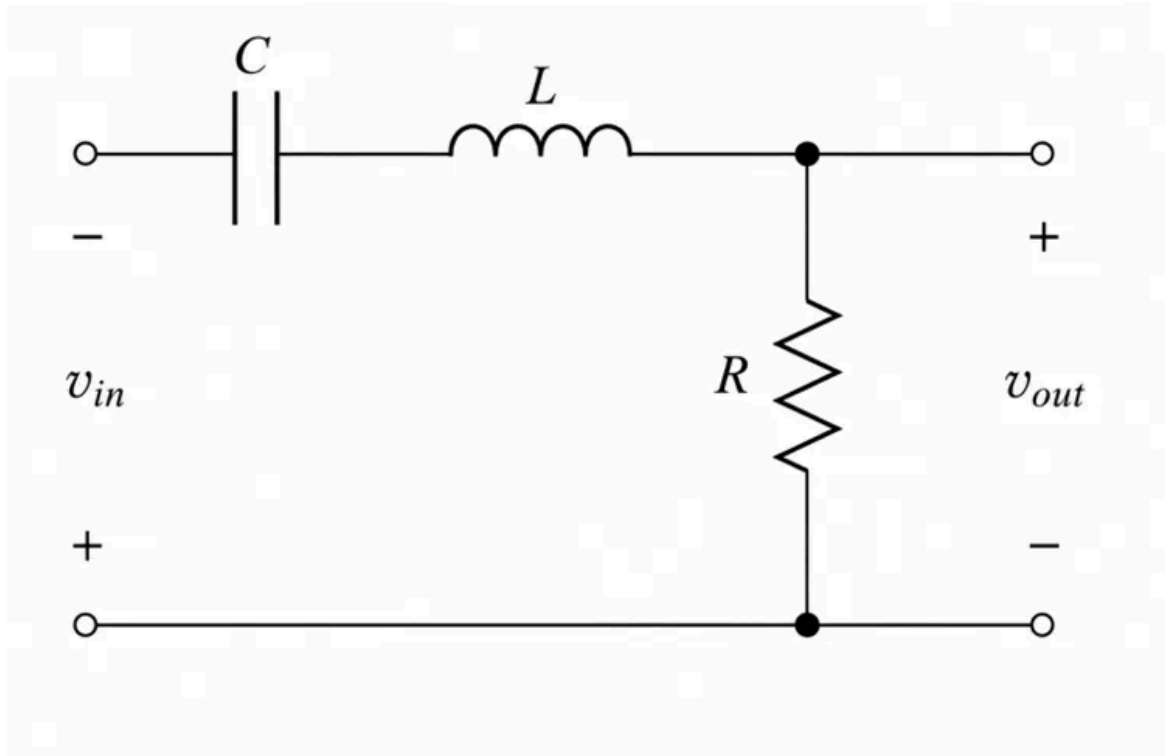
Electronics > RLC Circuits

CSIR NET

2021 June

3.5M

In the LCR circuit shown below, the resistance $R = 0.05 \Omega$, the inductance $L = 1 \text{ H}$ and the capacitance $C = 0.04 \text{ F}$.



If the input v_{in} is a square wave of angular frequency 1 rad/s , the output v_{out} is best approximated by a

1. Square wave of angular frequency 1 rad/s
2. Sine wave of angular frequency 1 rad/s
3. Square wave of angular frequency 5 rad/s
4. Sine wave of angular frequency 5 rad/s

Q79. [June 2021] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2021 June	3.5M
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In an experiment, the velocity of a non-relativistic neutron is determined by measuring the time (~ 50 ns) it takes to travel from the source to the detector kept at a distance L . Assume that the error in the measurement of L is negligibly small. If we want to estimate the kinetic energy T of the neutron to within 5% accuracy, i.e., $|\delta T/T| \leq 0.05$, the maximum permissible error $|\delta T|$ in measuring the time of flight is nearest to

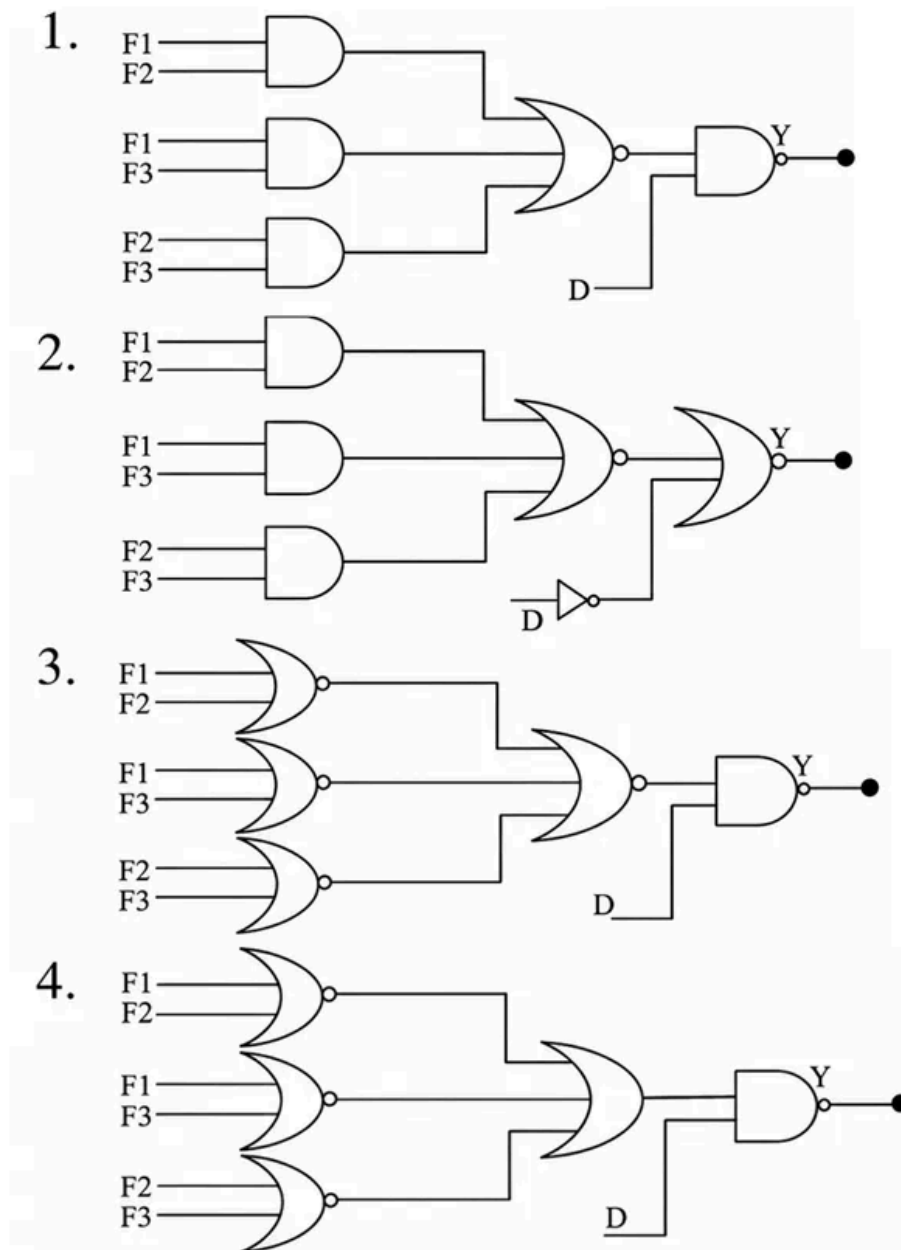
1. 1.75 ns
2. 0.75 ns
3. 2.25 ns
4. 1.25 ns

Q80. [June 2021] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2021 June	3.5M
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The door of an *X*-ray machine room is fitted with a sensor *D* (0 is open and 1 is closed). It is also equipped with three fire sensors F_1, F_2 and F_3 (each is 0 when disabled and 1 when enabled). The *X*-ray machine can operate only if the door is closed and at least 2 fire sensors are enabled. The logic circuit to ensure that the machine can be operated is

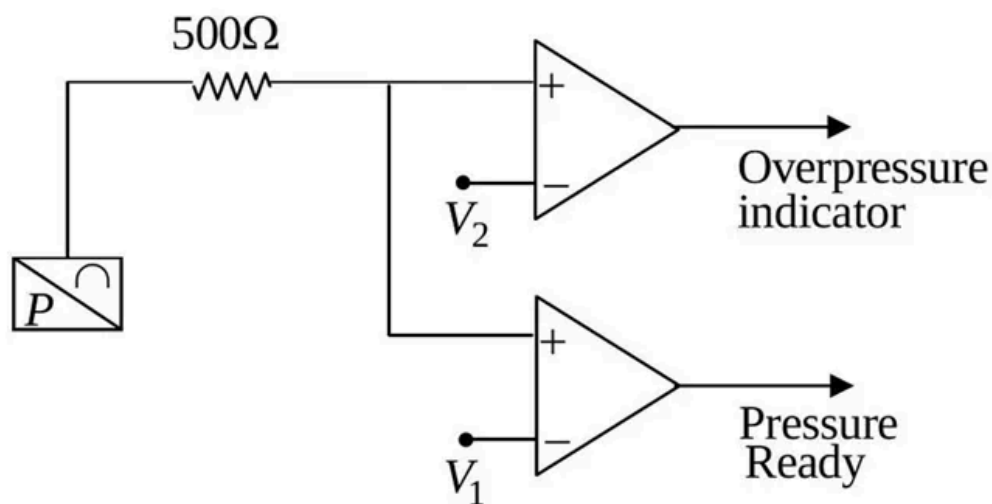


Q81. [June 2021] . 5.0 marks

Electronics > Instruments

CSIR NET	2021 June	5M
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The pressure of a gas in a vessel needs be maintained between 1.5 bar to 2.5 bar in an experiment. The vessel is fitted with a pressure transducer that generates 4 mA to 20 mA current for pressure in the range 1 bar to 5 bar. The current output of the transducer has a linear dependence on the pressure.



The reference voltages V_1 and V_2 in the comparators in the circuit (shown in figure above) suitable for the desired operating conditions are respectively

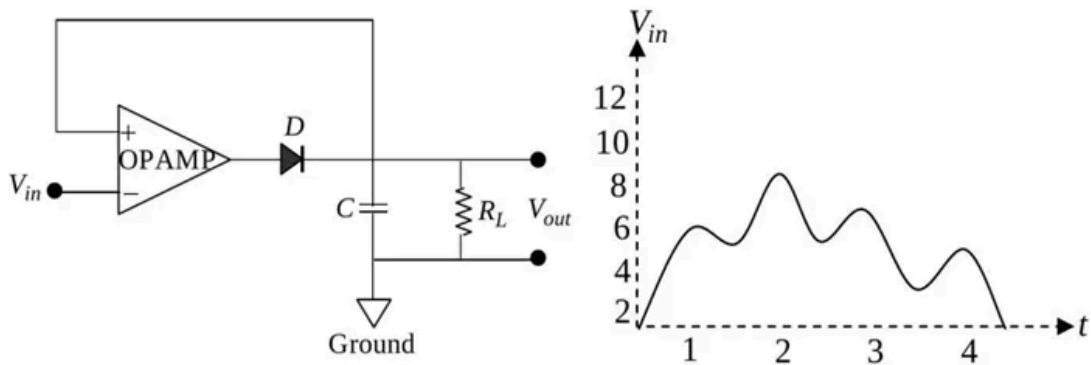
1. 2 V and 10 V
2. 2 V and 5 V
3. 3 V and 10 V
4. 3 V and 5 V

Q82. [June 2021] . 5.0 marks

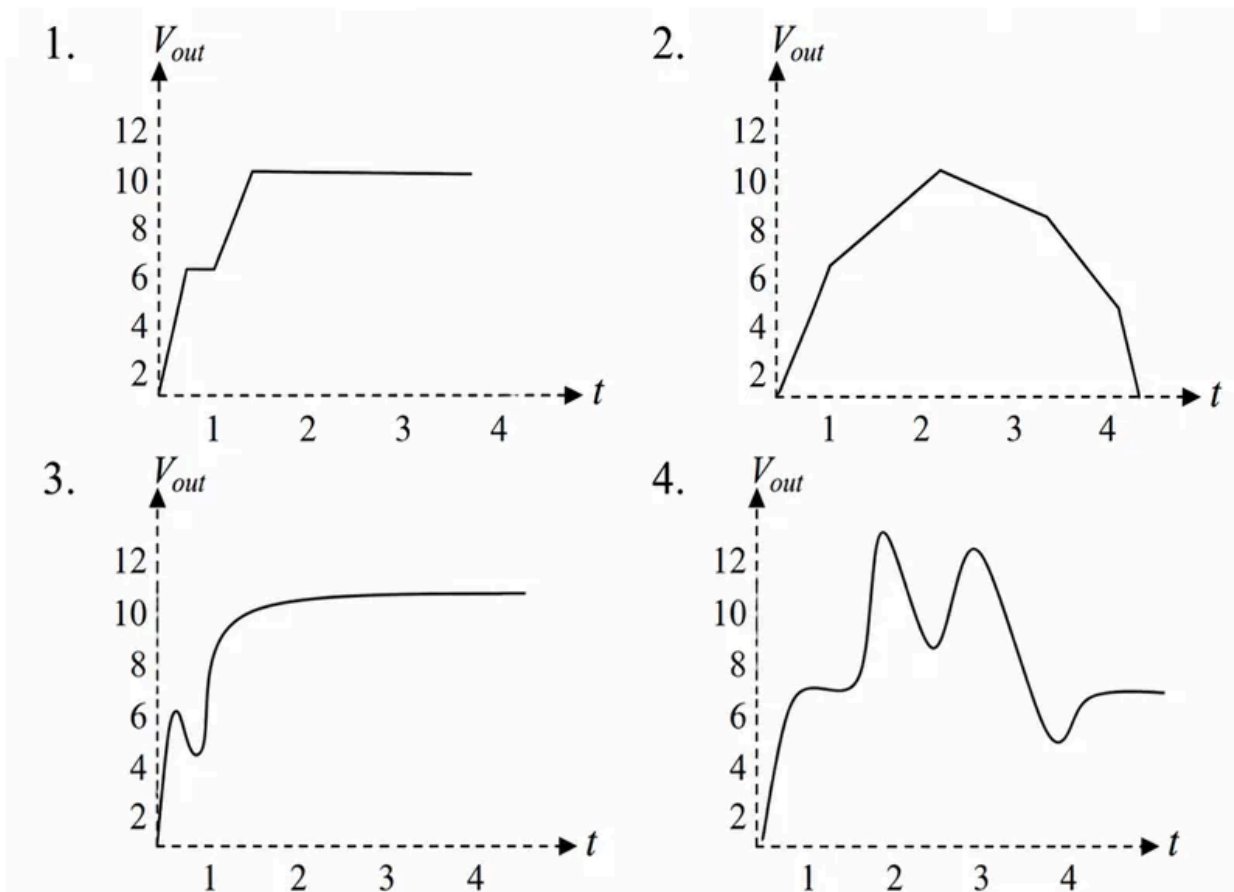
Electronics > Instruments

CSIR NET	2021 June	5M
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In the following circuit the input voltage V_{in} is such that $|V_{in}| < |V_{sat}|$ where V_{sat} is the saturation voltage of the op-amp (Assume that the diode is an ideal one and $R_L C$ is much larger than the duration of the measurement.)



For the input voltage as shown in the figure above the output voltage V_{out} is best represented by



Q83. [June 2022] . 3.5 marks

Electronics > FET

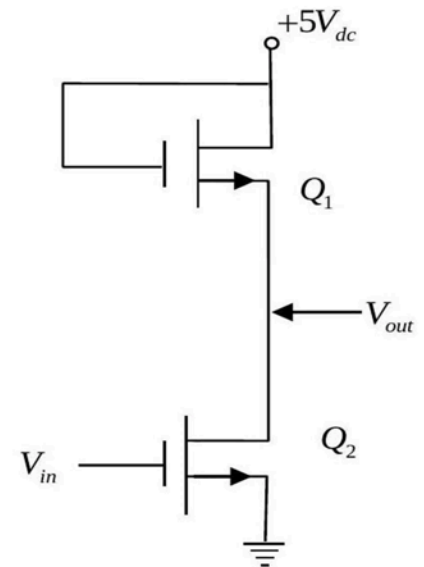
CSIR NET

2022 June

3.5M

The circuit containing two n-channel MOSFETs shown below, works as

1. a buffer
2. a non-inverting amplifier
3. an inverter
4. a rectifier



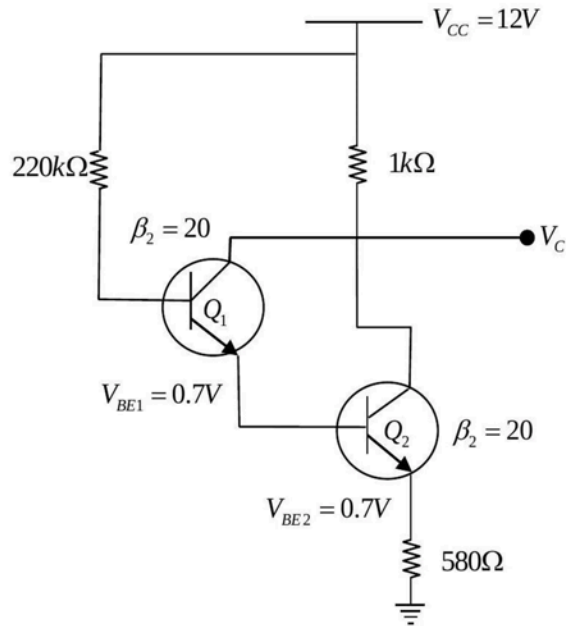
Q84. [June 2022] . 3.5 marks

Electronics > Transistors

CSIR NET	2022 June	3.5M
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The figure below shows a circuit with two transistors, Q_1 and Q_2 , having current gains β_1 and β_2 respectively. The collector voltage V_C will be closest to

1. 0.9 V
2. 2.2 V
3. 2.9 V
4. 4.2 V

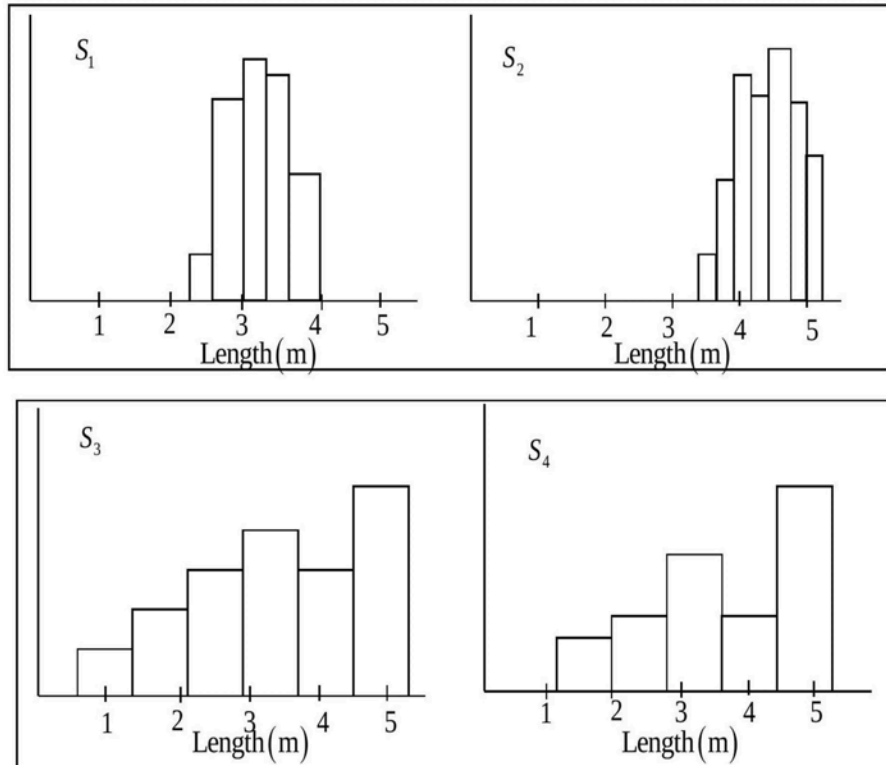


Q85. [June 2022] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2022 June	3.5M
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Four students (S_1, S_2, S_3 and S_4) make multiple measurements on the length of a table. The binned data are plotted as histograms in the following figures.



If the length of the table, specified by the manufacturer, is $3m$, the student whose measurements have the minimum systematic error, is

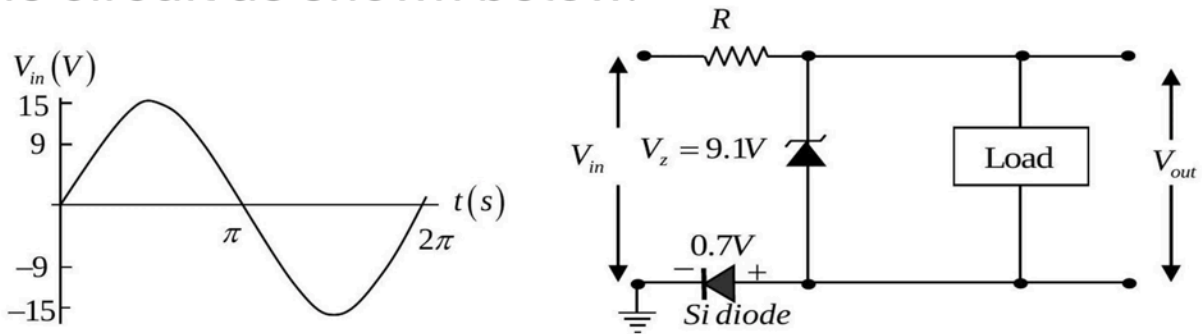
1. S_2
2. S_1
3. S_4
4. S_3

Q86. [June 2022] . 3.5 marks

Electronics > Diodes

CSIR NET	2022 June	3.5M
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A high impedance load (network) is connected in the circuit as shown below.



The forward voltage drop for silicon diode is 0.7 V and the Zener voltage is 9.10 V . If the input voltage (V_{in}) is sine wave with an amplitude of 15 V (as shown in the figure above), which of the following waveform qualitatively describes the output voltage (V_{out}) across the load?

- 1.
- 2.
- 3.
- 4.

Q88. [June 2022] . 5.0 marks

Electronics > OPAMP

CSIR NET	2022 June	5M
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An amplifier with a voltage gain of 40 dB without feedback is used in an electronic circuit. A negative feedback with a fraction $1/40$ is connected to the input of this amplifier. The net gain of the amplifier in the circuit is closest to

1. 40 dB
2. 37 dB
3. 29 dB
4. 20 dB

Q89. [June 2022] . 5.0 marks

Electronics > Instruments

CSIR NET	2022 June	5M
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A receiver operating at 27°C has an input resistance of 100Ω . The input thermal noise voltage for this receiver with a bandwidth of 100 kHz is closest to

1. 0.4 nV
2. 0.6 pV
3. 40 mV
4. $0.4\ \mu\text{V}$

Q90. [Dec 2023] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2023 Dec	3.5 M
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In the measurement of a radioactive sample, the measured counts with and without the sample for equal time intervals are $C = 500$ and $B = 100$, respectively. The errors in the measurements of C and B are $|\Delta C| = 20$ and $|\Delta B| = 10$, respectively. The net error $|\Delta Y|$ in the measured counts from the sample $Y = C - B$, is closet to

1. 22
2. 10
3. 30
4. 43

Q91. [Dec 2023] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2023 Dec	3.5 M
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For three inputs A, B and C , the minimum number of 2 -input NAND gates required to generate the output $Y = \overline{A + B + C}$ is

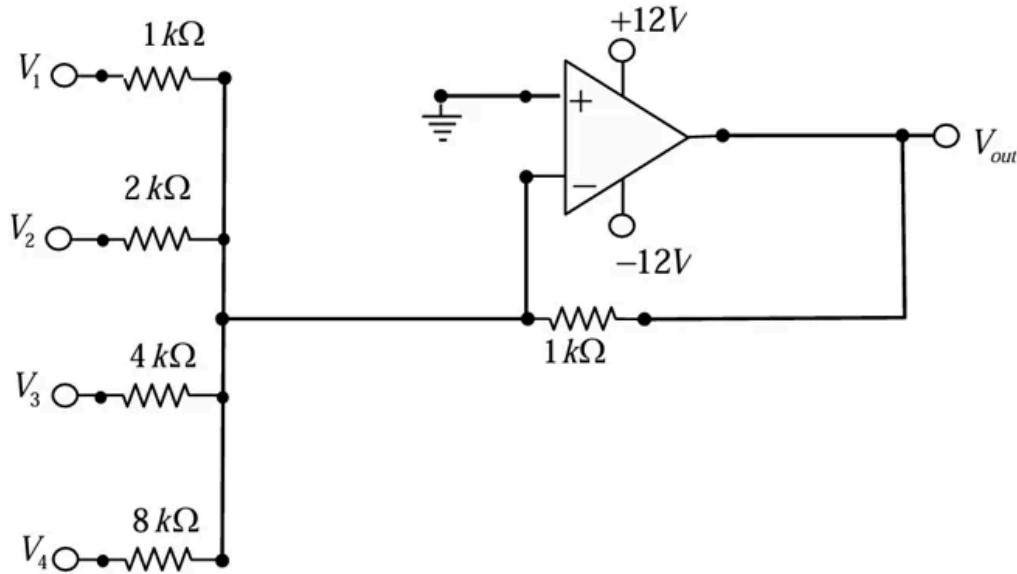
1. 3
2. 4
3. 7
4. 6

Q92. [Dec 2023] . 3.5 marks

Electronics > OPAMP

CSIR NET	2023 Dec	3.5 M
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In the circuit shown below using an ideal opamp, inputs $V_j (j = 1,2,3,4)$ may either be open or connected to a -5 V battery.



The minimum measurement range of a voltmeter to measure all possible values of V_{out} is

1. 10 V
2. 30 V
3. 3 V
4. 1 V

Q93. [Dec 2023] . 3.5 marks

Electronics > Diodes

CSIR NET	2023 Dec	3.5 M
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The light incident on a solar cell has a uniform photon flux in the energy range of 1 eV to 2 eV and is zero elsewhere. The active layer of the cell has a bandgap of 1.5 eV and absorbs 80% of the photons with energies above the bandgap. Ignoring non-radiative losses, the power conversion efficiency (ratio of the output power to the input power) is closest to

1. 47%
2. 70%
3. 23%
4. 35%

Q94. [Dec 2023] . 5.0 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2023 Dec	5 M
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Gauge factor of a strain gauge is defined as the ratio of the fractional change in resistance $\left(\frac{\Delta R}{R}\right)$ to the fractional change in length $\left(\frac{\Delta L}{L}\right)$. A metallic strain gauge with a gauge factor 2 has a resistance of 100Ω under unstrained condition. An aluminum foil with Young's modulus $Y = 70GN/m^2$ is installed on the metallic gauge. Keeping the foil within its elastic limit, a stress of $0.2GN/m^2$ is applied on the foil. The change in the resistance of the gauge will be closest to

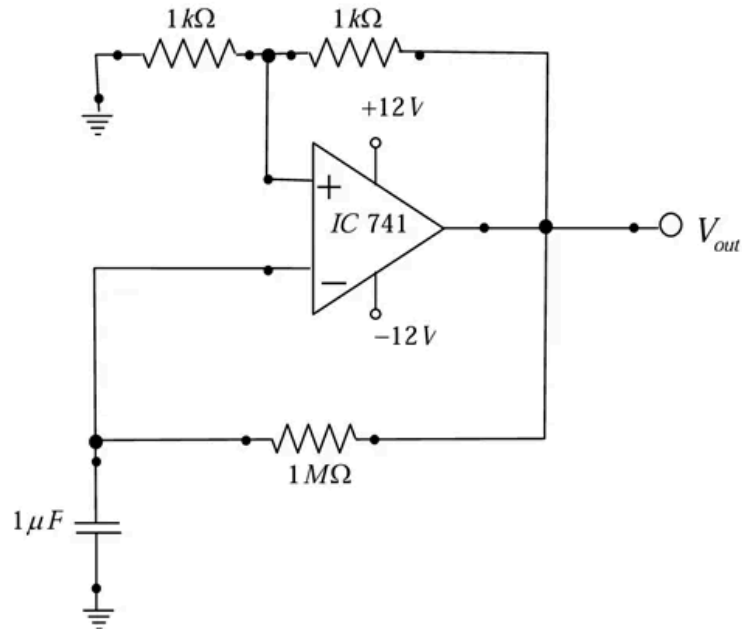
1. 0.14Ω
2. 1.23Ω
3. 0.28Ω
4. 0.56Ω

Q95. [Dec 2023] . 5.0 marks

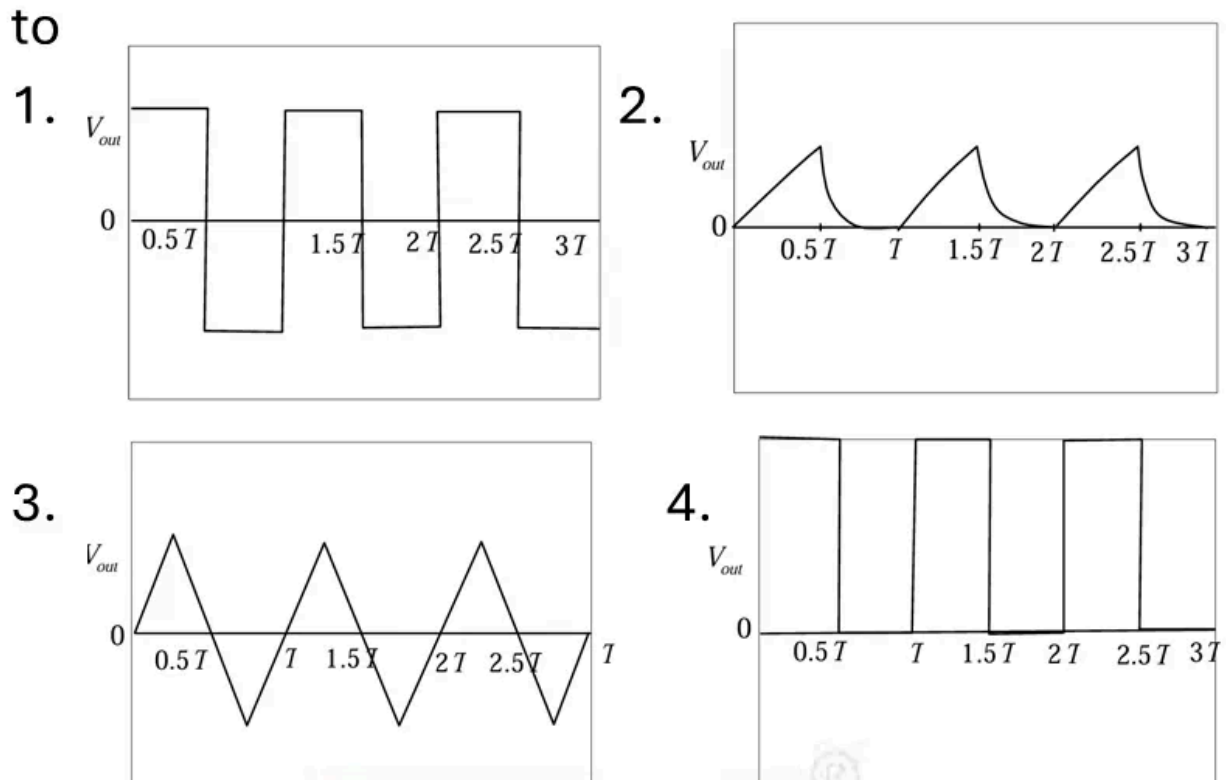
Electronics > OPAMP

CSIR NET	2023 Dec	5 M
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A circuit with operational amplifier is shown in the figure below.



The output voltage waveform V_{out} will be closest to

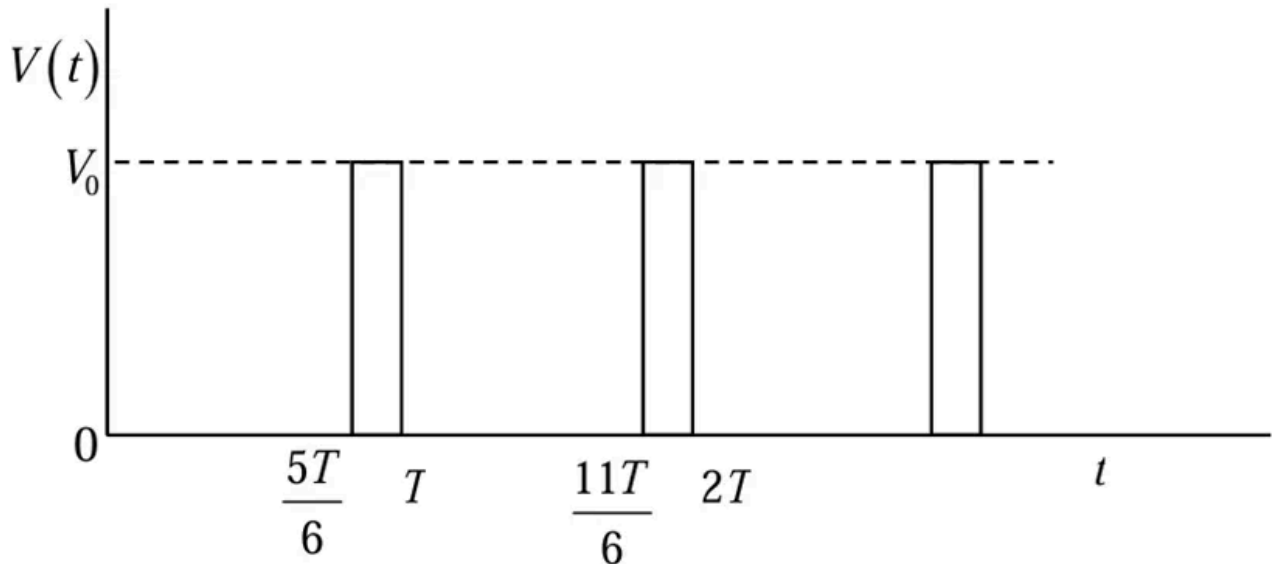


Q96. [Dec 2023] . 5.0 marks

Electronics > Instruments

CSIR NET	2023 Dec	5 M
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An infinite waveform $V(t)$ varies as shown in the figure below



The lowest harmonic that vanishes in the Fourier series of $V(t)$ is

1. 2
2. 3
3. 6
4. None

Q97. [June 2023] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2023 June	3.5M
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A DC motor is used to lift a mass M to a height h from the ground. The electric energy delivered to the motor is VIt , where V is the applied voltage, I is the current and t the time for which the motor runs. The efficiency e of the motor is the ratio between the work done by the motor and the energy delivered to it. If $M = 2.00 \pm 0.02\text{kg}$, $h = 1.00 \pm 0.01\text{ m}$, $V = 10.0 \pm 0.1\text{ V}$, $I = 2.00 \pm 0.02\text{ A}$ and $t = 300 \pm 15\text{ s}$, then the fractional error $|\delta e/e|$ in the efficiency of the motor is closest to

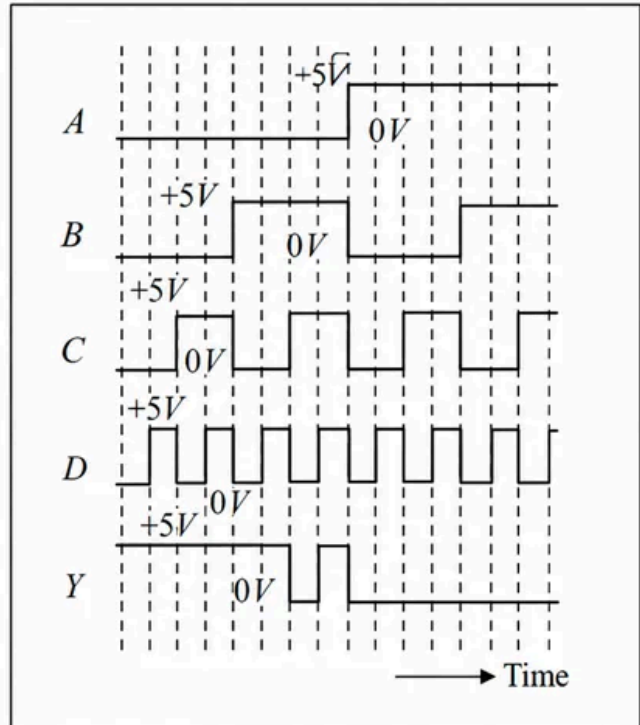
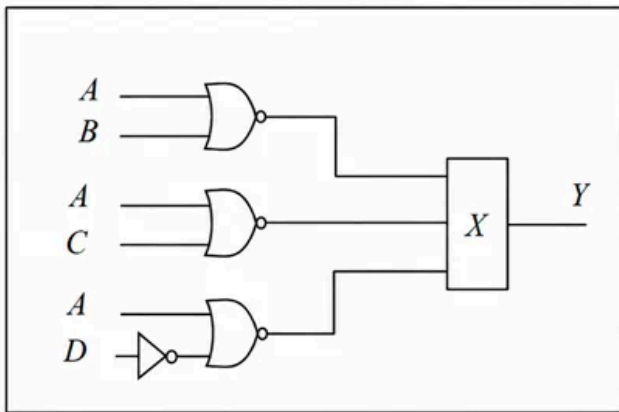
1. 0.05
2. 0.09
3. 0.12
4. 0.15

Q98. [June 2023] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2023 June	3.5M
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For the given logic circuit, the input waveforms A, B, C and D are shown as a function of time



To obtain the output Y as shown in the figure, the logic gate X should be

1. an AND gate
2. an OR gate
3. a NAND gate
4. a NOR gate

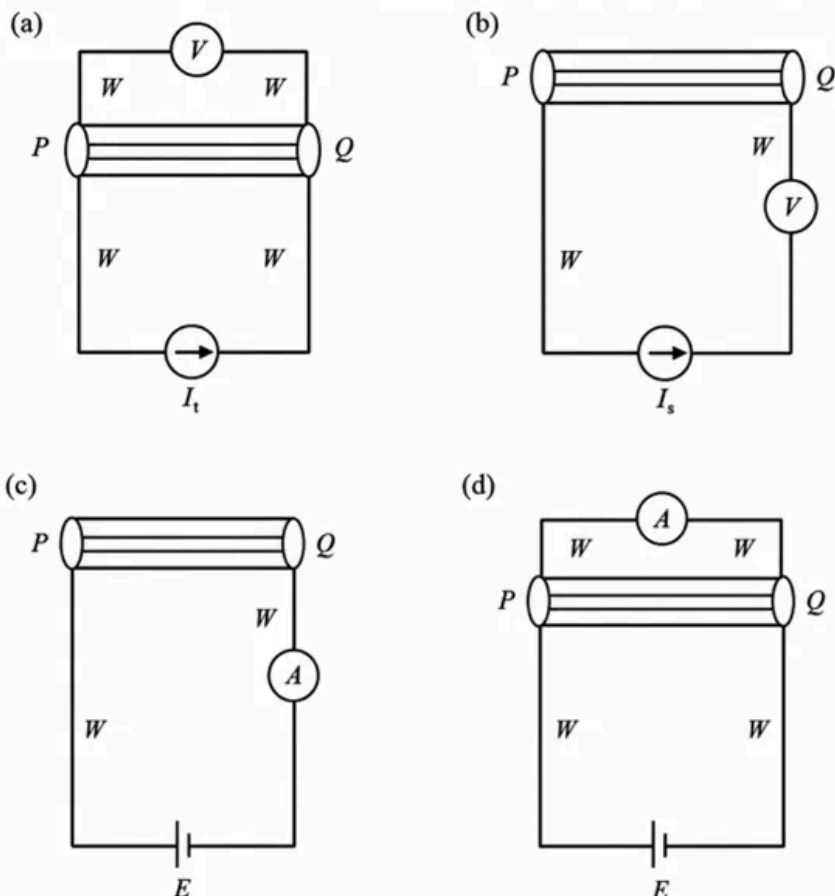
Q99. [June 2023] . 3.5 marks

Electronics > Instruments

CSIR NET	2023 June	3.5M
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A circuit needs to be designed to measure the resistance R of a cylinder PQ to the best possible accuracy, using an ammeter A , a voltmeter V , a battery E and a current source I_s (all assumed to be ideal). The value of R is known to be approximately 10Ω , and the resistance W of each of the connecting wires is close to 10Ω . If the current from the current source and voltage from the battery are known exactly, which of the following circuits provides the most accurate measurement of R ?

1. (b)
2. (a)
3. (d)
4. (c)



Q100. [June 2023] . 3.5 marks

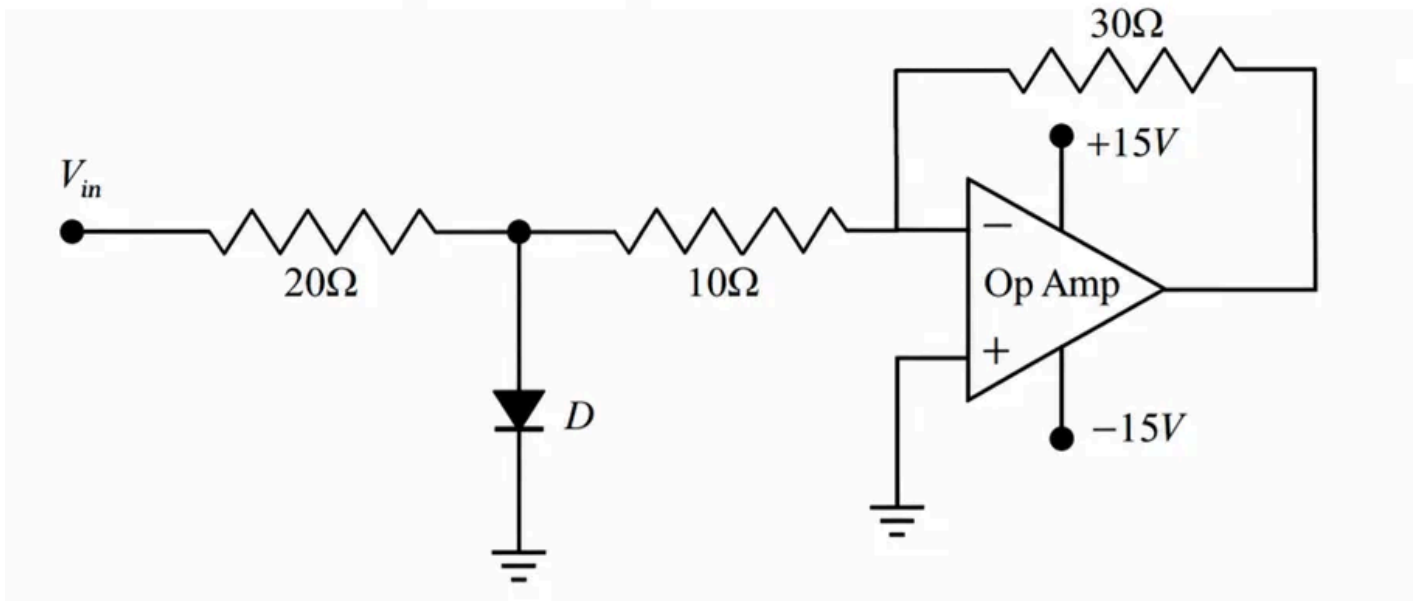
Electronics > OPAMP

CSIR NET

2023 June

3.5M

In the circuit below, there is a voltage drop of 0.7 V across the diode D in forward bias, while no current flows through it in reverse bias.



If V_{in} is a sinusoidal signal of frequency 50 Hz with an RMS value of 1 V, the maximum current that flows through the diode is closest to

1. 1 A
2. 0.14 A
3. 0 A
4. 0.07 A

Q101. [June 2023] . 5.0 marks

Electronics > Instruments

CSIR NET	2023 June	5M
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A train of impulses of frequency 500 Hz, in which the temporal width of each spike is negligible compared to its period, is used to sample a sinusoidal input signal of frequency 100 Hz. The sampled output is

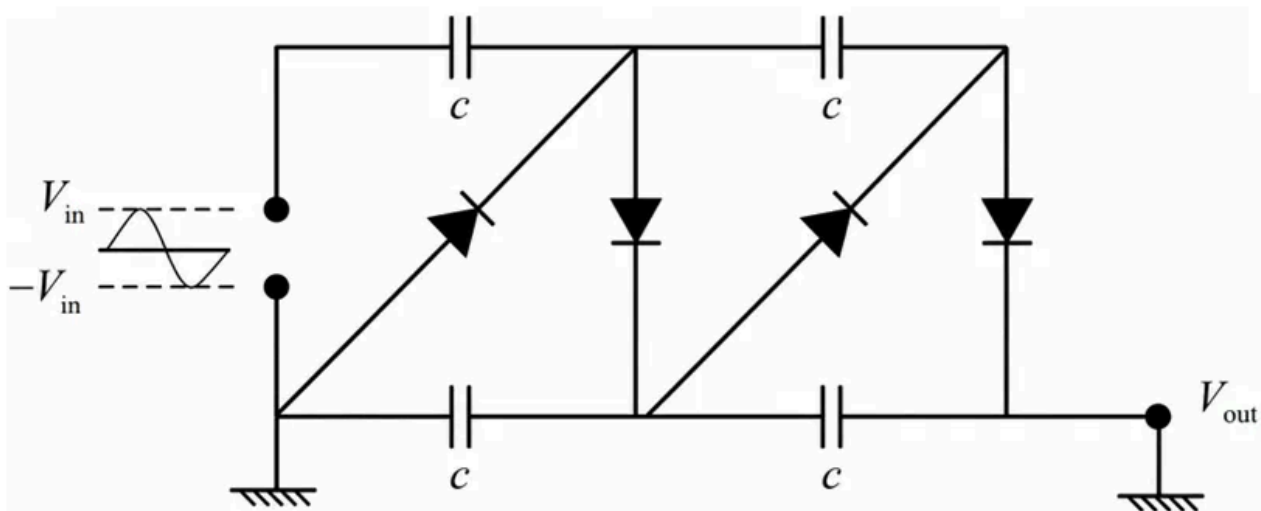
1. discrete with the spacing between the peaks being the same as the time period of the sampling signal
2. a sinusoidal wave with the same time period as the sampling signal
3. discrete with the spacing between the peaks being the same as the time period of the input signal
4. a sinusoidal wave with the same time period as the input signal

Q102. [June 2023] . 5.0 marks

Electronics > Diodes

CSIR NET	2023 June	5M
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In the circuit shown below, four silicon diodes and four capacitors are connected to a sinusoidal voltage source of amplitude $V_{in} > 0.7 \text{ V}$ and frequency 1 kHz .



If the knee voltage for each of the diodes is 0.7 V and the resistances of the capacitors are negligible, the DC output voltage V_{out} after 2 seconds of starting the voltage source is closest to

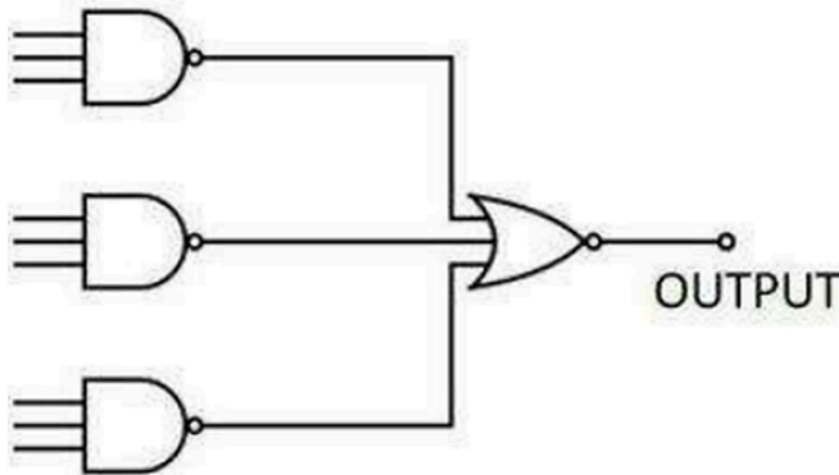
1. $1.4 V_{in} - 0.7 \text{ V}$
2. $4 V_{in} - 2.8 \text{ V}$
3. $V_{in} - 0.7 \text{ V}$
4. $V_{in} - 2.8 \text{ V}$

Q103. [Dec 2024] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2024 Dec	3.5M
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The output of the following circuit is always found to be zero.



Such an observation can be due to

1. Two of the inputs of any one of the NAND gates being accidentally shorted to each other
2. One of the inputs to the NOR gate being accidentally grounded
3. One of the inputs to one of the NAND gates being accidentally grounded
4. Two of the inputs of the NOR gate being accidentally shorted to each other

Q104. [Dec 2024] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2024 Dec	3.5M
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A DC motor operating at a voltage V and a current I is used to lift a mass m to a height h . The percentage uncertainty in the measurement of time t is 5% and that for the other parameters (V, I, m and h) are 1% each. If the measurements are independent and the errors are random, the uncertainty in the estimation of the efficiency $\left(\frac{\text{output power}}{\text{input power}}\right)$ of the motor is closest to

1. 3.1%
2. 5.4%
3. 4.8%
4. 6.3%

Q105. [Dec 2024] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2024 Dec	3.5M
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The following table shows the relationship between an independent quantity x and an experimentally measured quantity y .

x	0	1	2	3	4	5
y	0.1	2.1	8.1	17.9	32.2	49.7

The relationship between x and y is best represented by

1. $y \propto x^3$
2. $y \propto e^x$
3. $y \propto x^2$
4. $y \propto \sqrt{x}$

Q106. [Dec 2024] . 3.5 marks

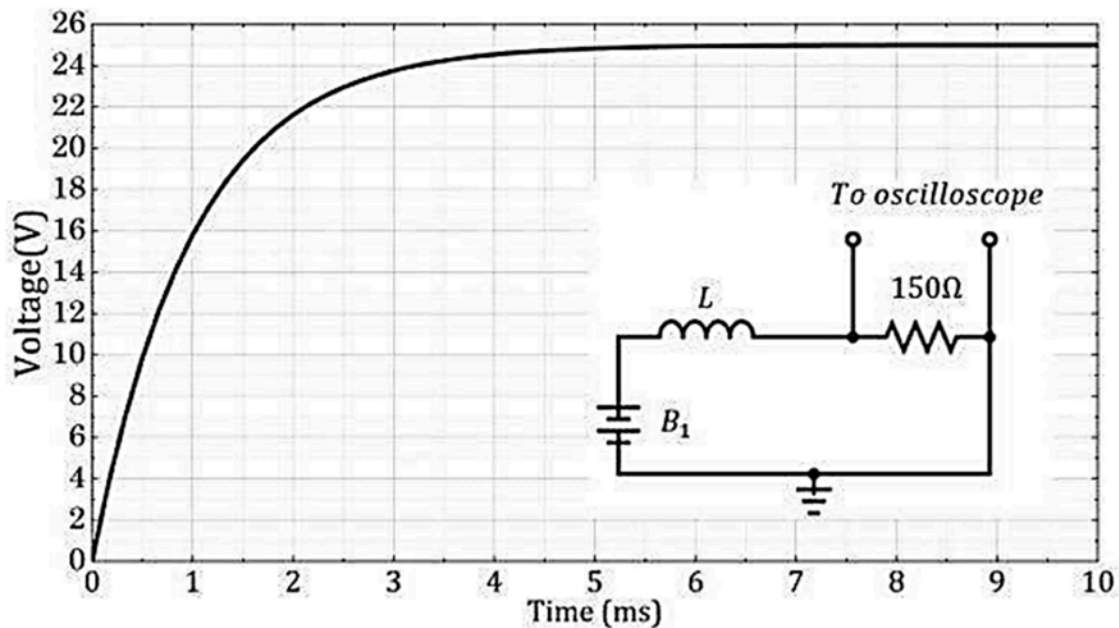
Electronics > RLC Circuits

CSIR NET

2024 Dec

3.5M

An ideal inductor L is connected in series to a 150Ω resistor as shown in the circuit (inset). When the circuit is driven by a battery B_1 , the voltage across the resistor as a function of time, as measured by an oscilloscope, is shown in the plot.



Based on this observation, the estimated value of L is closest to

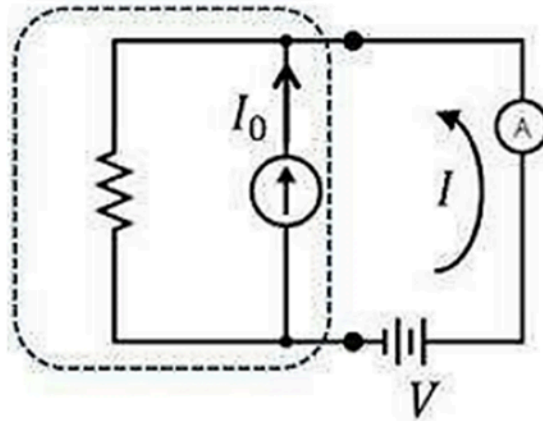
1. 50mH
2. 300 mH
3. 450 mH
4. 150 mH

Q107. [Dec 2024] . 3.5 marks

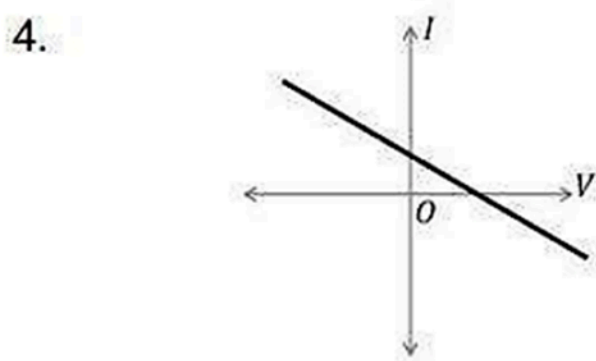
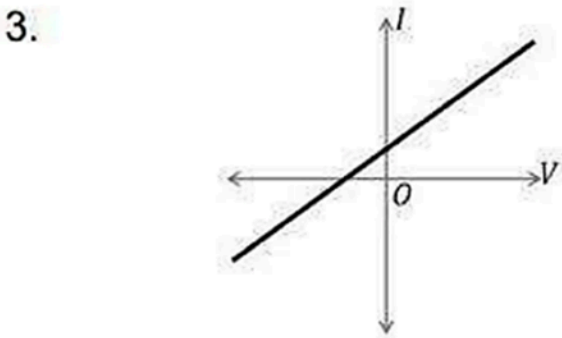
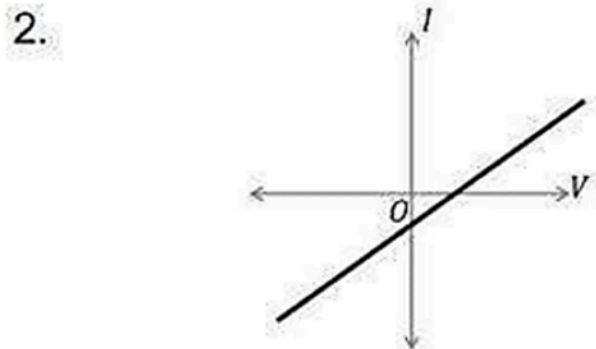
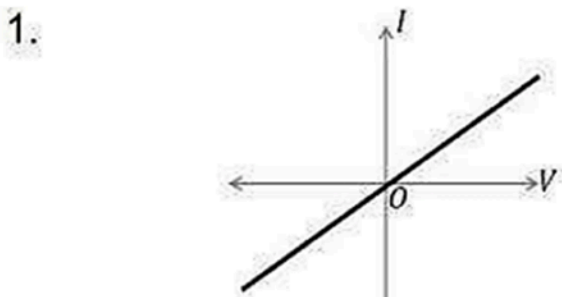
Electronics > Basic Electronics

CSIR NET	2024 Dec	3.5M
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A circuit component consists of a resistor in parallel with an ideal current source. The I-V characteristics of the component was measured using a variable voltage source and an ammeter 'A' :



The arrow in the figure indicates the positive direction of current. The I-V characteristics of the component is best represented by



Q108. [Dec 2024] . 5.0 marks

Electronics > Digital Electronics

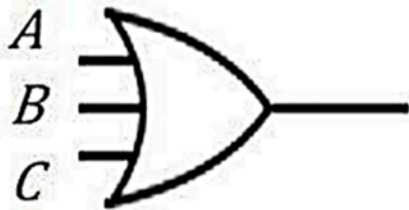
CSIR NET	2024 Dec	5M
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The logic circuit that will have the output

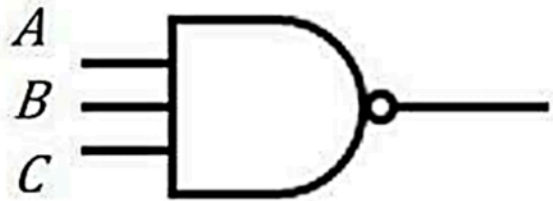
$$Y = (A + B)\overline{\overline{A}(\overline{B} + \overline{C})} + \overline{A}(B + C)$$

is

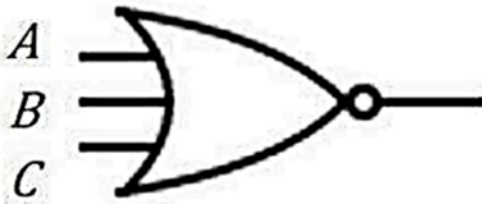
1.



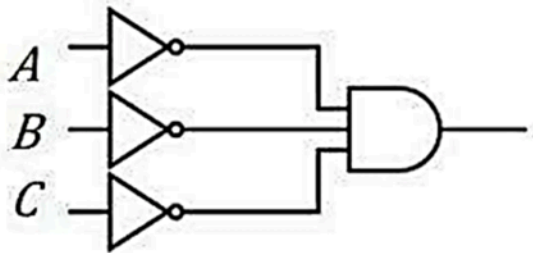
2.



3.



4.



Q109. [Dec 2024] . 5.0 marks

Electronics > Diodes

CSIR NET

2024 Dec

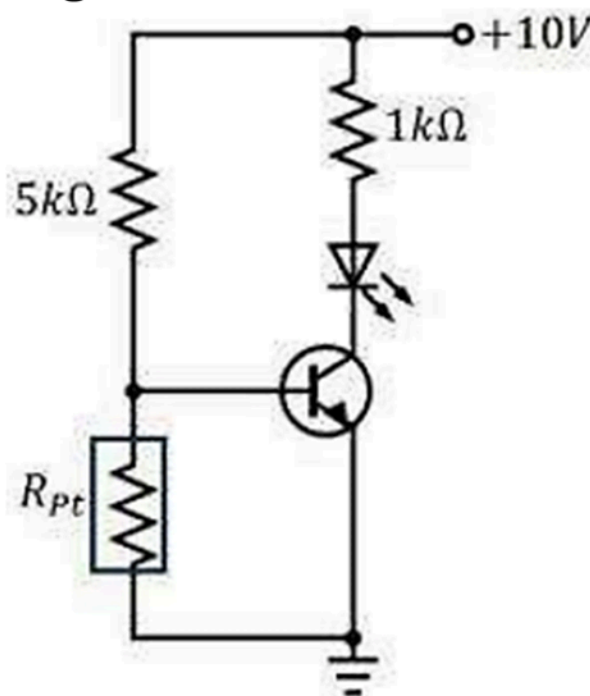
5M

An LED is required to glow brightly when the temperature sensed by a Platinum resistance thermometer exceeds a certain value. In the circuit shown below, the resistance of the Pt thermometer (in ohms) varies as

$$R_{Pt}(T) = 100 + 0.4 T$$

where T is temperature in degree Celsius. The transistor turns on when $V_{BE} > 0.7 V$ and it has a very high current gain. The temperature at which the LED would start glowing is closest to

1. 850°C
2. 400°C
3. 500°C
4. 700°C



Q110. [Dec 2024] . 5.0 marks

Electronics > OPAMP

CSIR NET

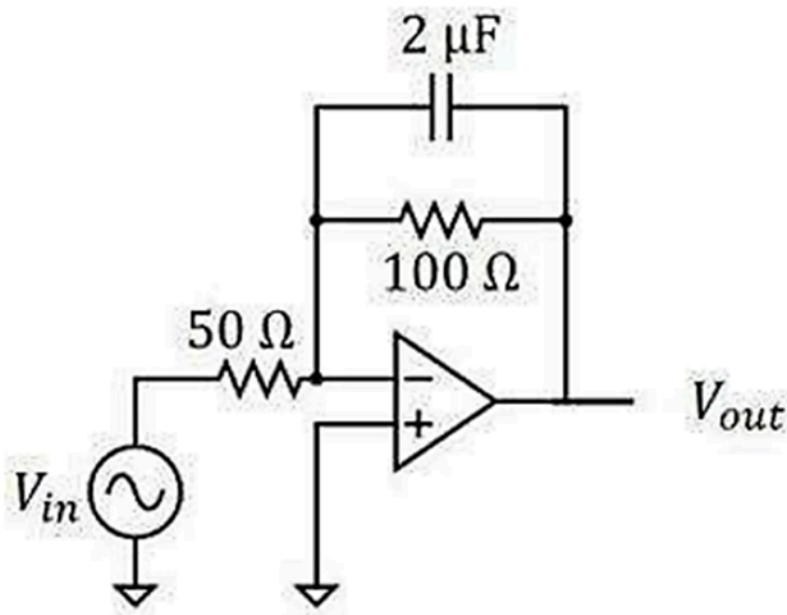
2024 Dec

5M

In the circuit shown below, the input voltage (in volts) is given by

$$V_{in}(t) = 0.1\sin(\omega_1 t) + \sin(\omega_2 t)$$

where $\omega_1 = 5 \times 10^2 \text{ s}^{-1}$ and $\omega_2 = 5 \times 10^4 \text{ s}^{-1}$.



The time varying part of the output voltage $V_{out}(t)$ (in volts) is closest to

1. $-0.2\sin(\omega_1 t) - 2\sin(\omega_2 t)$
2. $-0.2\sin(\omega_1 t) + 0.2\cos(\omega_2 t)$
3. $2\cos(\omega_1 t) + 0.2\cos(\omega_2 t)$
4. $2\cos(\omega_1 t) - 2\sin(\omega_2 t)$

Q111. [June 2024] . 3.5 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2024 June	3.5M
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A set of 100 data points yields an average $\bar{x} = 9$ and a standard deviation $\sigma_x = 4$. The error in the estimated mean is closest to

1. 3.0
2. 0.4
3. 4.0
4. 0.3

Q112. [June 2024] . 3.5 marks

Electronics > Instruments

CSIR NET	2024 June	3.5M
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A battery with an open circuit voltage of 10 V is connected to a load resistor of 485Ω and the voltage measured across the battery terminals using an ideal voltmeter is 9.7 V . The internal resistance of the battery is closest to

1. 30Ω
2. 15Ω
3. 20Ω
4. 40Ω

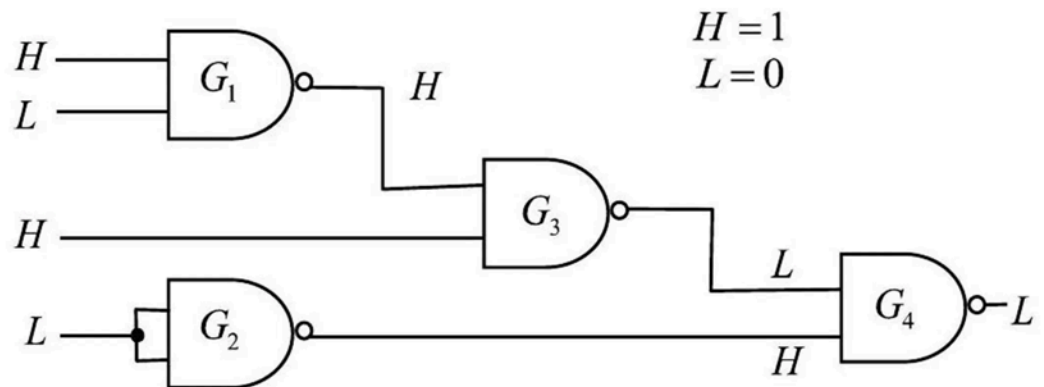
Q113. [June 2024] . 3.5 marks

Electronics > Digital Electronics

CSIR NET	2024 June	3.5M
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The logic levels H and L at different locations in a digital circuit are found to be as shown in the figure. Based on these observations, which of the logic gates is not behaving as an ideal NAND gate?

1. G2
2. G3
3. G4
4. G1

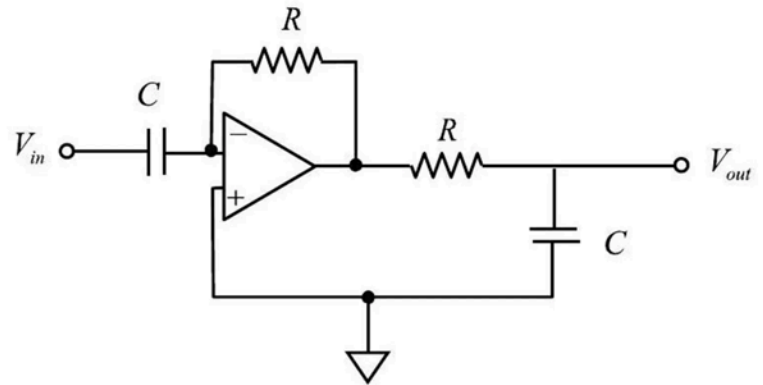
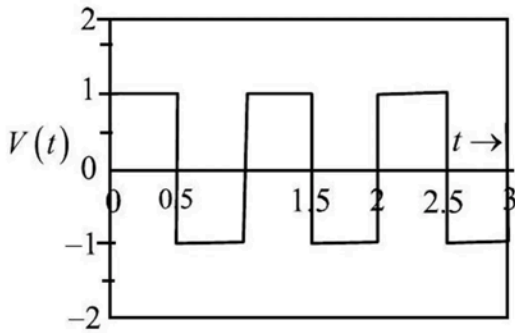


Q114. [June 2024] . 3.5 marks

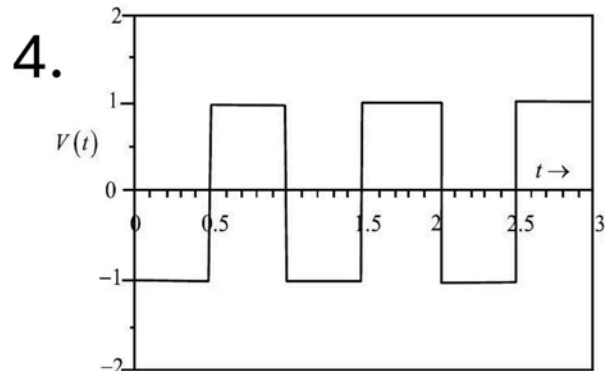
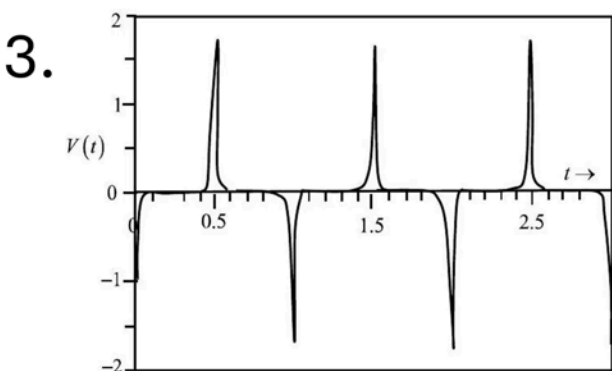
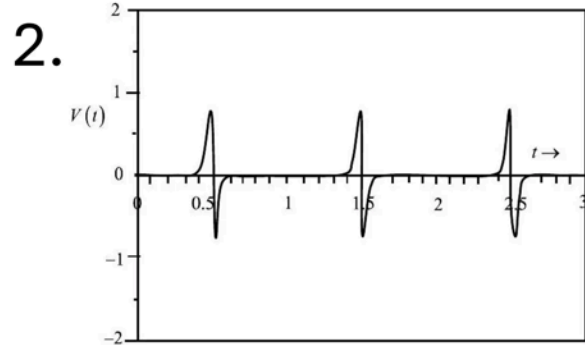
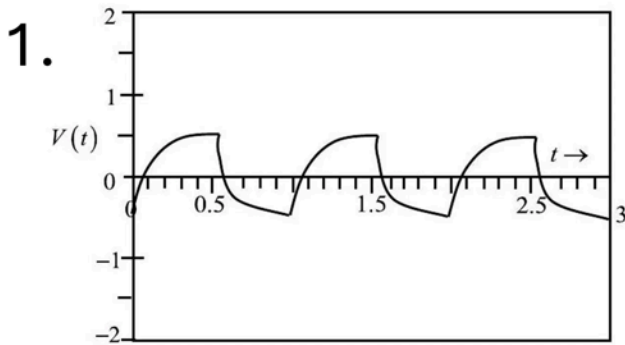
Electronics > OPAMP

CSIR NET	2024 June	3.5M
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A train of square wave pulses is given to the input of an ideal opamp circuit shown below.



Given that the period of the input pulses $T \ll RC$ and the opamp does not get into saturation, which of the following best represents the output waveform?



Q115. [June 2024] . 5.0 marks

Electronics > AD/DA Conversion

CSIR NET	2024 June	5M
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A piezoresistive pressure sensor utilizes change in electrical resistance (ΔR) with change in pressure (ΔP) as $\Delta R = -R_0 \log_{10} \left(\frac{\Delta P}{P_0} \right)$, where $R_0 = 500\Omega$ and $P_0 = 1000\text{mbar}$. A current of $2\mu\text{A}$ is passed through the sensor and the resultant voltage drop is measured using an analog-to-digital (ADC) converter having a range 0 to 1 V . If a pressure change of 1 mbar is to be measured, amongst the given options, the minimum number of bits needed for the ADC is

1. 12
2. 14
3. 8
4. 10

Q116. [June 2024] . 5.0 marks

Electronics > Basic Electronics

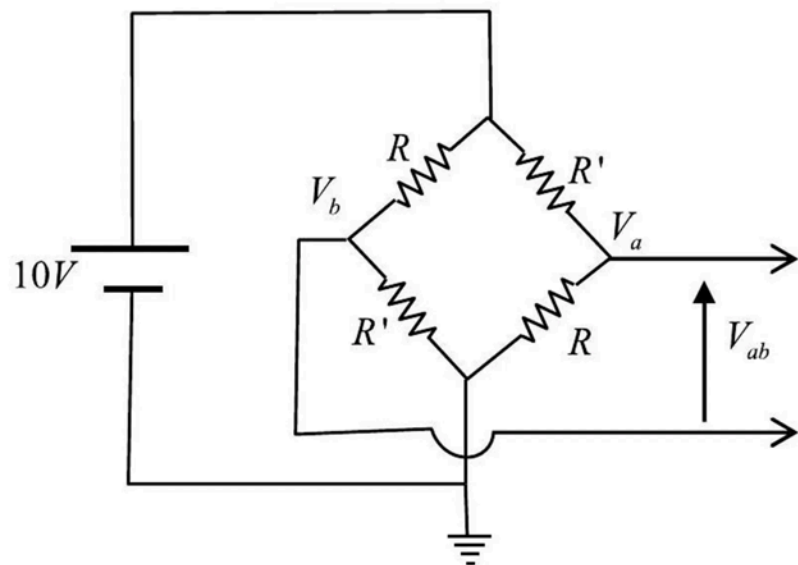
CSIR NET

2024 June

5M

In the circuit shown in the figure, the resistances R and R' change due to strain. While R increases, R' decreases by the same amount ΔR due to the applied strain. The unstrained values of R and R' are 100Ω each. If same strain is applied to all the resistors, and the output voltage (V_{ab}) changes to 0.3 V , then ΔR is closest to

1. 3Ω
2. 1.5Ω
3. 4.5Ω
4. 6Ω



Q117. [June 2024] . 5.0 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2024 June	5M
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An astronomer observes 500 objects and classifies them as either of type A or type B. She finds 148 objects to be of type B. Assuming a binomial distribution, the best estimate of the fraction of type A objects and its associated standard deviation respectively are

1. 0.704,0.002
2. 0.70,0.02
3. 0.704,0.031
4. 0.72,0.03

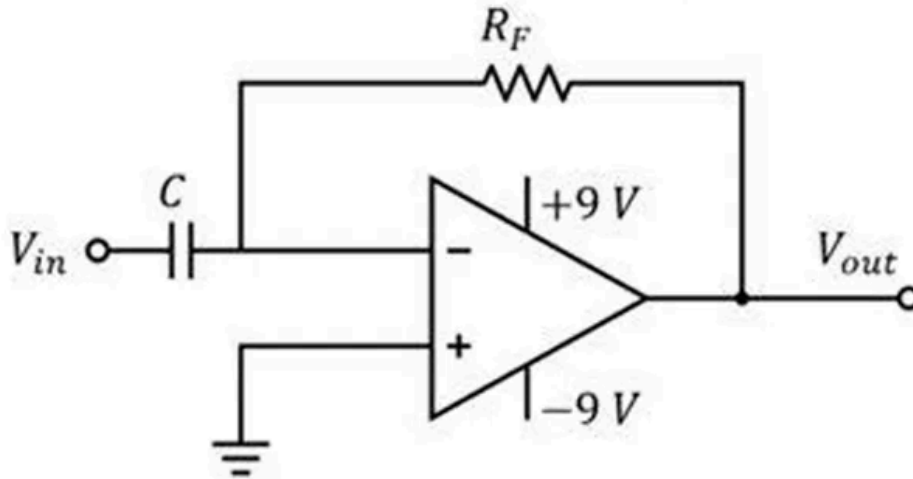
Q118. [Dec 2025] . 3.5 marks

Electronics > OPAMP

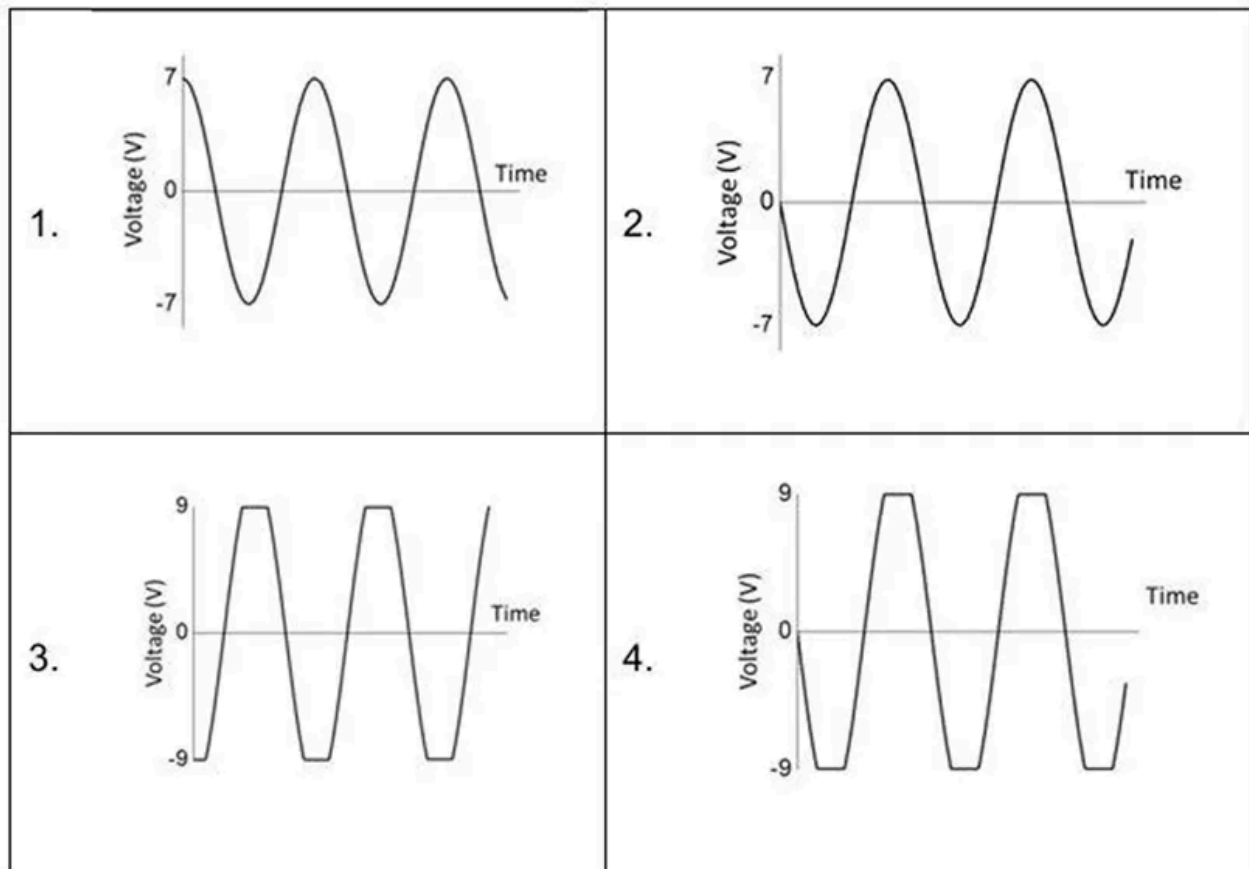
CSIR NET	2025 Dec	3.5M	Electronics
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In the circuit shown below, the input voltage is

$$V_{in}(t) = 0.3\sin 50t \text{ (Volts) and } C = 100\mu F, R_F = 10k\Omega.$$



Considering the opamp to be ideal and neglecting the transients, the best representation of the output voltage $V_{out}(t)$ is

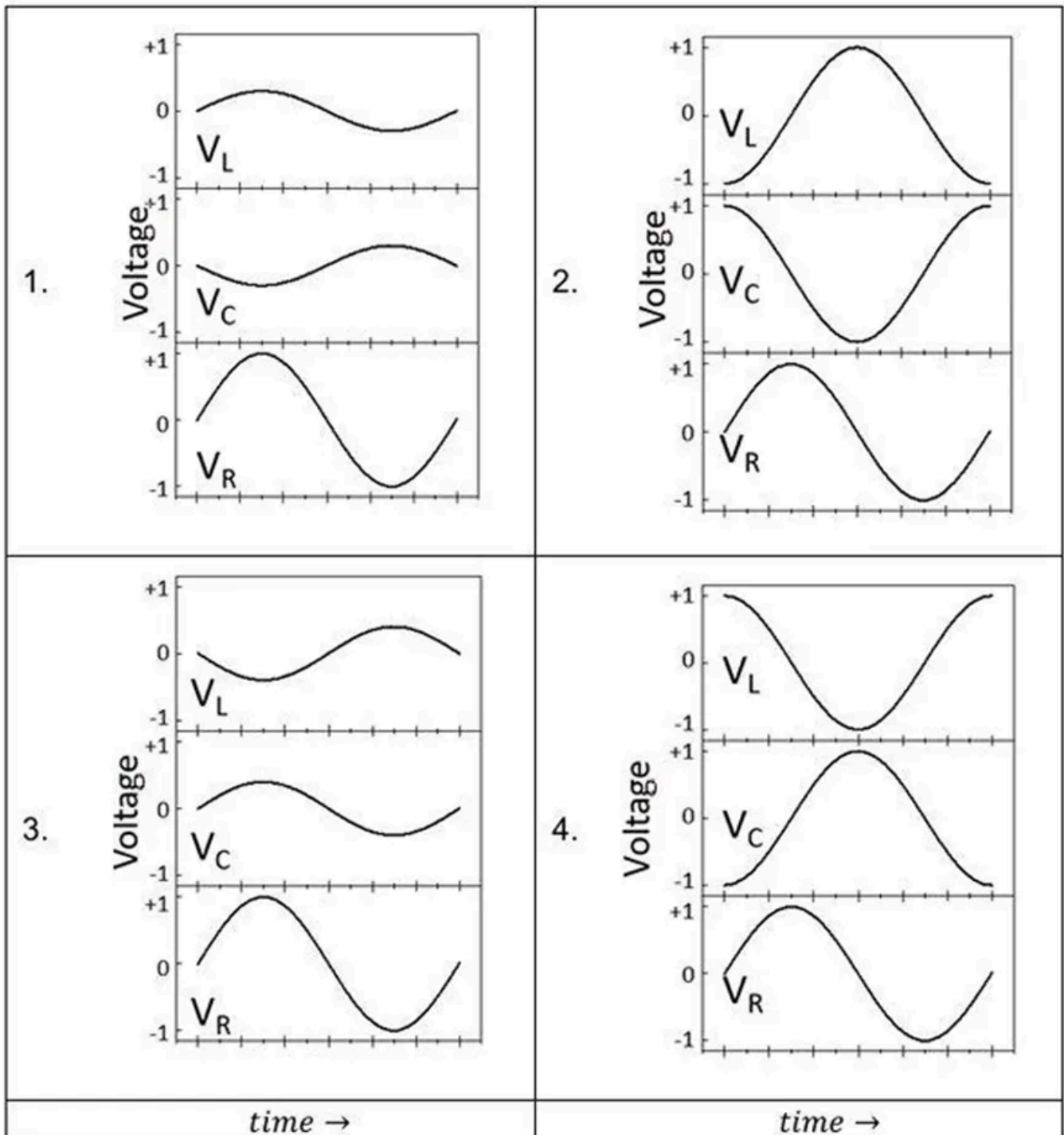


Q119. [Dec 2025] . 3.5 marks

Electronics > RLC Circuits

CSIR NET	2025 Dec	3.5M	Electronics
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In an ideal series LCR circuit, which one of the following best represents the steady-state voltage waveforms V_L, V_C, V_R (only one cycle is shown) across L, C and R as a function of time at resonance frequency



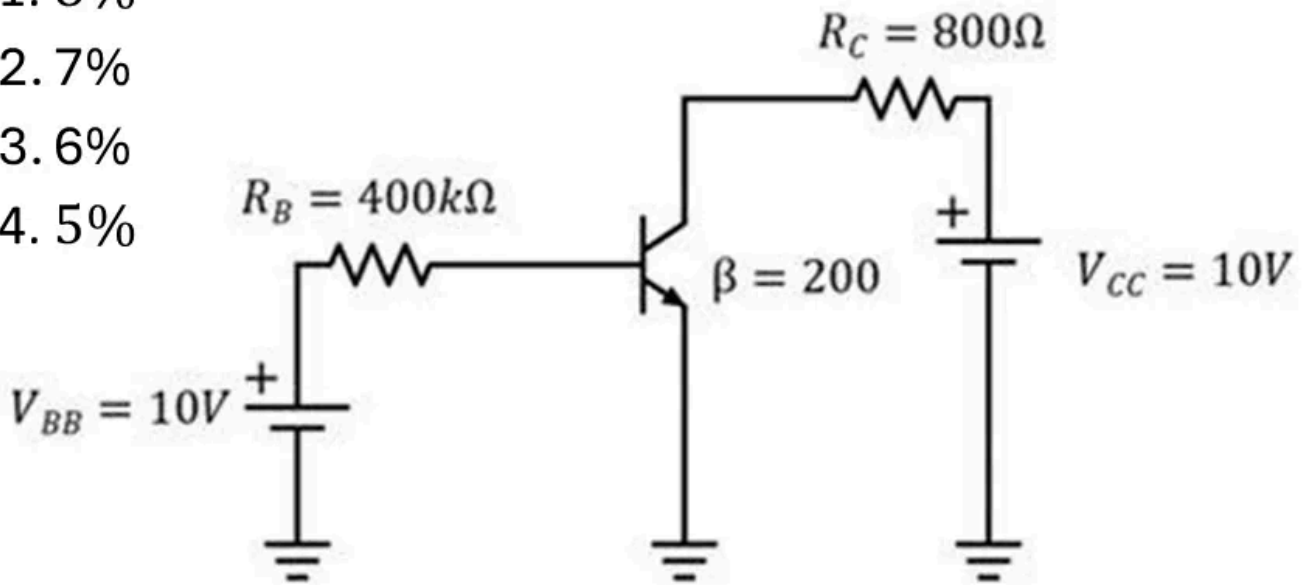
Q120. [Dec 2025] . 3.5 marks

Electronics > Transistors

CSIR NET	2025 Dec	3.5M	Electronics
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In the transistor circuit given below the voltage V_{CC} fluctuates by 5%. Then the fluctuation in V_{CE} would be closest to (take $V_{BE} = 0.7 \text{ V}$)

- 1. 8%
- 2. 7%
- 3. 6%
- 4. 5%



Q121. [Dec 2025] . 5.0 marks

Electronics > "Errors , curve fitting and data analysis"

CSIR NET	2025 Dec	5M	MMP
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A thermistor measures an object's temperature T , by measuring its resistance R according to $R = AT^{-n}$, where A and n are positive constants. The observed resistances for different values of temperature (including environmental and instrumental sources of error) are given in table. The estimated value of the exponent n , from the above data, is closest to

1. 2.0
2. 0.8
3. 1.3
4. 2.7

$T(K)$	$R(\Omega)$
250	140
300	110
350	90

Q122. [Dec 2025] . 5.0 marks

Electronics > Digital Electronics

CSIR NET	2025 Dec	5M	Electronics
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The digital logic circuit that would give the following truth table

A	0	0	0	0	1	1	1	1
B	0	0	1	1	0	0	1	1
C	0	1	0	1	0	1	0	1
Y	1	0	0	0	1	0	1	1

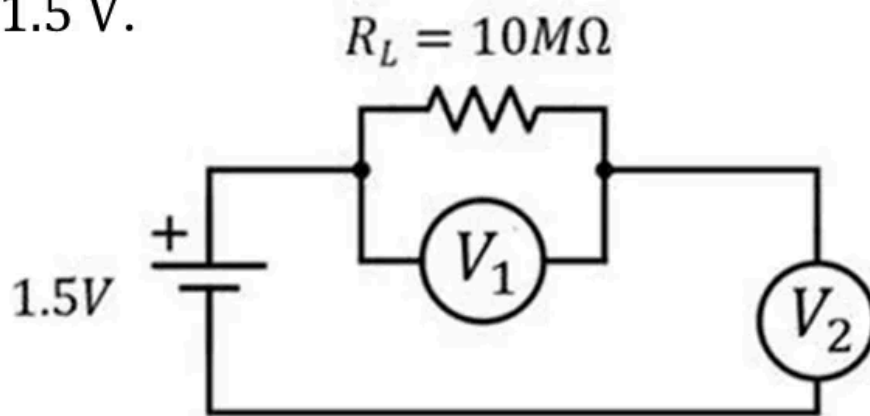
1.		2.	
3.		4.	

Q123. [Dec 2025] . 5.0 marks

Electronics > Instruments

CSIR NET	2025 Dec	5M	Electronics
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In the circuit shown below, the input impedance of voltmeters V_1 and V_2 are $10M\Omega$. If $R_L = 10M\Omega$ and $V_{in} = 1.5\text{ V}$.



The measured voltages by V_1 and V_2 are closest to

1. 0.5 V and 1.0 V , respectively
2. 0 V and 1.5 V , respectively
3. 1.5 V and 0 V , respectively
4. 1.0 V and 0.5 V , respectively

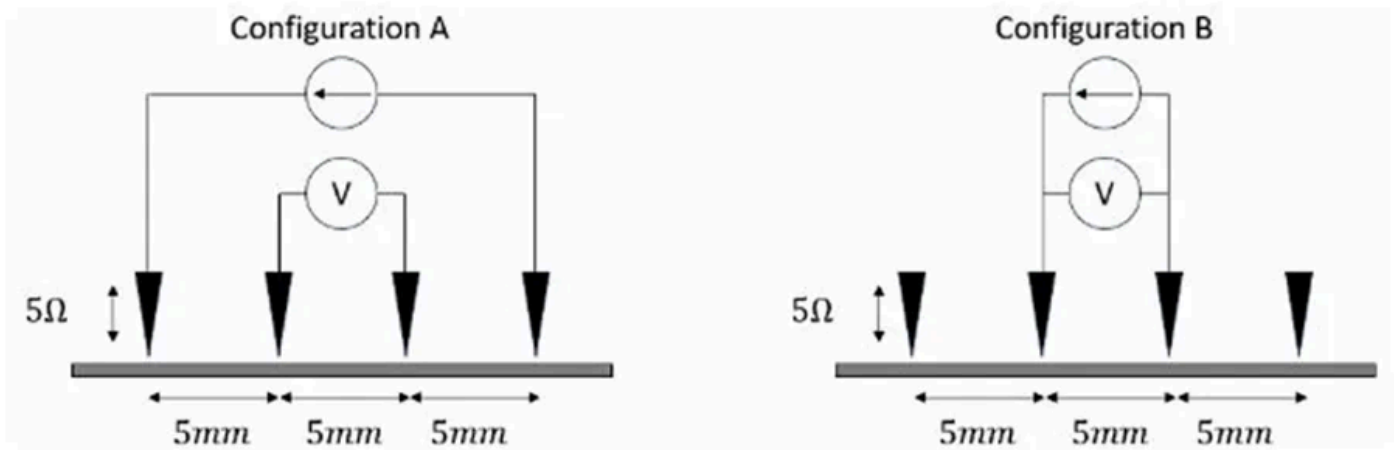
Q124. [June 2025] . 3.5 marks

Electronics > Instruments

CSIR NET	2025 June	3.5M	Electronics
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Let R_A and R_B be the resistances of a channel determined (by taking the ratio of the voltage measured and current flowing) using configurations A and B respectively, as shown in the figure. In both configurations, each lead resistance is 5Ω and each contact resistance is 10Ω . The channel has a resistivity of $20\Omega/\text{mm}$. Considering the voltmeter and the current source as ideal devices, the ratio R_B/R_A is:

1. 1.1
2. 1.2
3. 1.3
4. 1.5



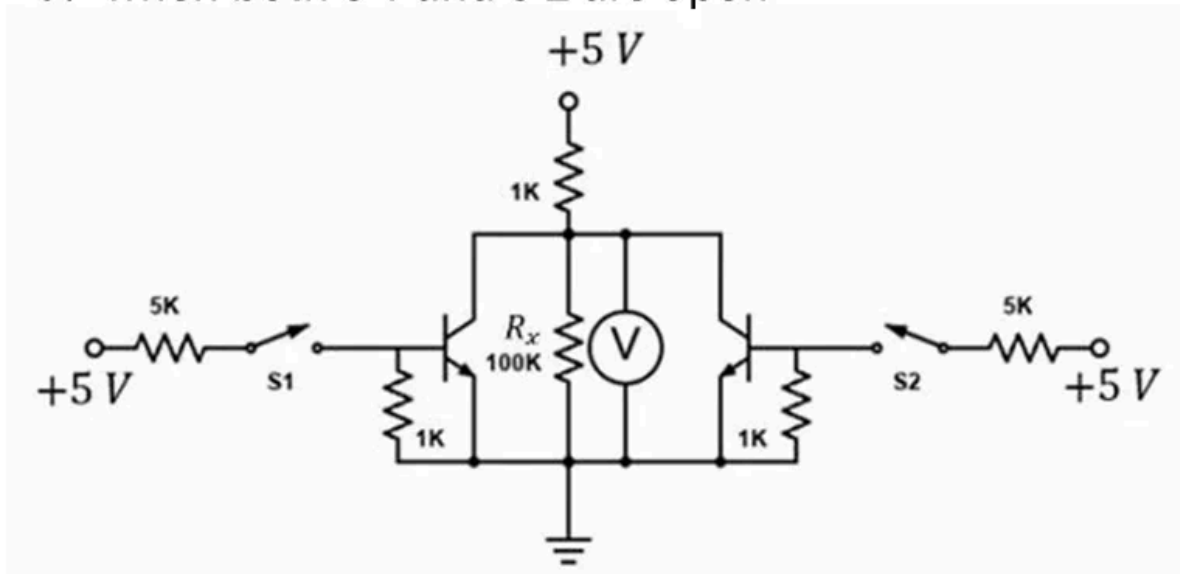
Q125. [June 2025] . 3.5 marks

Electronics > Transistors

CSIR NET	2025 June	3.5M	Electronics
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The circuit, composed of npn transistors of high β , resistors and switches, is shown in the figure. The biasing is sufficient to turn on the transistors when respective switches S1 and S2 are closed. The voltage across the resistor $R_x = 100\text{k}\Omega$ is

1. $\sim 5\text{V}$ when both S 1 and S 2 are closed
2. $\sim 5\text{V}$ when either S 1 or S 2 are closed
3. $\sim 5\text{V}$ when both S 1 and S 2 are open
4. $\sim 0\text{V}$ when both S 1 and S 2 are open

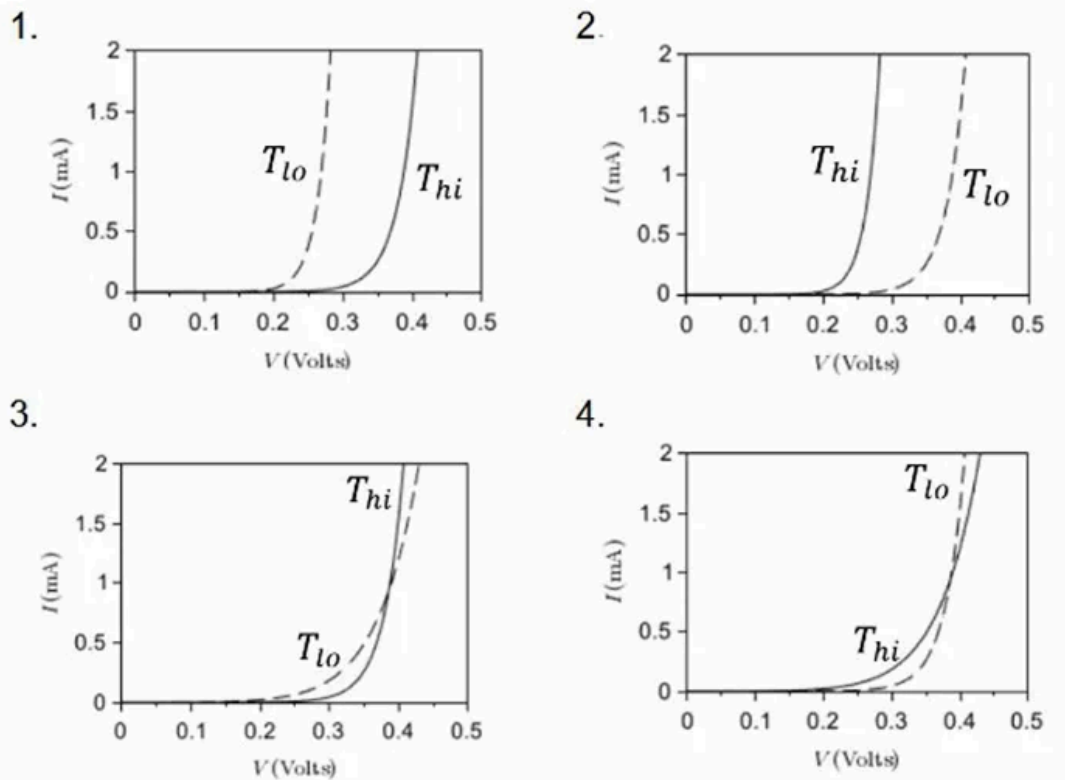


Q126. [June 2025] . 3.5 marks

Electronics > Diodes

CSIR NET	2025 June	3.5M	Electronics
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A Silicon p-n junction diode is operated under forward bias at two temperatures $T_{hi} \approx 300$ K, (shown by solid line) and $T_{lo} \approx 200$ K, (shown by dotted line). Which of the following plots best represents the I-V characteristics of the diode?



Q127. [June 2025] . 3.5 marks

Electronics > Instruments

CSIR NET

2025 June

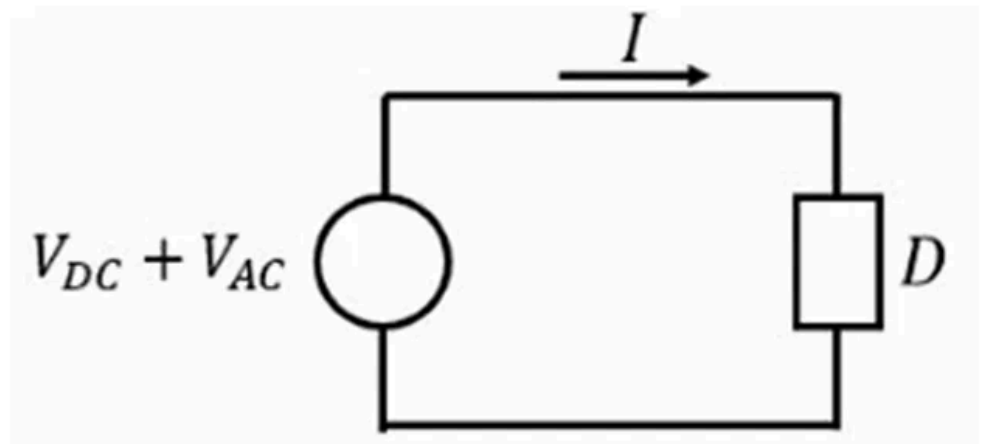
3.5M

Electronics

Consider the device D shown in the figure below. Its current-voltage characteristic is given by $I = aV + bV^2$, where I is the current, V is the input voltage, and a and b are constants. The device is used to mix a voltage signal $V = V_{DC} + V_{AC}$, where $V_{AC} = V_0 \cos \omega t$. V_{DC} and V_0 are constants.

The frequency components present in the current I are

1. 0 and ω
2. 0, ω and 2ω
3. 0 and 2ω
4. ω and 2ω



Q128. [June 2025] . 5.0 marks

Electronics > Digital Electronics

CSIR NET	2025 June	5M	Electronics
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The minimum number of two input NOR gates required to obtain the following output for three digital inputs A , B and C

$$Y = (\bar{A} + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})(\bar{A} + \bar{B} + C)$$

would be

- 1. 4
- 2. 3
- 3. 5
- 4. 6

Answer Key

128 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Electronics	Diodes	3
Q2	Electronics	Flip flops/Counters/Registers/microcontroller etc.	4
Q3	Electronics	OPAMP	3
Q4	Electronics	"Errors , curve fitting and data analysis"	2
Q5	Electronics	FET	3
Q6	Electronics	Flip flops/Counters/Registers/microcontroller etc.	4
Q7	Electronics	Flip flops/Counters/Registers/microcontroller etc.	4
Q8	Electronics	Transistors	2
Q9	Electronics	"Errors , curve fitting and data analysis"	3
Q10	Electronics	Digital Electronics	2&4
Q11	Electronics	FET	2
Q12	Electronics	Flip flops/Counters/Registers/microcontroller etc.	2
Q13	Electronics	OPAMP	3
Q14	Electronics	Flip flops/Counters/Registers/microcontroller etc.	2
Q15	Electronics	Basic Electronics	4
Q16	Electronics	Diodes	2
Q17	Electronics	OPAMP	3
Q18	Electronics	Instruments	2
Q19	Electronics	"Errors , curve fitting and data analysis"	2
Q20	Electronics	"Errors , curve fitting and data analysis"	1
Q21	Electronics	Basic Electronics	4
Q22	Electronics	Digital Electronics	4
Q23	Electronics	OPAMP	2
Q24	Electronics	Diodes	4
Q25	Electronics	Instruments	3
Q26	Electronics	Flip flops/Counters/Registers/microcontroller etc.	4
Q27	Electronics	"Errors , curve fitting and data analysis"	3
Q28	Electronics	Transistors	4
Q29	Electronics	AD/DA Conversion	1
Q30	Electronics	Diodes	3
Q31	Electronics	Diodes	3
Q32	Electronics	Flip flops/Counters/Registers/microcontroller etc.	4
Q33	Electronics	"Errors , curve fitting and data analysis"	1
Q34	Electronics	Instruments	3
Q35	Electronics	FET	4
Q36	Electronics	OPAMP	4
Q37	Electronics	Flip flops/Counters/Registers/microcontroller etc.	2
Q38	Electronics	"Errors , curve fitting and data analysis"	1
Q39	Electronics	Diodes	1
Q40	Electronics	Digital Electronics	3

Answer Key (cont.)

Q. No	Subject	Topic	Answer
Q41	Electronics	"Errors , curve fitting and data analysis"	2
Q42	Electronics	OPAMP	4
Q43	Electronics	Flip flops/Counters/Registers/microcontroller etc.	2
Q44	Electronics	Digital Electronics	2
Q45	Electronics	Transistors	1
Q46	Electronics	Diodes	3
Q47	Electronics	OPAMP	None
Q48	Electronics	Instruments	2
Q49	Electronics	Flip flops/Counters/Registers/microcontroller etc.	4
Q50	Electronics	Digital Electronics	3
Q51	Electronics	Diodes	3
Q52	Electronics	Transistors	*
Q53	Electronics	AD/DA Conversion	1
Q54	Electronics	OPAMP	None
Q55	Electronics	Instruments	4
Q56	Electronics	"Errors , curve fitting and data analysis"	2
Q57	Electronics	AD/DA Conversion	3
Q58	Electronics	Diodes	2
Q59	Electronics	Instruments	2
Q60	Electronics	OPAMP	1
Q61	Electronics	Transistors	1
Q62	Electronics	"Errors , curve fitting and data analysis"	4
Q63	Electronics	RLC Circuits	4
Q64	Electronics	Transistors	4
Q65	Electronics	Digital Electronics	2
Q66	Electronics	OPAMP	2
Q67	Electronics	Diodes	2
Q68	Electronics	OPAMP	1
Q69	Electronics	RLC Circuits	3
Q70	Electronics	RLC Circuits	1
Q71	Electronics	Flip flops/Counters/Registers/microcontroller etc.	3
Q72	Electronics	Digital Electronics	2
Q73	Electronics	Instruments	3
Q74	Electronics	Instruments	2
Q75	Electronics	OPAMP	3
Q76	Electronics	Instruments	4
Q77	Electronics	OPAMP	1
Q78	Electronics	RLC Circuits	4
Q79	Electronics	"Errors , curve fitting and data analysis"	4
Q80	Electronics	Digital Electronics	2
Q81	Electronics	Instruments	4

Answer Key (cont.)

Q. No	Subject	Topic	Answer
Q82	Electronics	Instruments	1
Q83	Electronics	FET	3
Q84	Electronics	Transistors	2
Q85	Electronics	"Errors , curve fitting and data analysis"	2
Q86	Electronics	Diodes	3
Q87	Electronics	Digital Electronics	None
Q88	Electronics	OPAMP	3
Q89	Electronics	Instruments	4
Q90	Electronics	"Errors , curve fitting and data analysis"	1
Q91	Electronics	Digital Electronics	2
Q92	Electronics	OPAMP	1
Q93	Electronics	Diodes	1
Q94	Electronics	"Errors , curve fitting and data analysis"	4
Q95	Electronics	OPAMP	1
Q96	Electronics	Instruments	3
Q97	Electronics	"Errors , curve fitting and data analysis"	1
Q98	Electronics	Digital Electronics	2
Q99	Electronics	Instruments	2
Q100	Electronics	OPAMP	3
Q101	Electronics	Instruments	1
Q102	Electronics	Diodes	2
Q103	Electronics	Digital Electronics	3
Q104	Electronics	"Errors , curve fitting and data analysis"	2
Q105	Electronics	"Errors , curve fitting and data analysis"	3
Q106	Electronics	RLC Circuits	4
Q107	Electronics	Basic Electronics	2
Q108	Electronics	Digital Electronics	1
Q109	Electronics	Diodes	4
Q110	Electronics	OPAMP	2
Q111	Electronics	"Errors , curve fitting and data analysis"	2
Q112	Electronics	Instruments	2
Q113	Electronics	Digital Electronics	3
Q114	Electronics	OPAMP	4
Q115	Electronics	AD/DA Conversion	4
Q116	Electronics	Basic Electronics	1
Q117	Electronics	"Errors , curve fitting and data analysis"	2
Q118	Electronics	OPAMP	3
Q119	Electronics	RLC Circuits	4
Q120	Electronics	Transistors	1
Q121	Electronics	"Errors , curve fitting and data analysis"	3
Q122	Electronics	Digital Electronics	2

Answer Key (cont.)

Q. No	Subject	Topic	Answer
Q123	Electronics	Instruments	1
Q124	Electronics	Instruments	3
Q125	Electronics	Transistors	3
Q126	Electronics	Diodes	2
Q127	Electronics	Instruments	2
Q128	Electronics	Digital Electronics	1

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