

National Testing Agency

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Subject Name : B TECH
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Total Marks : 300
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B TECH

Group Number : 1
Group Id : 864351258
Group Maximum Duration : 0
Group Minimum Duration : 180
Show Attended Group? : No
Edit Attended Group? : No
Break time : 0
Group Marks : 300
Is this Group for Examiner? : No

Physics Section A

Section Id : 864351986
Section Number : 1
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 20
Number of Questions to be attempted : 20
Section Marks : 80

Enable Mark as Answered Mark for Review and Clear Response : Yes
Sub-Section Number : 1
Sub-Section Id : 8643511213
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 86435121250 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If velocity [V] time [T] and force [F] are chosen as the base quantities, the dimensions of the mass will be :

Options :

86435170331. $[FT^{-1}V^{-1}]$

86435170332. $[FVT^{-1}]$

86435170333. $[FT^2V]$

86435170334. $[FTV^{-1}]$

Question Number : 2 Question Id : 86435121251 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A free electron of 2.6 eV energy collides with a H^+ ion. This results in the formation of a hydrogen atom in the first excited state and a photon is released. Find the frequency of the emitted photon. ($h = 6.6 \times 10^{-34} \text{ J s}$)

Options :

86435170335. $0.19 \times 10^{15} \text{ MHz}$

86435170336. 9.0×10^{27} MHz

86435170337. 1.45×10^9 MHz

86435170338. 1.45×10^{16} MHz

Question Number : 3 Question Id : 86435121252 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Statement I :

If three forces \vec{F}_1 , \vec{F}_2 and \vec{F}_3 are represented by three sides of a triangle and $\vec{F}_1 + \vec{F}_2 = -\vec{F}_3$, then these three forces are concurrent forces and satisfy the condition for equilibrium.

Statement II :

A triangle made up of three forces \vec{F}_1 , \vec{F}_2 and \vec{F}_3 as its sides taken in the same order, satisfy the condition for translatory equilibrium.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

Options :

86435170339. Both **Statement I** and **Statement II** are true.

86435170340. Both **Statement I** and **Statement II** are false.

86435170341. **Statement I** is true but **Statement II** is false.

86435170342. **Statement I** is false but **Statement II** is true.

Question Number : 4 Question Id : 86435121253 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two thin metallic spherical shells of radii r_1 and r_2 ($r_1 < r_2$) are placed with their centres coinciding. A material of thermal conductivity K is filled in the space between the shells. The inner shell is maintained at temperature θ_1 and the outer shell at temperature θ_2 ($\theta_1 < \theta_2$). The rate at which heat flows radially through the material is :

Options :

86435170343.
$$\frac{4\pi Kr_1r_2(\theta_2 - \theta_1)}{r_2 - r_1}$$

86435170344.
$$\frac{K(\theta_2 - \theta_1)(r_2 - r_1)}{4\pi r_1r_2}$$

86435170345.
$$\frac{K(\theta_2 - \theta_1)}{r_2 - r_1}$$

86435170346.
$$\frac{\pi r_1r_2(\theta_2 - \theta_1)}{r_2 - r_1}$$

Question Number : 5 Question Id : 86435121254 Question Type : MCQ Option Shuffling : Yes Is Que

Correct Marks : 4 Wrong Marks : 1

Statement I :

Two forces $(\vec{P} + \vec{Q})$ and $(\vec{P} - \vec{Q})$ where $\vec{P} \perp \vec{Q}$, when act at an angle θ_1 to each other, the magnitude of their resultant is $\sqrt{3(P^2 + Q^2)}$, when they act at an angle θ_2 , the magnitude of their resultant becomes $\sqrt{2(P^2 + Q^2)}$. This is possible only when $\theta_1 < \theta_2$.

Statement II :

In the situation given above.

$$\theta_1 = 60^\circ \text{ and } \theta_2 = 90^\circ$$

In the light of the above statements, choose the **most appropriate** answer from the options given below :

Options :

86435170347. Both **Statement I** and **Statement II** are true.

86435170348. Both **Statement I** and **Statement II** are false.

86435170349. **Statement I** is true but **Statement II** is false.

86435170350. **Statement I** is false but **Statement II** is true.

Question Number : 6 Question Id : 86435121255 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If R_E be the radius of Earth, then the ratio between the acceleration due to gravity at a depth 'r' below and a height 'r' above the earth surface is :

(Given : $r < R_E$)

Options :

86435170351. $1 + \frac{r}{R_E} + \frac{r^2}{R_E^2} + \frac{r^3}{R_E^3}$

86435170352. $1 + \frac{r}{R_E} - \frac{r^2}{R_E^2} - \frac{r^3}{R_E^3}$

86435170353. $1 - \frac{r}{R_E} - \frac{r^2}{R_E^2} - \frac{r^3}{R_E^3}$

86435170354. $1 + \frac{r}{R_E} - \frac{r^2}{R_E^2} + \frac{r^3}{R_E^3}$

Question Number : 7 Question Id : 86435121256 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A mixture of hydrogen and oxygen has volume 500 cm³ pressure 400 kPa and mass 0.76 g. The ratio of masses of oxygen

Options :



86435170355. 3 : 8

86435170356. 8 : 3

86435170357. 3 : 16

86435170358. 16 : 3

Question Number : 8 Question Id : 86435121257 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A block moving horizontally on a smooth surface with a speed of 40 m/s splits into two parts with masses in the ratio of 1 : 2. If the smaller part moves at 60 m/s in the same direction, then the fractional change in kinetic energy is :

Options :

86435170359. $\frac{1}{8}$

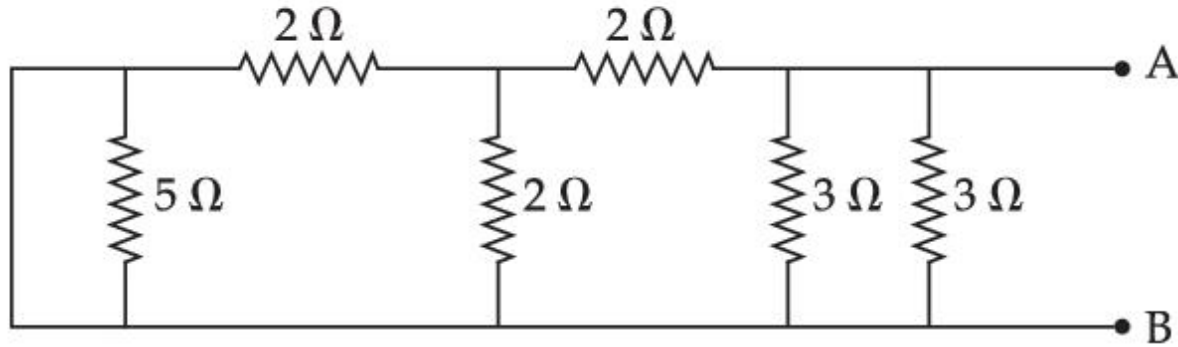
86435170360. $\frac{1}{4}$

86435170361. $\frac{1}{3}$

86435170362. $\frac{2}{3}$

Question Number : 9 Question Id : 86435121258 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The equivalent resistance of the given circuit between the terminals A and B is :



Options :

86435170363. 0Ω

86435170364. 3Ω

86435170365. 1Ω

86435170366. $\frac{9}{2} \Omega$

Question Number : 10 Question Id : 86435121259 Question Type : MCQ Option Shuffling : Yes Is Qu
Correct Marks : 4 Wrong Marks : 1

A bob of mass 'm' suspended by a thread of length l undergoes simple harmonic oscillations with time period T . If the bob is immersed in a liquid that has density $\frac{1}{4}$ times that of the bob and the length of the thread is increased by $1/3^{\text{rd}}$ of the original length, then the time period of the simple harmonic oscillations will be :

Options :

86435170367. $\frac{4}{3} T$

86435170368. $\frac{3}{4} T$

86435170369. $\frac{3}{2} T$

86435170370. T

Question Number : 11 Question Id : 86435121260 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Four identical hollow cylindrical columns of mild steel support a big structure of mass 50×10^3 kg. The inner and outer radii of each column are 50 cm and 100 cm respectively. Assuming uniform local distribution, calculate the compression strain of each column.

[use $Y = 2.0 \times 10^{11}$ Pa, $g = 9.8$ m/s²]

Options :

86435170371. 2.60×10^{-7}

86435170372. 3.60×10^{-8}

86435170373. 1.87×10^{-3}

86435170374. 7.07×10^{-4}

Question Number : 12 Question Id : 86435121261 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

For a body executing S.H.M. :

- (a) Potential energy is always equal to its K.E.
- (b) Average potential and kinetic energy over any given time interval are always equal.
- (c) Sum of the kinetic and potential energy at any point of time is constant.
- (d) Average K.E. in one time period is equal to average potential energy in one time period.

Choose the **most appropriate** option from the options given below

Options :

86435170375. only (b)

86435170376. (b) and (c)

86435170377. only (c)

86435170378. (c) and (d)

Question Number : 13 Question Id : 86435121262 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The magnetic field vector of an electromagnetic wave is given by $B = B_0 \frac{\hat{i} + \hat{j}}{\sqrt{2}} \cos(kz - \omega t)$;

where \hat{i}, \hat{j} represents unit vector along x and y -axis respectively. At $t=0$ s, two electric

charges q_1 of 4π coulomb and q_2 of 2π coulomb located at $\left(0, 0, \frac{\pi}{k}\right)$ and $\left(0, 0, \frac{3\pi}{k}\right)$,

respectively, have the same velocity of $0.5 c \hat{i}$, (where c is the velocity of light). The ratio of

the force acting on charge q_1 to q_2 is :

Options :

86435170379. $\sqrt{2} : 1$

86435170380. $1 : \sqrt{2}$

86435170381. 2 : 1

86435170382. $2\sqrt{2} : 1$

Question Number : 14 Question Id : 86435121263 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A system consists of two identical spheres each of mass 1.5 kg and radius 50 cm at the ends of a light rod. The distance between the centres of the two spheres is 5 m. What will be the moment of inertia of the system about an axis perpendicular to the rod passing through its midpoint ?

Options :

86435170383. 19.05 kgm²

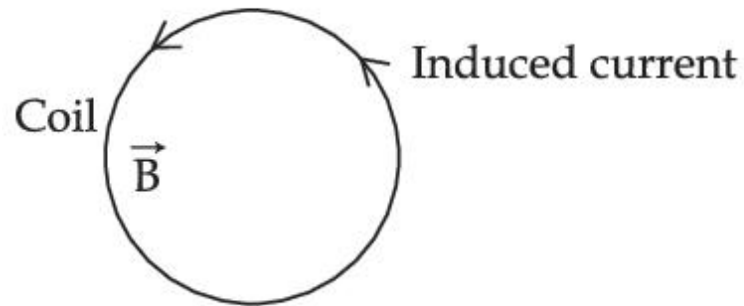
86435170384. 1.905×10^5 kgm²

86435170385. 18.75 kgm²

86435170386. 1.875×10^5 kgm²

Question Number : 15 Question Id : 86435121264 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A coil is placed in a magnetic field \vec{B} as shown below :



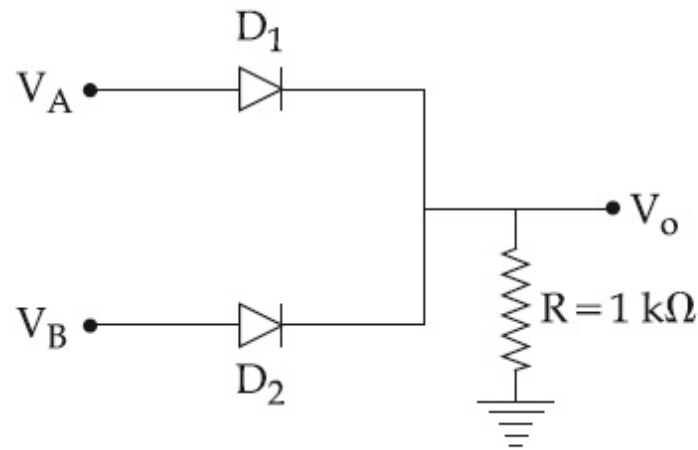
A current is induced in the coil because \vec{B} is :

Options :

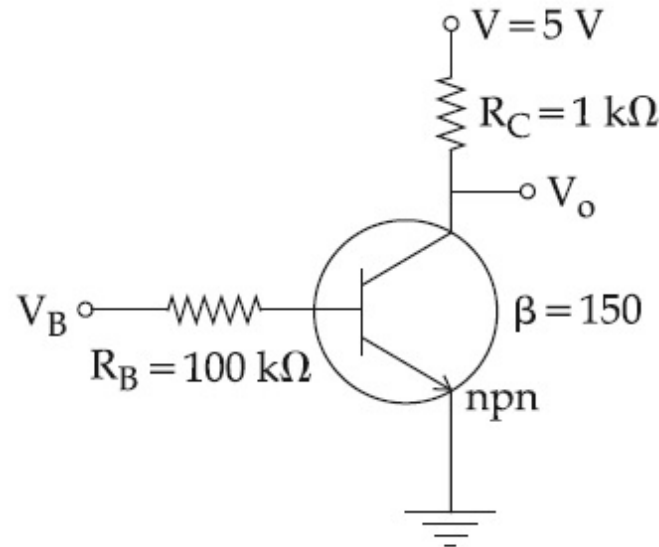
- 86435170387. outward and increasing with time
- 86435170388. outward and decreasing with time
- 86435170389. parallel to the plane of coil and increasing with time
- 86435170390. parallel to the plane of coil and decreasing with time

Question Number : 16 Question Id : 86435121265 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If V_A and V_B are the input voltages (either 5 V or 0 V) and V_o is the output voltage then the two gates represented in the following circuits (A) and (B) are :



(A)



(B)

Options :

86435170391. NAND and NOR Gate

86435170392. AND and OR Gate

86435170393. AND and NOT Gate

86435170394. OR and NOT Gate

Question Number : 17 Question Id : 86435121266 Question Type : MCQ Option Shuffling : Yes Is Qu
Correct Marks : 4 Wrong Marks : 1

A current of 1.5 A is flowing through a triangle, of side 9 cm each. The magnetic field at the centroid of the triangle is :

(Assume that the current is flowing in the clockwise direction.)

Options :

86435170395. 3×10^{-5} T, inside the plane of triangle

86435170396. 3×10^{-7} T, outside the plane of triangle

86435170397. $2\sqrt{3} \times 10^{-5}$ T, inside the plane of triangle

86435170398. $2\sqrt{3} \times 10^{-7}$ T, outside the plane of triangle

Question Number : 18 Question Id : 86435121267 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Statement I :

To get a steady dc output from the pulsating voltage received from a full wave rectifier we can connect a capacitor across the output parallel to the load R_L .

Statement II :

To get a steady dc output from the pulsating voltage received from a full wave rectifier we can connect an inductor in series with R_L .

In the light of the above statements, choose the **most appropriate** given below :

Options :



86435170399. Both **Statement I** and **Statement II** are true

86435170400. Both **Statement I** and **Statement II** are false

86435170401. **Statement I** is true but **Statement II** is false

86435170402. **Statement I** is false but **Statement II** is true

Question Number : 19 Question Id : 86435121268 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Consider two separate ideal gases of electrons and protons having same number of particles. The temperature of both the gases are same. The ratio of the uncertainty in determining the position of an electron to that of a proton is proportional to :

Options :

86435170403. $\sqrt{\frac{m_e}{m_p}}$

86435170404. $\frac{m_p}{m_e}$

86435170405. $\sqrt{\frac{m_p}{m_e}}$

$$\left(\frac{m_p}{m_e}\right)^{3/2}$$

86435170406.

Question Number : 20 Question Id : 86435121269 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Choose the **incorrect** statement :

- (a) The electric lines of force entering into a Gaussian surface provide negative flux.
- (b) A charge 'q' is placed at the centre of a cube. The flux through all the faces will be the same.
- (c) In a uniform electric field net flux through a closed Gaussian surface containing no net charge, is zero.
- (d) When electric field is parallel to a Gaussian surface, it provides a finite non-zero flux.

Choose the **most appropriate** answer from the options given below :

Options :

86435170407. (a) and (c) Only

86435170408. (b) and (d) Only

86435170409. (c) and (d) Only

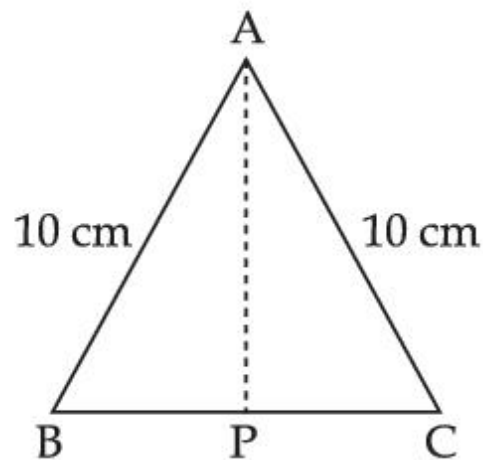
86435170410. (d) Only

Physics Section B

Section Id :	864351987
Section Number :	2
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	8643511214
Question Shuffling Allowed :	Yes

Question Number : 21 Question Id : 86435121270 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Cross-section view of a prism is the equilateral triangle ABC shown in the figure. The minimum deviation is observed using this prism when the angle of incidence is equal to the prism angle. The time taken by light to travel from P (midpoint of BC) to A is _____ $\times 10^{-10}$ s. (Given, speed of light in vacuum = 3×10^8 m/s and $\cos 30^\circ = \frac{\sqrt{3}}{2}$)



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 22 **Question Id :** 86435121271 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

A sample of gas with $\gamma = 1.5$ is taken through an adiabatic process in which the volume is compressed from 1200 cm^3 to 300 cm^3 . If the initial pressure is 200 kPa . The absolute value of the workdone by the gas in the process = _____ J.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 23 **Question Id :** 86435121272 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

A parallel plate capacitor of capacitance $200 \mu\text{F}$ is connected to a battery of 200 V . A dielectric slab of dielectric constant 2 is now inserted into the space between plates of capacitor while the battery remain connected. The change in the electrostatic energy in the capacitor will be _____ J.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 24 **Question Id :** 86435121273 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

In a Young's double slit experiment, the slits are separated by 0.3 mm and the screen is 1.5 m away from the plane of slits. Distance between fourth bright fringes on both sides of central bright fringe is 2.4 cm. The frequency of light used is _____ $\times 10^{14}$ Hz.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 25 **Question Id :** 86435121274 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

A bandwidth of 6 MHz is available for A.M. transmission. If the maximum audio signal frequency used for modulating the carrier wave is not to exceed 6 kHz. The number of stations that can be broadcasted within this band simultaneously without interfering with each other will be _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 26 **Question Id :** 86435121275 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

The diameter of a spherical bob is measured using a vernier callipers. 9 divisions of the main scale, in the vernier callipers, are equal to 10 divisions of vernier scale. One main scale division is 1 mm. The main scale reading is 10 mm and 8th division of vernier scale was found to coincide exactly with one of the main scale division. If the given vernier callipers has positive zero error of 0.04 cm, then the radius of the bob is _____ $\times 10^{-2}$ cm.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

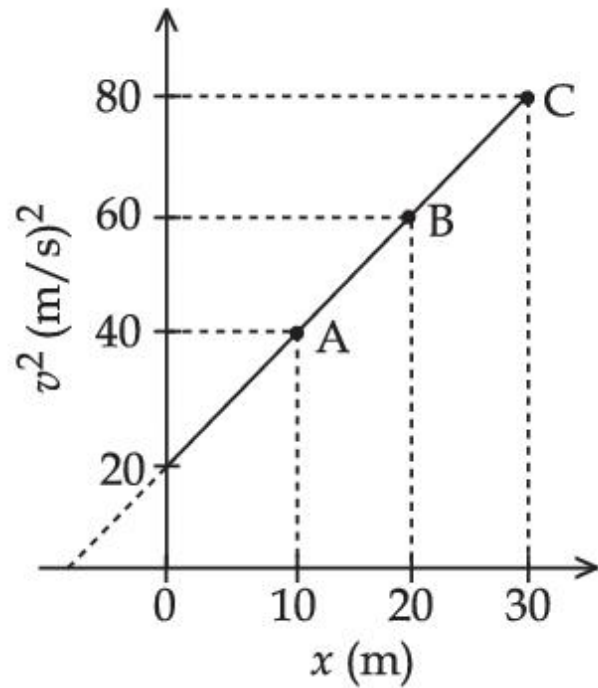
Possible Answers :

1

Question Number : 27 **Question Id :** 86435121276 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

A particle is moving with constant acceleration 'a'. Following graph shows v^2 versus x (displacement) plot. The acceleration of the particle is _____ m/s^2 .



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

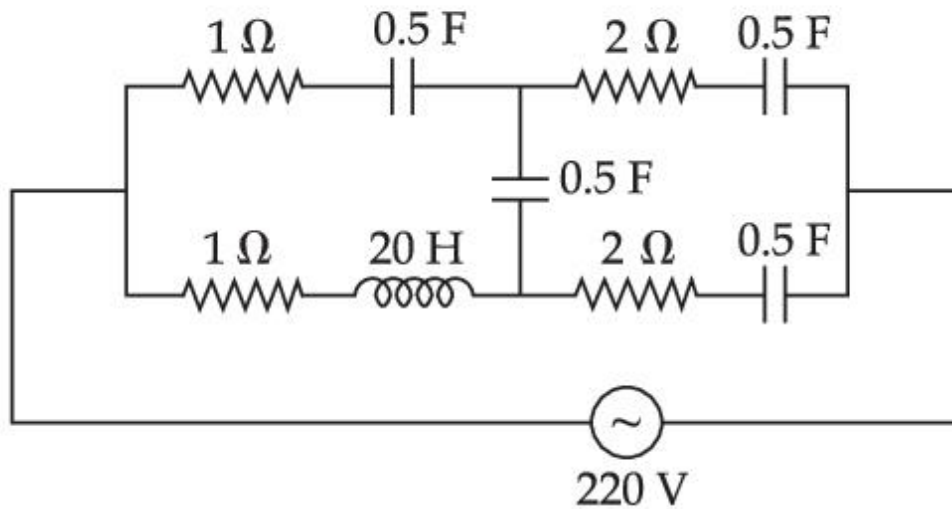
Possible Answers :

1

Question Number : 28 **Question Id :** 86435121277 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

At very high frequencies, the effective impedance of the given circuit will be _____ Ω .



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 29 **Question Id :** 86435121278 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

A long solenoid with 1000 turns/m has a core material with relative permeability 500 and volume 10^3 cm^3 . If the core material is replaced by another material having relative permeability of 750 with same volume maintaining same current of 0.75 A in the solenoid, the fractional change in the magnetic moment of the core would be approximately $\left(\frac{x}{499}\right)$.

Find the value of x .

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 30 **Question Id :** 86435121279 **Question Type :** SA

Correct Marks : 4 **Wrong Marks :** 0

A resistor dissipates 192 J of energy in 1 s when a current of 4 A is passed through it. Now, when the current is doubled, the amount of thermal energy dissipated in 5 s is _____ J.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1