PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Instruments - CSIR NET Physics PYQs

Electronics . All PYQs (2015-2025) with answer key

19 questions . Answer key included

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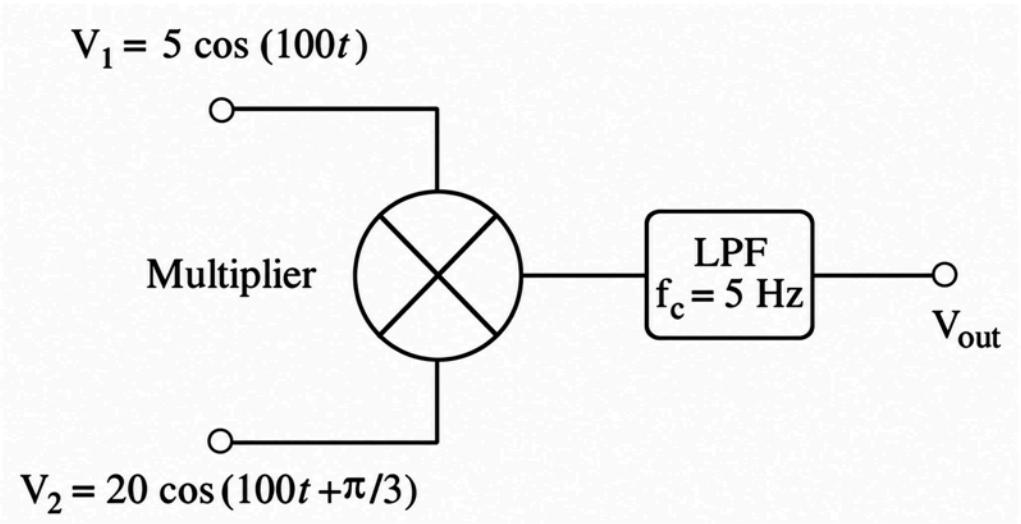
Q1. [Dec 2016] . 5.0 marks

Electronics > Instruments

CSIR NET	2016 Dec	5M

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

1. 5 V
2. 25 V
3. 100 V
4. 50 V



Q2. [June 2016] . 5.0 marks

Electronics > Instruments

CSIR NET	2016 June	5M

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. $35:36$

Q3. [Dec 2017] . 5.0 marks

Electronics > Instruments

CSIR NET	2017 Dec	5M

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

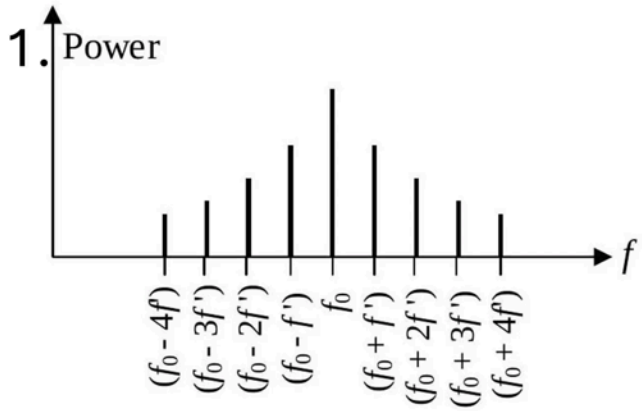
1. 10 mbar
2. $10^{-1} mbar$
3. $10^{-2} mbar$
4. 10^{2} mbar

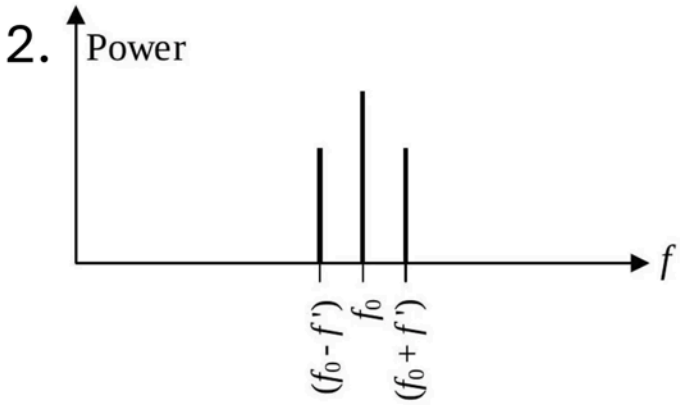
Q4. [Dec 2018] . 5.0 marks

Electronics > Instruments

CSIR NET	2018 Dec	5M

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?

1.


2.


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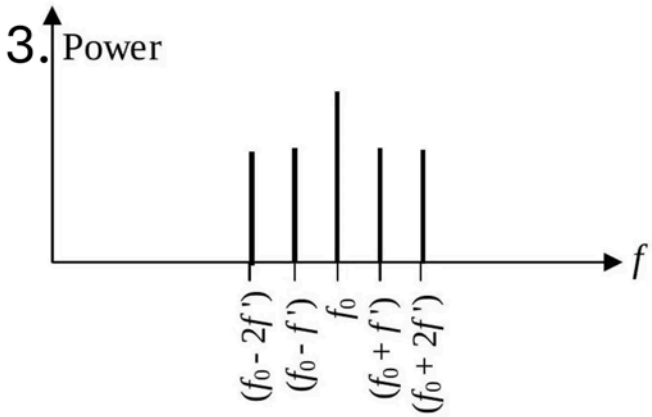
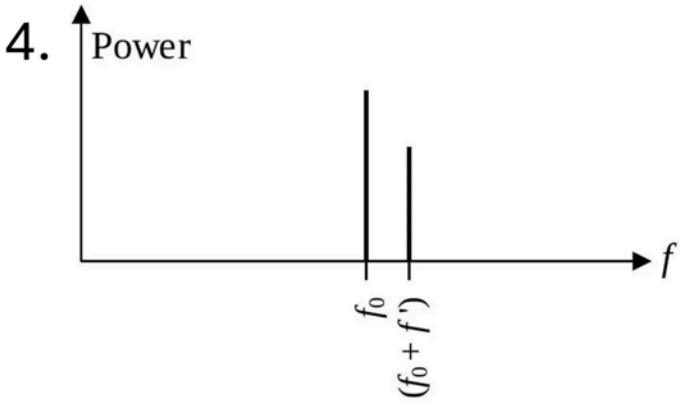


4.


Q5. [June 2018] . 5.0 marks

Electronics > Instruments

CSIR NET	2018 June	5M

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

Q6. [Dec 2019] . 5.0 marks

Electronics > Instruments

CSIR NET	2019 Dec	5M

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

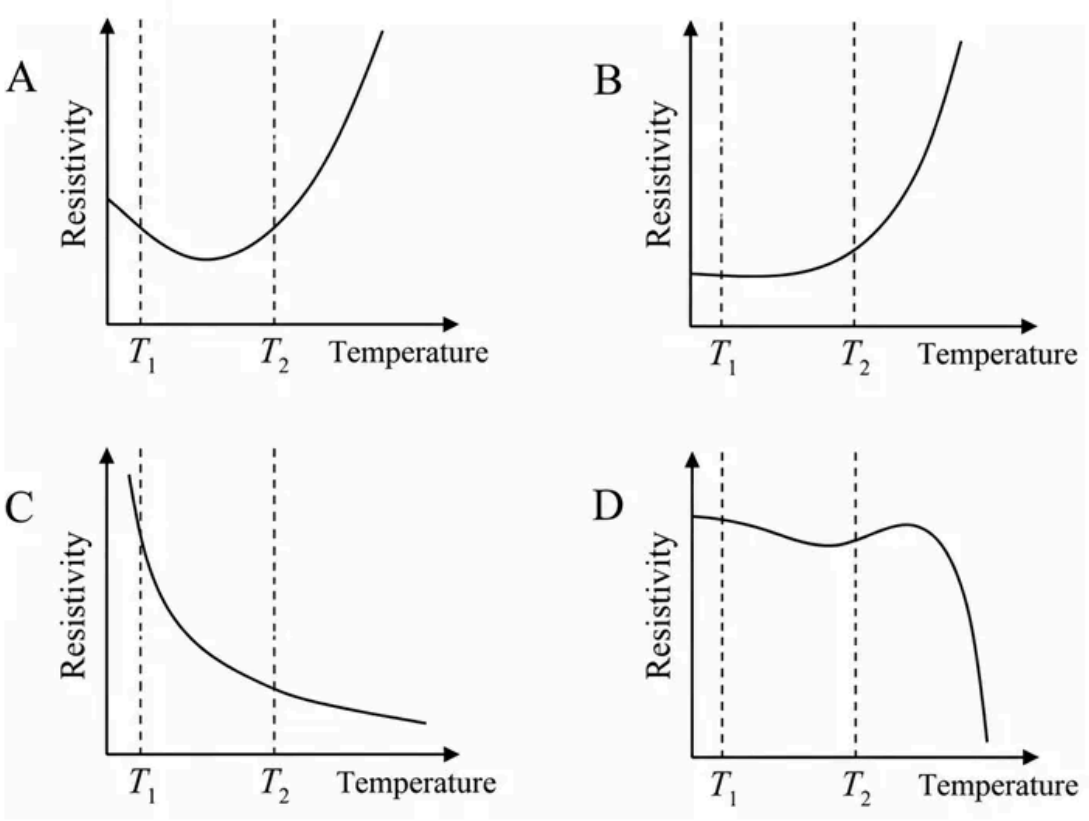
1. $1/10$
2. $1/\sqrt{10}$
3. $\sqrt{10}$
4. 10

Q7. [June 2020] . 3.5 marks

Electronics > Instruments

CSIR NET	2020 June	3.5M

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

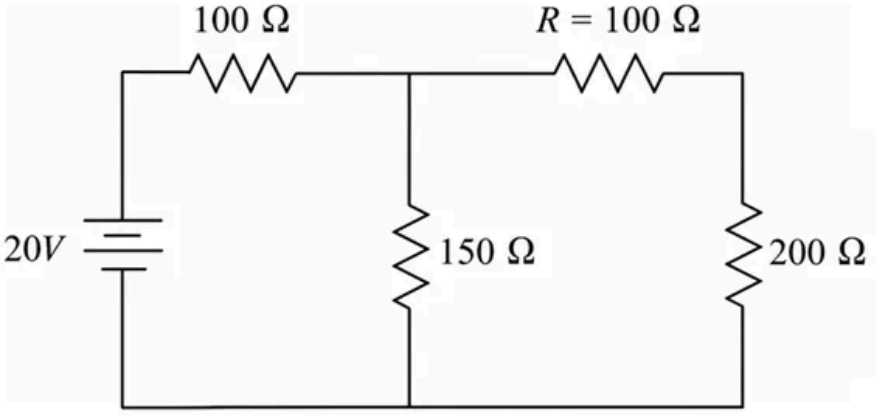
Q8. [June 2020] . 5.0 marks

Electronics > Instruments

CSIR NET	2020 June	5M

Two voltmeters A and B with internal resistances 2 MΩ and 0.1 kΩ 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



Q9. [June 2020] . 5.0 marks

Electronics > Instruments

CSIR NET	2020 June	5M

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

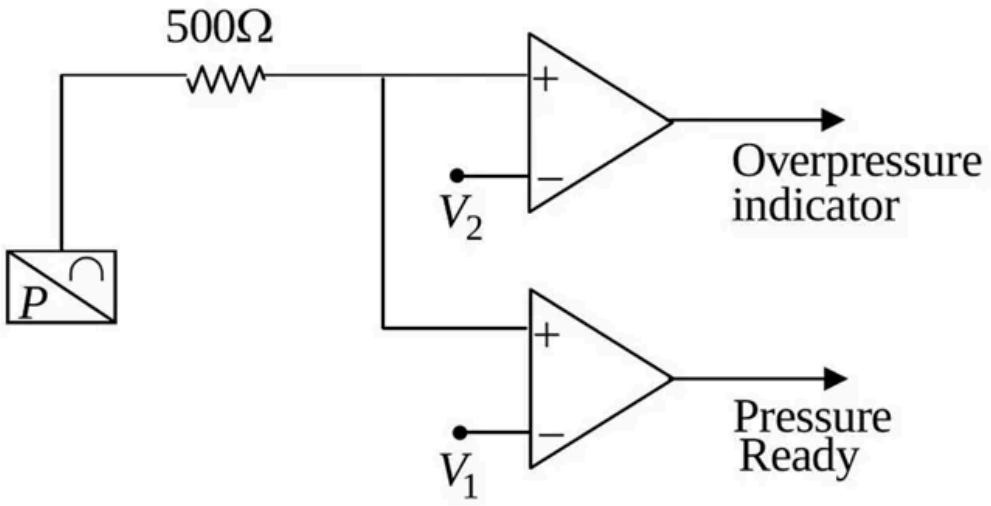
1. 10 rotations per second in the clockwise direction
2. 10 rotations per second in the anticlockwise direction
3. 5 rotations per second in the clockwise direction
4. 5 rotations per second in the anticlockwise direction

Q10. [June 2021] . 5.0 marks

Electronics > Instruments

CSIR NET	2021 June	5M

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

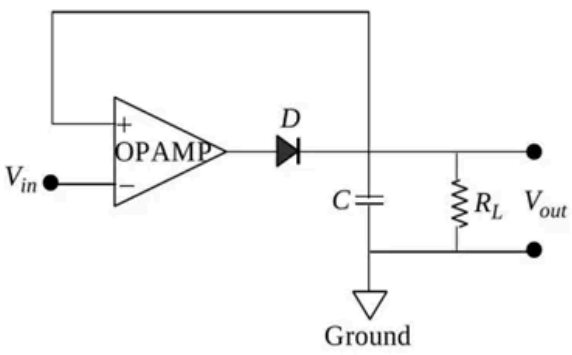
1. 2 V and 10 V
2. 2 V and 5 V
3. 3 V and 10 V
4. 3 V and 5 V

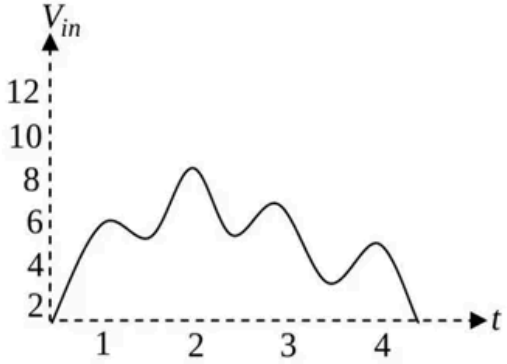
Q11. [June 2021] . 5.0 marks

Electronics > Instruments

CSIR NET	2021 June	5M

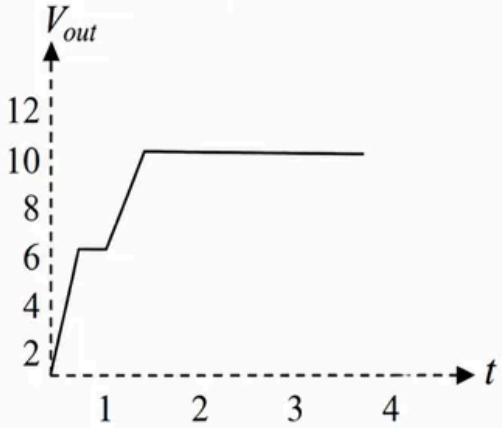
In the following circuit the input voltage V_{in} is such that $|V_{in}| < |V_{sat}|$ where V_{sat} is the saturation voltage of the op-amp (Assume that the diode is an ideal one and $R_L C$ is much larger than the duration of the measurement.)



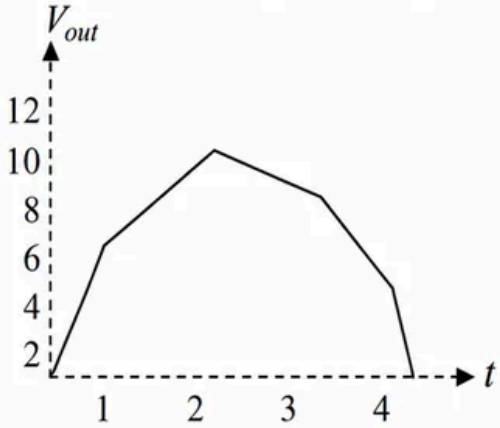


For the input voltage as shown in the figure above the output voltage V_{out} is best represented by

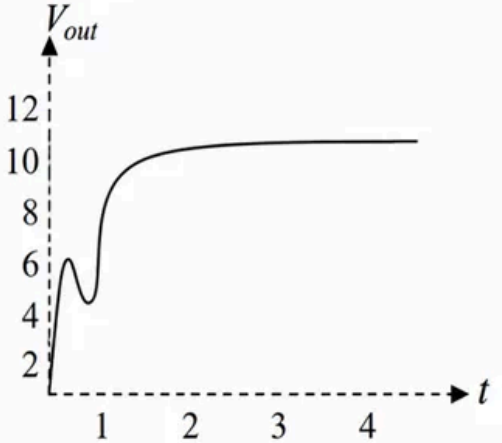
1.



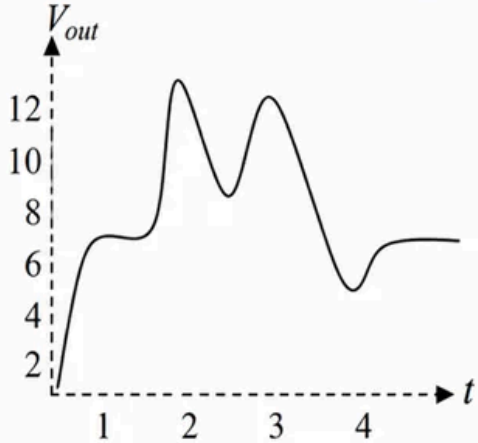
2.



3.



4.



Q12. [June 2022] . 5.0 marks

Electronics > Instruments

CSIR NET	2022 June	5M

A receiver operating at $27^{\circ}C$ has an input resistance of 100Ω. The input thermal noise voltage for this receiver with a bandwidth of 100 kHz is closest to

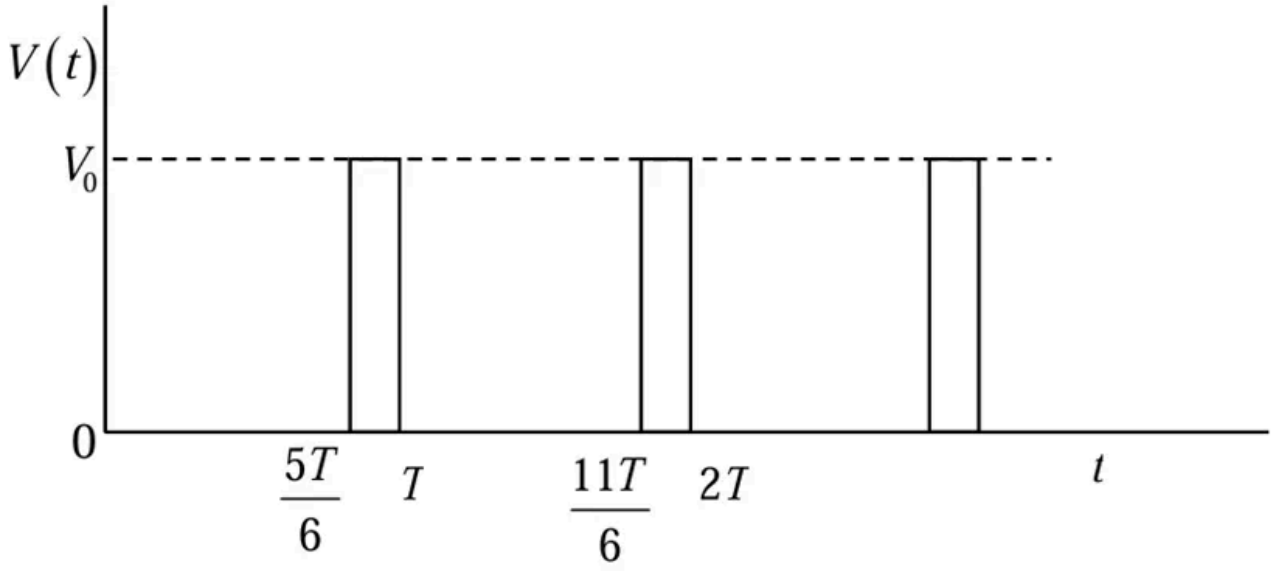
1. 0.4 nV
2. 0.6 pV
3. 40 mV
4. $0.4\ \mu V$

Q13. [Dec 2023] . 5.0 marks

Electronics > Instruments

CSIR NET	2023 Dec	5 M

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

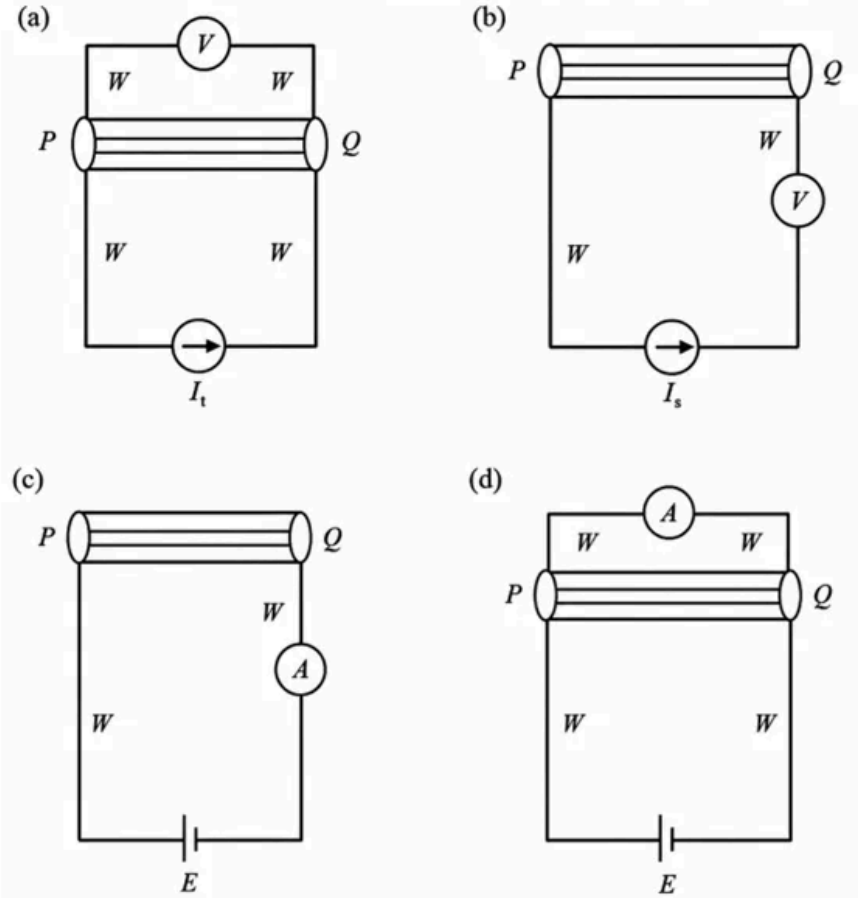
Q14. [June 2023] . 3.5 marks

Electronics > Instruments

CSIR NET	2023 June	3.5M

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)



Q15. [June 2023] . 5.0 marks

Electronics > Instruments

CSIR NET	2023 June	5M

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

Q16. [June 2024] . 3.5 marks

Electronics > Instruments

CSIR NET	2024 June	3.5M

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

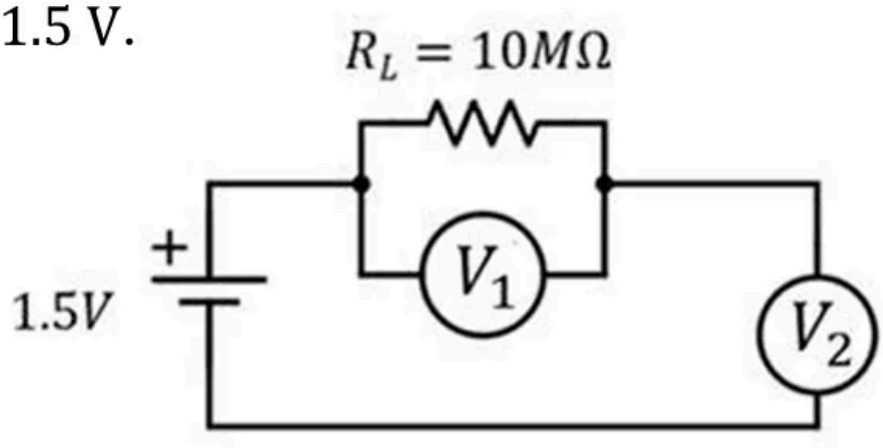
1. 30Ω
2. 15Ω
3. 20Ω
4. 40Ω

Q17. [Dec 2025] . 5.0 marks

Electronics > Instruments

CSIR NET	2025 Dec	5M	Electronics

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



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

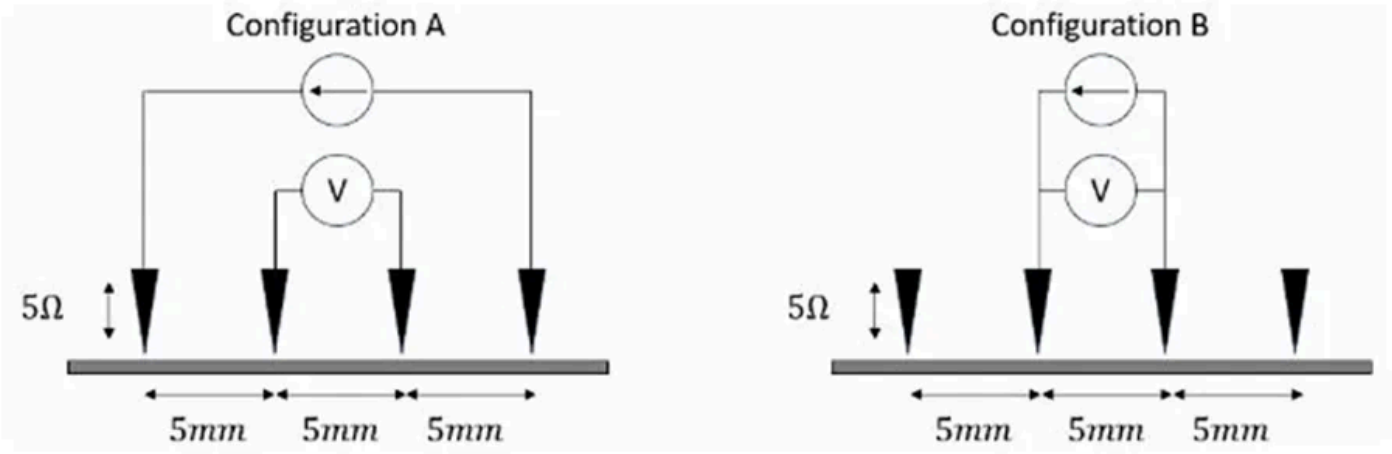
Q18. [June 2025] . 3.5 marks

Electronics > Instruments

CSIR NET	2025 June	3.5M	Electronics

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



Q19. [June 2025] . 3.5 marks

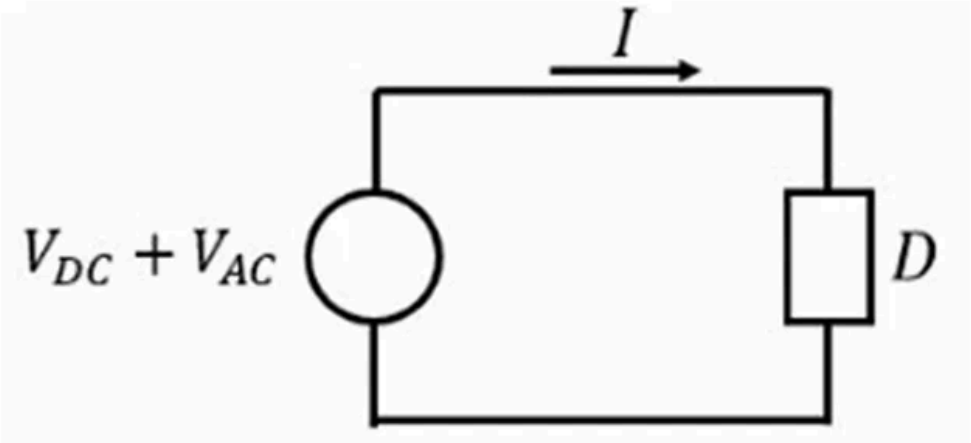
Electronics > Instruments

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



Answer Key

19 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Electronics	Instruments	**2**
Q2	Electronics	Instruments	**3**
Q3	Electronics	Instruments	**3**
Q4	Electronics	Instruments	**2**
Q5	Electronics	Instruments	**4**
Q6	Electronics	Instruments	**2**
Q7	Electronics	Instruments	**3**
Q8	Electronics	Instruments	**2**
Q9	Electronics	Instruments	**4**
Q10	Electronics	Instruments	**4**
Q11	Electronics	Instruments	**1**
Q12	Electronics	Instruments	**4**
Q13	Electronics	Instruments	**3**
Q14	Electronics	Instruments	**2**
Q15	Electronics	Instruments	**1**
Q16	Electronics	Instruments	**2**
Q17	Electronics	Instruments	**1**
Q18	Electronics	Instruments	**3**
Q19	Electronics	Instruments	**2**

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