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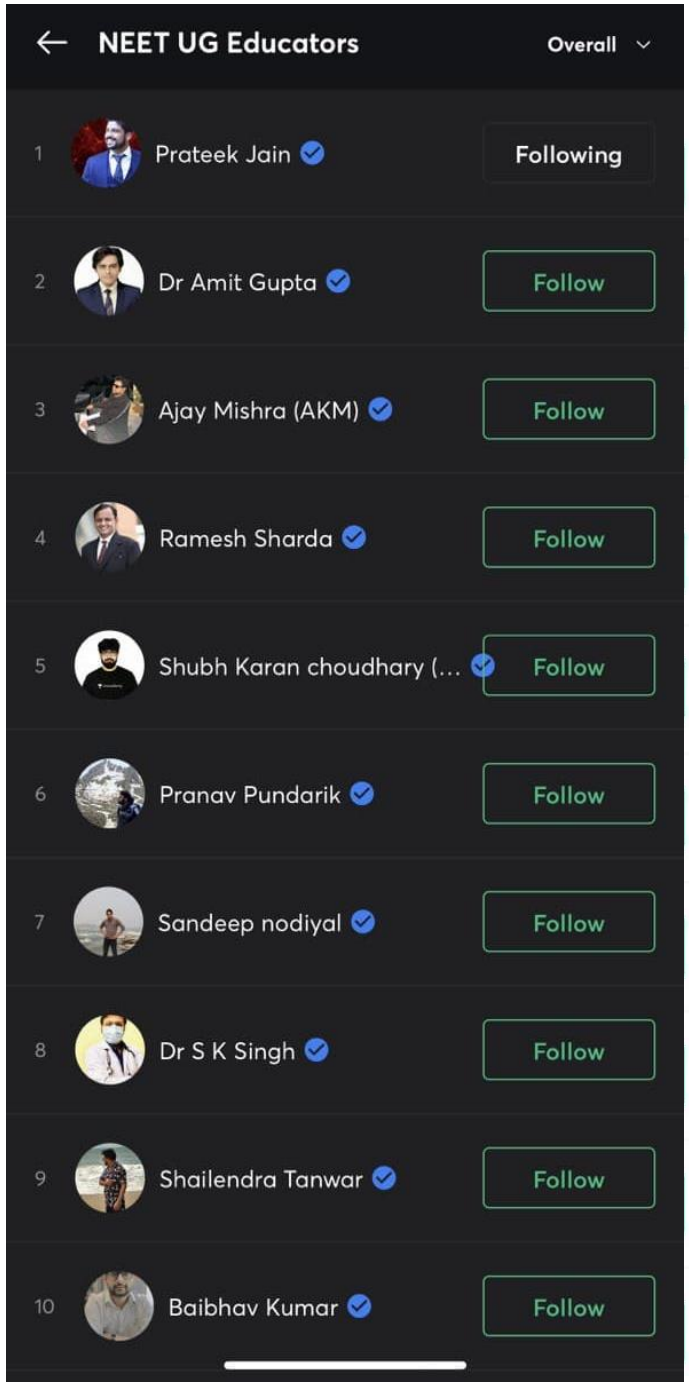

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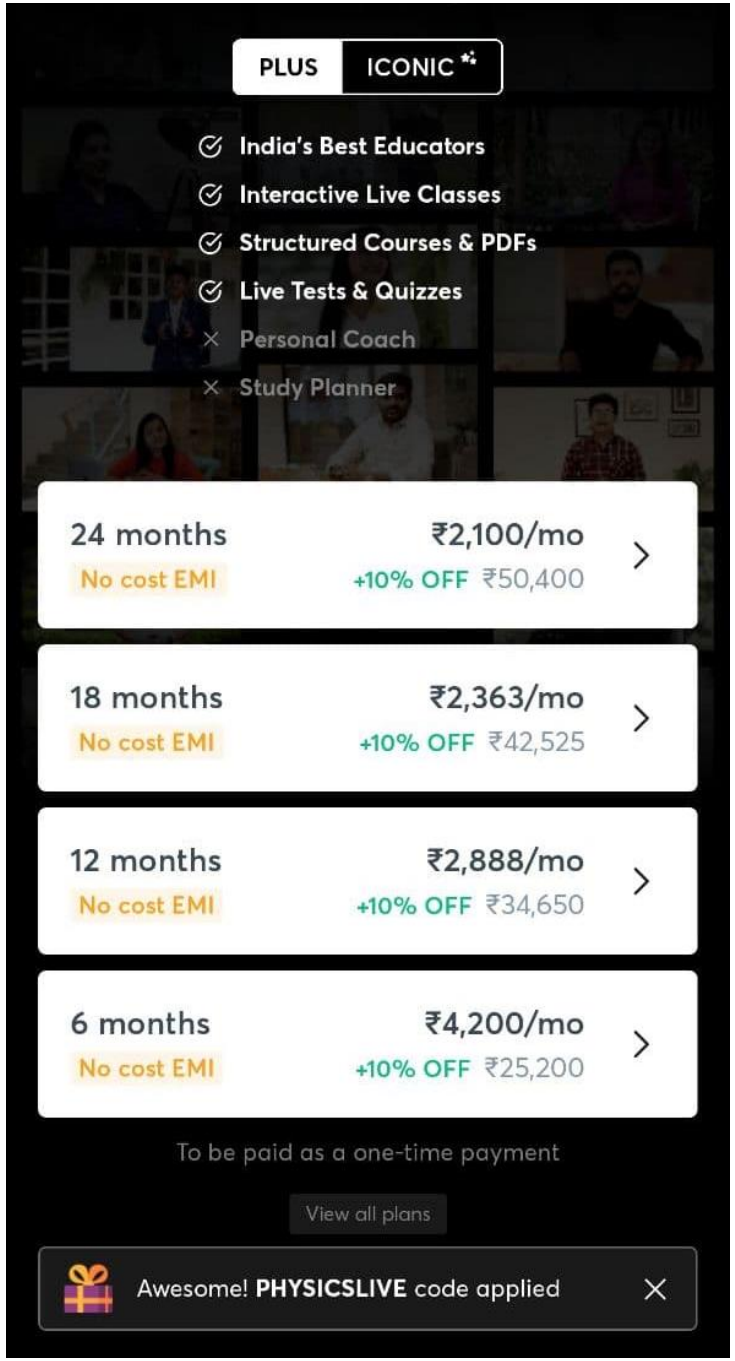

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Solution
NEET & AIIMS PYQs

Current Electricity (2/3): Combination of resistors, Circuits, Wheat Stone Bridge, Power

By Physicsaholics Team

PYQs on Following Subtopic:

Combination of Resistors & Circuit Problems

. A wire of resistance $12\ \Omega\ m^{-1}$ is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points A and B as shown in the figure is

[CBSE AIPMT 2009]

(a) $0.6\ \pi\ \Omega$ (b) $3\ \Omega$ (c) $6\ \pi\ \Omega$ (d) $6\ \Omega$

Ans. a

When a wire of uniform cross-section a, length l and resistance R is bent into a complete circle, resistance between two of diametrically opposite points will be

[CBSE AIPMT 2005]

(a) $\frac{R}{4}$ (b) $\frac{R}{8}$ (c) $4R$ (d) $\frac{R}{2}$

Ans. a

n resistances each of r ohm, when connected in parallel give an equivalent resistance of R ohm. If these resistances were connected in series, the combination would have a resistance in ohms, equal to

[CBSE AIPMT 2004]

(a) n^2R (b) $\frac{R}{n^2}$ (c) $\frac{R}{n}$ (d) nR

Ans. a

Two wires of the same metal have same length, but their cross-sections are in the ratio 3 : 1. They are joined in series. The resistance of thicker wire is 10 Ω. The total resistance of the combination will be

[CBSE AIPMT 1995]

(a) 10 Ω (b) 20 Ω (c) 40 Ω (d) 100 Ω

Ans. c

Three resistances each of 4 Ω are connected to form a triangle. The resistance between any two terminals is

[CBSE AIPMT 1993]

(a) 12 Ω (b) 2 Ω (c) 6 Ω (d) $\frac{8}{3}$ Ω

Ans. d

You are given several identical resistances each of value $R = 10\ \Omega$ and each capable of carrying a maximum current of 1A. It is required to make a suitable combination of these resistances of $5\ \Omega$ which can carry a current of 4 A. The minimum number of resistances of the type R that will be required for this job is *[CBSE AIPMT 1990]*

(a) 4 (b) 10 (c) 8 (d) 20

Ans. c

n equal resistors are first connected in series and then connected in parallel. What is the ratio of the maximum to the minimum resistance ? *[CBSE AIPMT 1989]*

(a) n (b) $1/n^2$ (c) n^2 (d) $1/n$

Ans. c

Ten identical wires each having a resistance of one ohm are connected in parallel. The combination will have a resistance of

(a) 0.1 Ω (b) 10 Ω

(c) 0.01 Ω (d) 1 Ω. *(1995)*

AIIMS

Ans. a

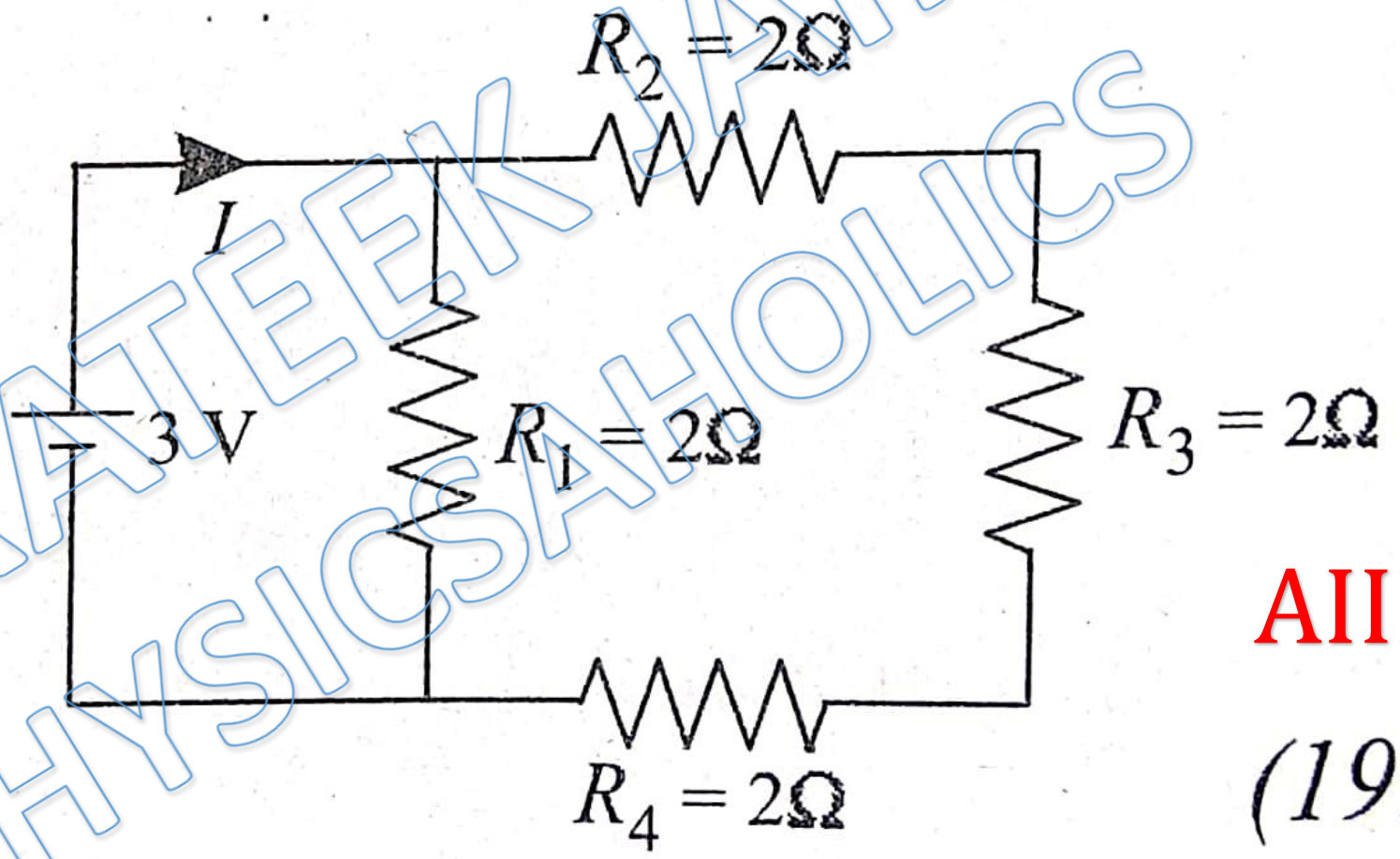
What is the current (I) in the circuit, as shown in figure ?

(a) 1.2 A

(b) 0.5 A

(c) 1 A

(d) 2 A



AIIMS

(1998)

Ans. d

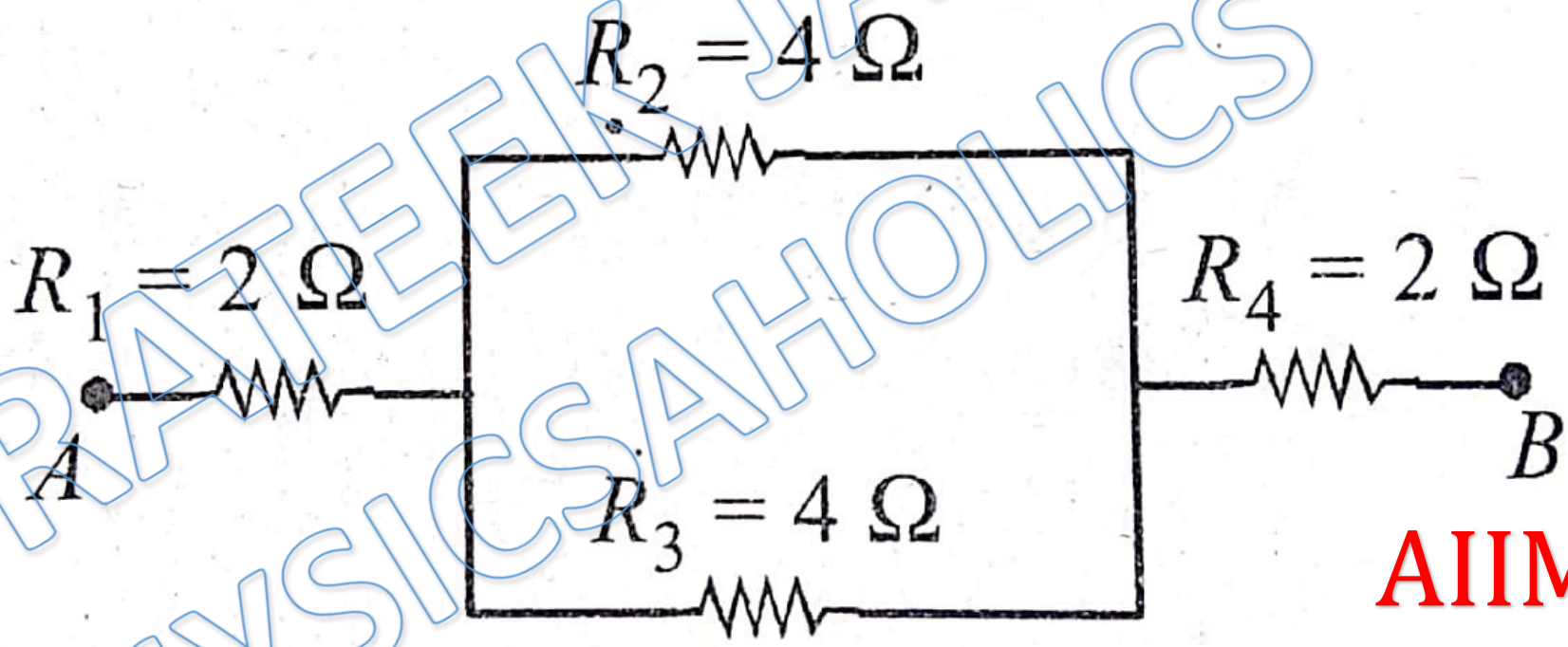
In the figure, the equivalent resistance between the points A and B is

(a) $8\ \Omega$

(b) $6\ \Omega$

(c) $2\ \Omega$

(d) $4\ \Omega$.

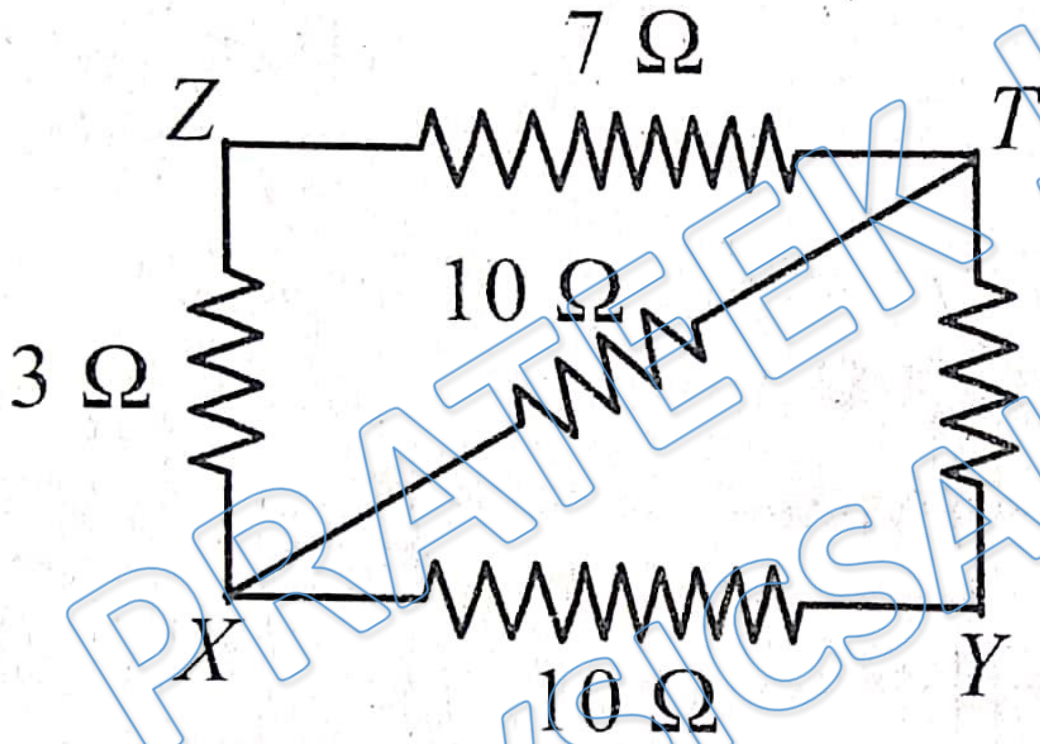


AIIMS

(1998)

Ans. b

The equivalent resistance between the points X and Y in the following circuit diagram will be



(a) 10 Ω
(b) 5 Ω
(c) 7 Ω
(d) 3 Ω.

AIIMS
(2008)

Ans. b

A and B are two points on a uniform ring of resistance R. The $\angle ACB = \theta$, where C is the centre of the ring. The equivalent resistance between A and B is

(a) $\dfrac{R\theta(2\pi-\theta)}{4\pi^2}$

(b) $R\left(1-\dfrac{\theta}{2\pi}\right)$

(c) $\dfrac{R\theta}{2\pi}$

(d) $\dfrac{R(2\pi-\theta)}{4\pi}$

AIIMS

(2017)

Ans. a

2, 4 and 6 S are the conductances of three conductors. When they are joined in parallel, their equivalent conductance will be

(a) 12 S (b) (1/12) S

(c) (12/11) S (d) 11/12 S *(2014)*

AIIMS

Ans. a

Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is *[CBSE AIPMT 2015]*

(a) $\frac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$

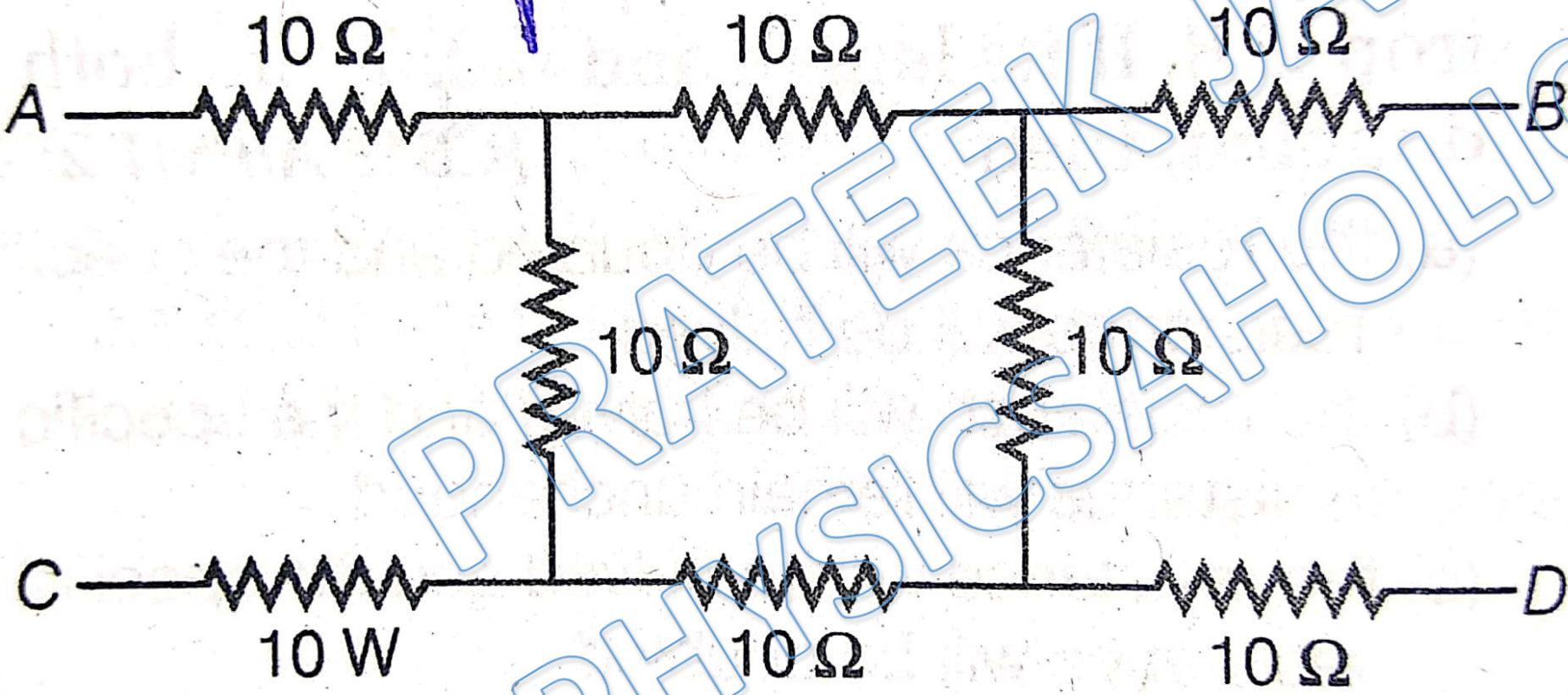
(b) $\frac{\sigma_1+\sigma_2}{2\sigma_1\sigma_2}$

(c) $\frac{\sigma_1+\sigma_2}{\sigma_1\sigma_2}$

(d) $\frac{\sigma_1\sigma_2}{\sigma_1+\sigma_2}$

Ans. a

. What will be the equivalent resistance of circuit shown in figure between two points A and D ? *[CBSE AIPMT 1996]*



(a) 10 Ω (b) 20 Ω (c) 30 Ω (d) 40 Ω

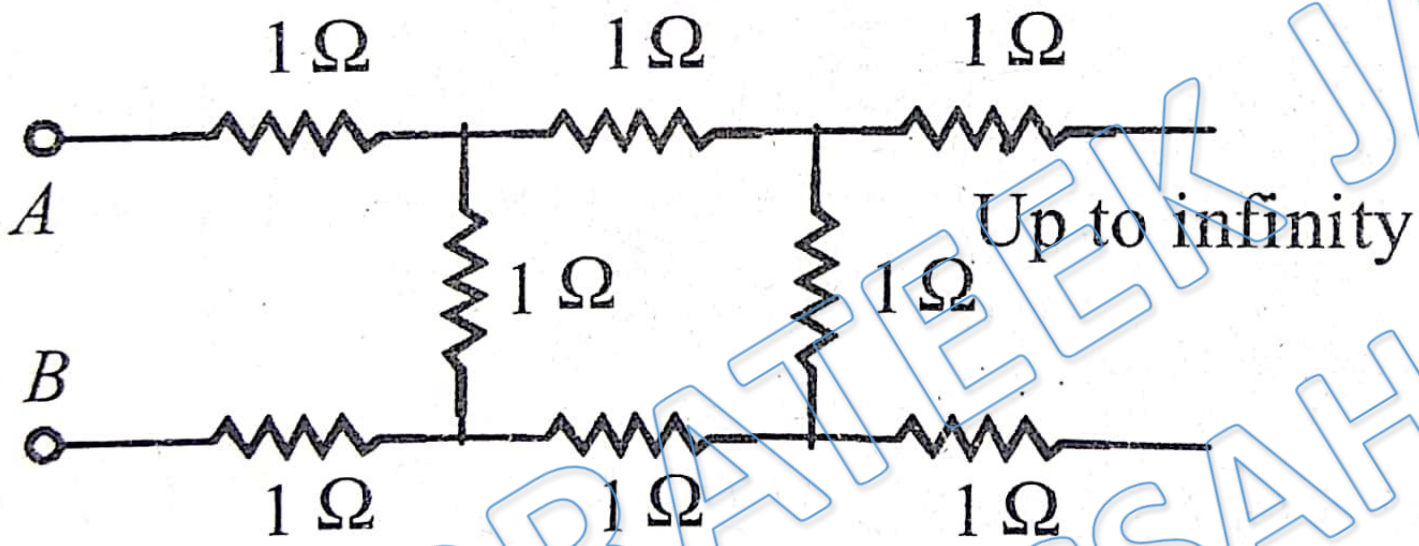
Ans. c

PYQs on Following Subtopic:

Ladder problems

New Problem.

The resistance between the terminal points A and B of the given infinitely long circuit will be



(a) $(\sqrt{3}-1)\ \Omega$ (b) $(1-\sqrt{3})\ \Omega$

(c) $(1+\sqrt{3})\ \Omega$ (d) $(2+\sqrt{3})\ \Omega$. AIIMS (2000)

Ans. c

PYQs on Following Subtopic:

Wheat Stone Bridge

. The resistances of the four arms P, Q, R and S in a Wheatstone bridge are 10 Ω, 30 Ω, 30 Ω and 90 Ω, respectively. The emf and internal resistance of the cell are 7 V and 5 Ω respectively. If the galvanometer resistance is 50 Ω, the current drawn from the cell will be

[NEET 2013]

(a) 1.0 A
(b) 0.2 A
(c) 0.1 A
(d) 2.0 A

Ans. b

. Three resistance P, Q, R each of $2\ \Omega$ and an unknown resistance S form the four arms of a Wheatstone bridge circuit. When a resistance of $6\ \Omega$ is connected in parallel to S the bridge gets balanced. What is the value of S ?

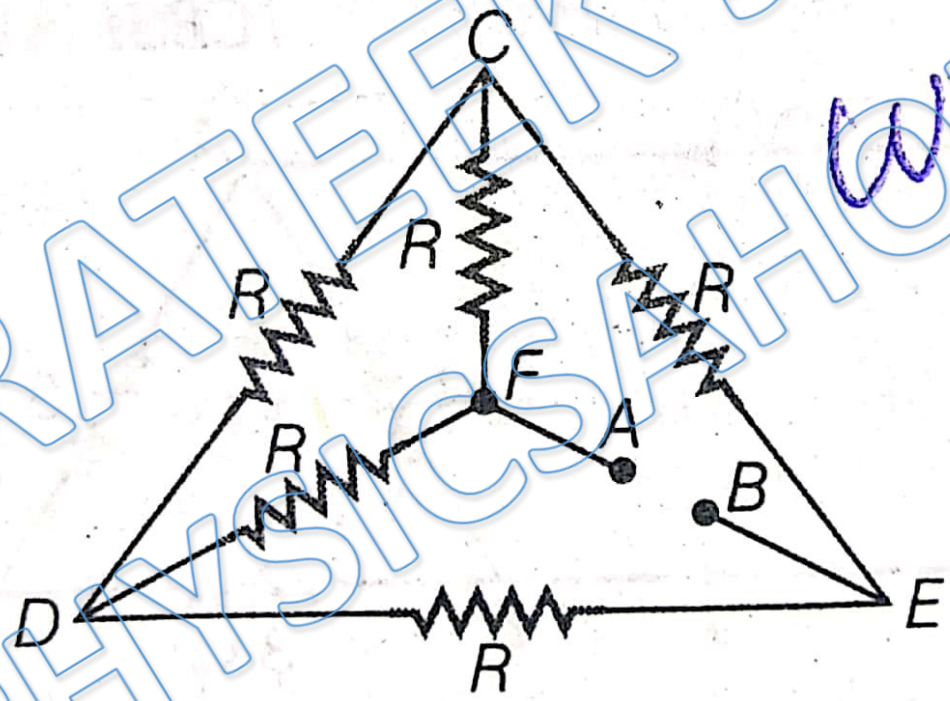
[CBSE AIPMT 2007]

(a) $2\ \Omega$ (b) $3\ \Omega$ (c) $6\ \Omega$ (d) $1\ \Omega$

Ans. b

Five equal resistances each of resistance R are connected as shown in the figure. A battery of $4V$ volts is connected between A and B. The current flowing in $AFCEB$ will be

[CBSE AIPMT 2004]



Wheatstone bridge

(a) $\frac{3V}{R}$ (b) $\frac{V}{R}$ (c) $\frac{V}{2R}$ (d) $\frac{2V}{R}$

Ans. d

In a Wheatstone bridge, all the four arms have equal resistance R. If the resistance of the galvanometer arm is also R, the equivalent resistance of the combination as seen by the battery is *[CBSE AIPMT 2003]*

(a) R (b) $2R$ (c) $\frac{R}{4}$ (d) $\frac{R}{2}$

Ans. a

In a Wheatstone bridge resistance of each of the four sides is 10 Ω. If the resistance of the galvanometer is also 10 Ω, then effective resistance of the bridge will be

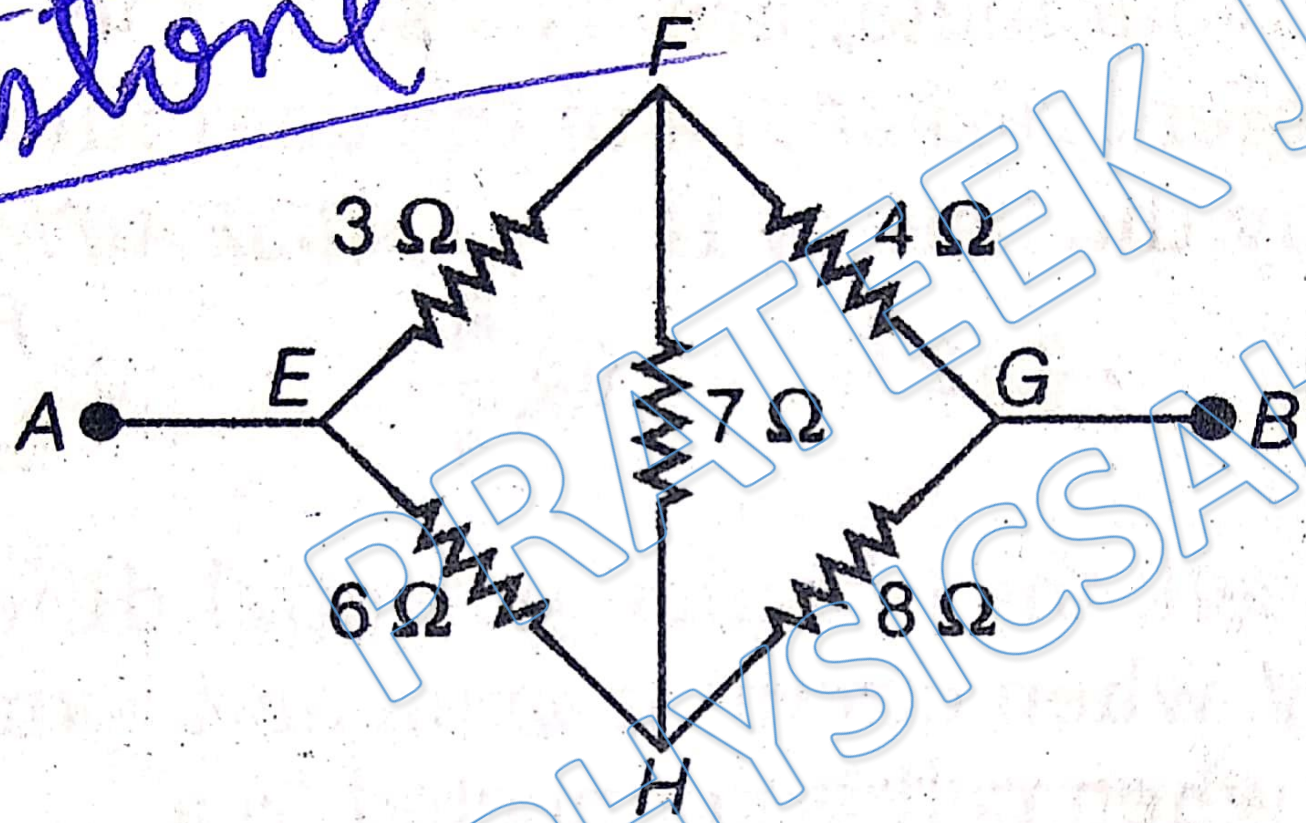
[CBSE AIPMT 2001]

(a) 10 Ω (b) 5 Ω (c) 20 Ω (d) 40 Ω

Ans. a

A bridge circuit is shown in figure. The equivalent resistance between A and B will be

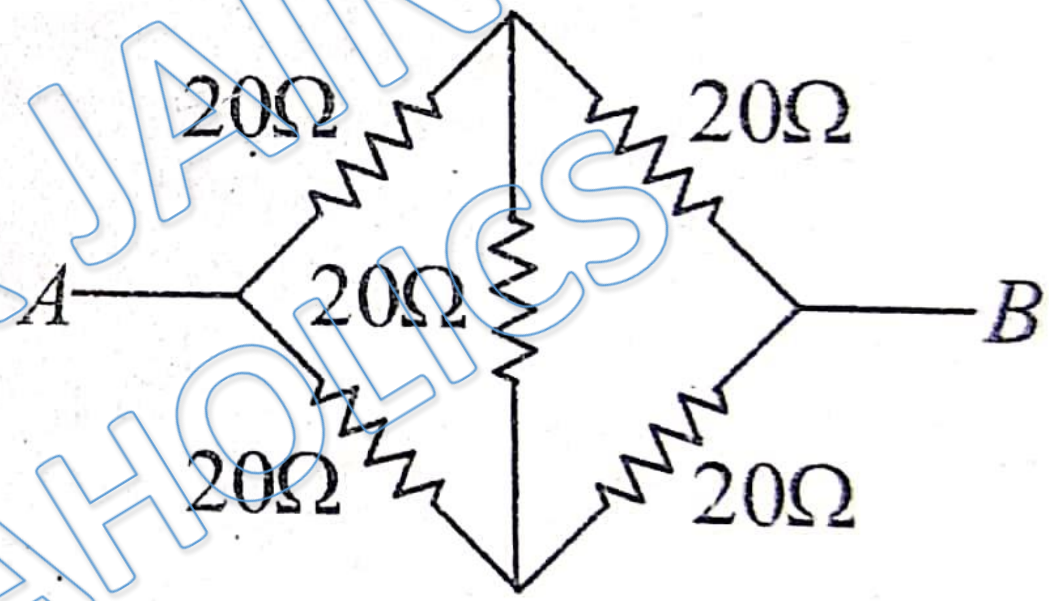
[CBSE AIPMT 2000]



(a) 21 Ω (b) 7 Ω (c) $\frac{252}{85}$ Ω (d) $\frac{14}{3}$ Ω

Ans. d

What is the equivalent resistance between A and B in the given figure



(a) 40 Ω

(b) 10 Ω

(c) 50 Ω

(d) 20 Ω.

(1995)

AIIMS

Ans. d

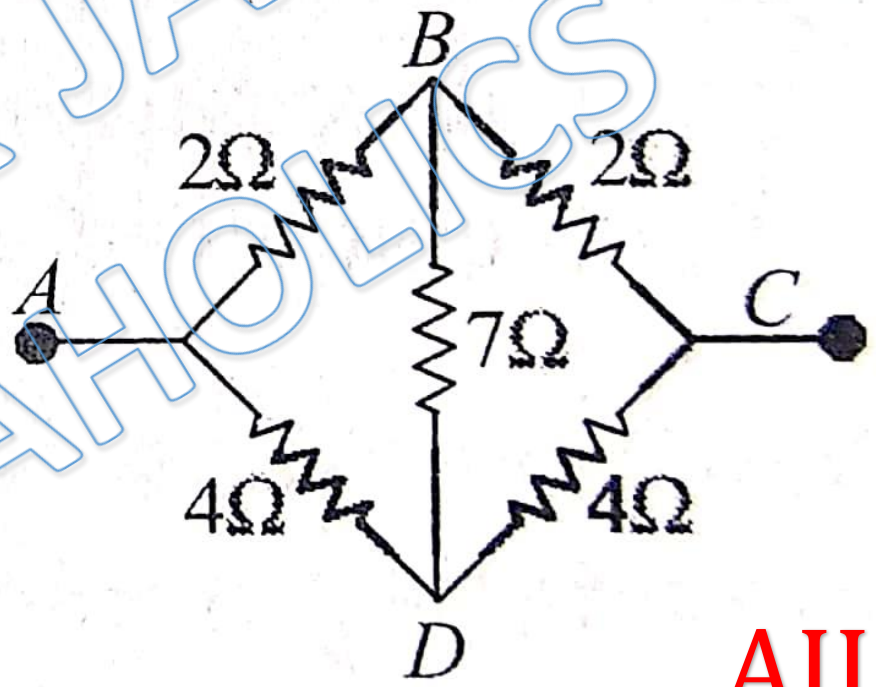
The equivalent resistance between A and C of the given circuit, is

(a) $8\ \Omega$

(b) $\frac{32}{4}\Omega$

(c) $\frac{4}{3}\Omega$

(d) $\frac{8}{3}\Omega$.



AIIMS

(1996, 2001)

Ans. d

A circuit consisting of five resistors each of resistance R, forming a Wheatstone bridge. What is the equivalent resistance of the circuit?

(a) $2R$ (b) R

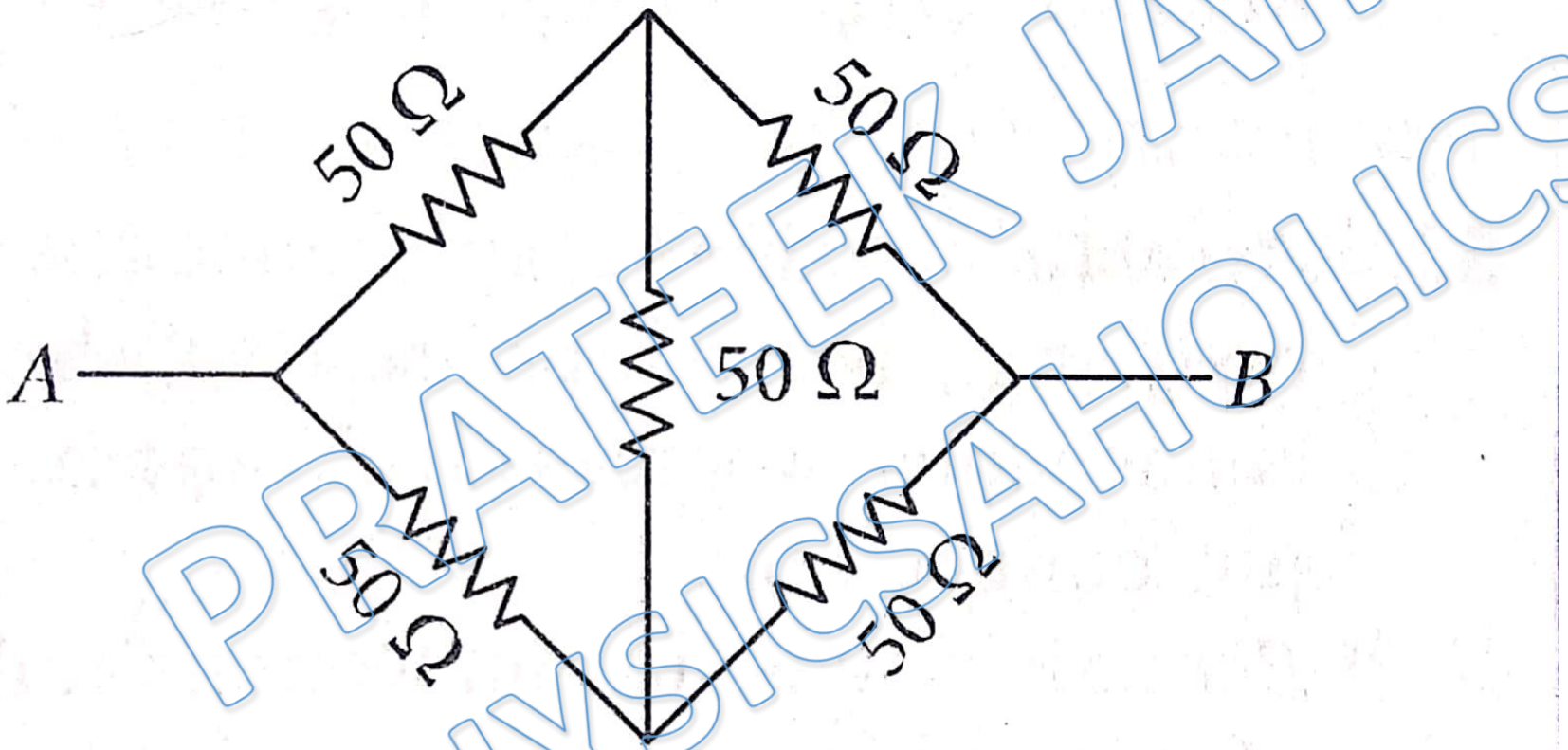
(c) $2R/3$ (d) $R/2$

(2013)

AIIMS

Ans. b

What is the equivalent resistance between A and B in given figure?

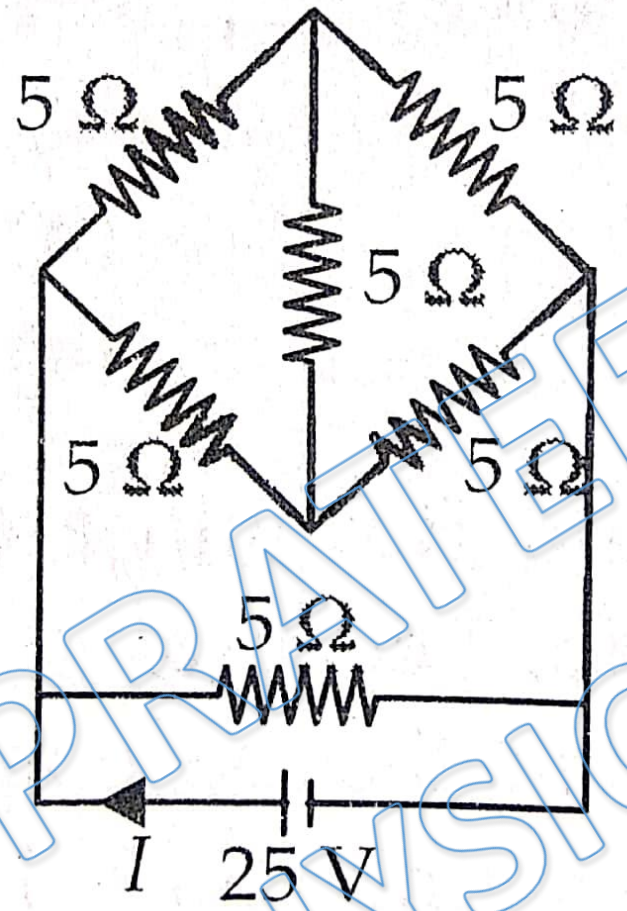


(a) 50 Ω
(b) 25 Ω
(c) 75 Ω
(d) 100 Ω

AIIMS (2015)

Ans. a

Calculate I for the given circuit diagram.



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(a) 10 A
(b) 5 A
(c) 2.5 A
(d) 20 A

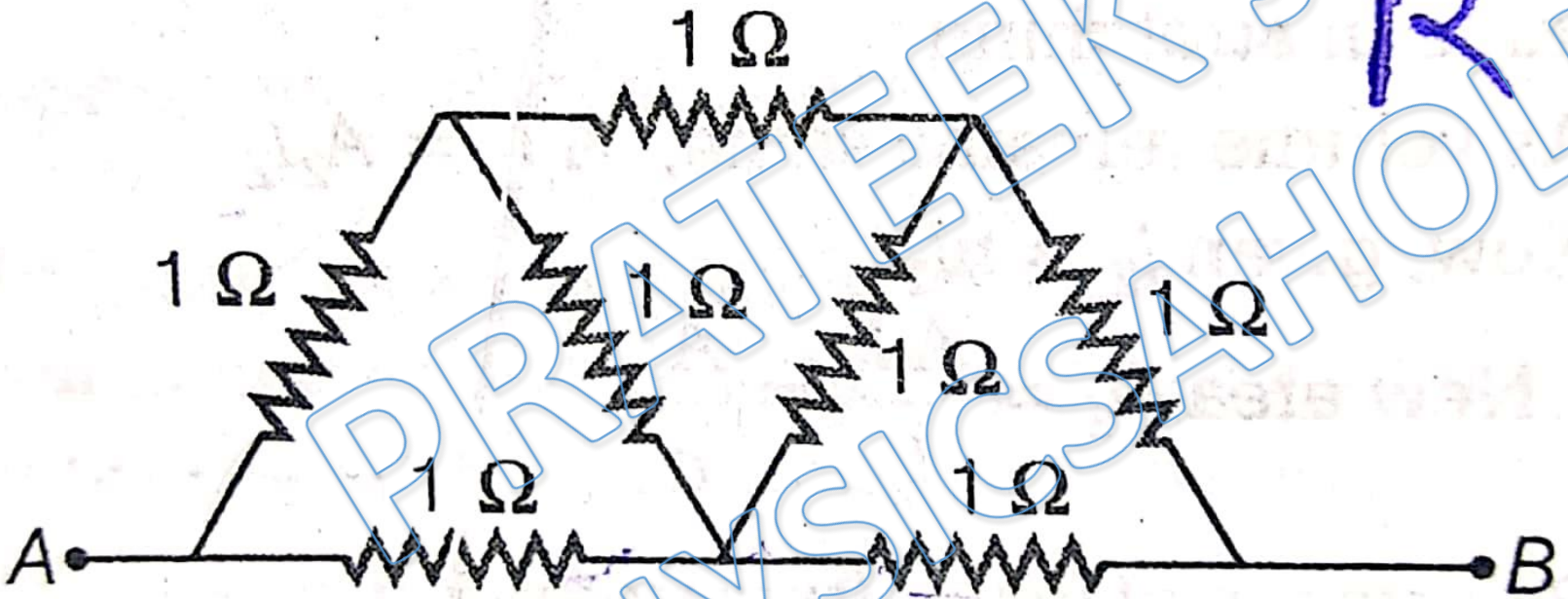
(2012)

Ans. a

PYQs on Following Subtopic:

Symmetric Circuits

In the network shown in figure each resistance is 1 Ω. The effective resistance between A and B is *[CBSE AIPMT 1990]*



(a) $\frac{4}{3}\ \Omega$ (b) $\frac{3}{2}\ \Omega$ (c) 7 Ω (d) $\frac{8}{7}\ \Omega$

Ans. d

PYQs on Following Subtopic:

Combination of cells

Two cells, having the same emf are connected in series through an external resistance R. Cells have internal resistances r_1 and r_2 $(r_1 > r_2)$ respectively. When the circuit is closed, the potential difference across the first cell is zero. The value of R is

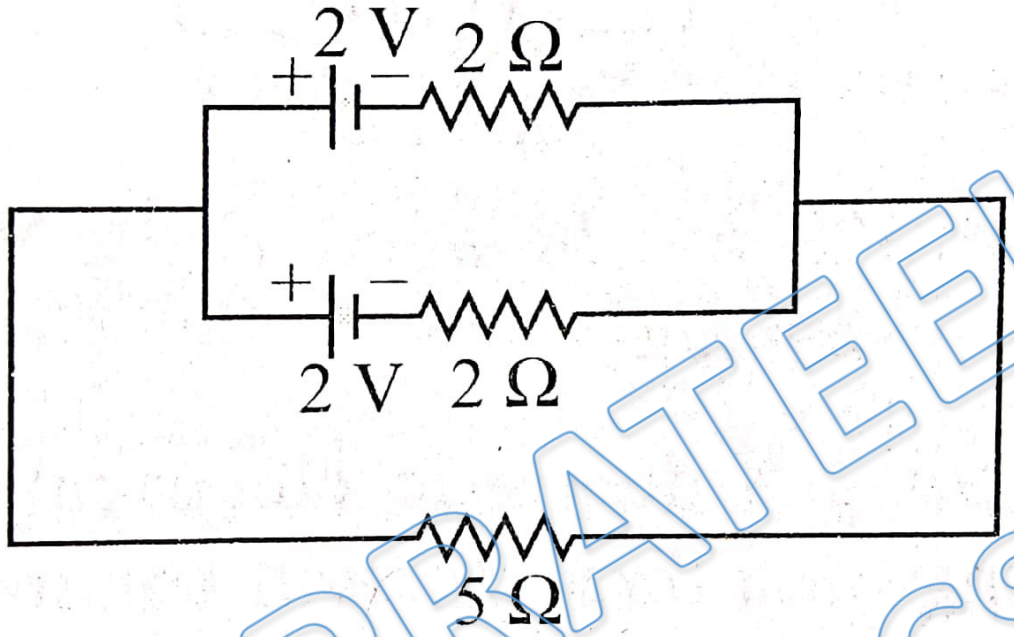
KVL

[CBSE AIPMT 2006]

(a) $r_1 - r_2$ (b) $\frac{r_1 + r_2}{2}$ (c) $\frac{r_1 - r_2}{2}$ (d) $r_1 + r_2$

Ans. a

In the circuit shown, the current through the 5 Ω resistor is



(a) $\frac{8}{3}$ A

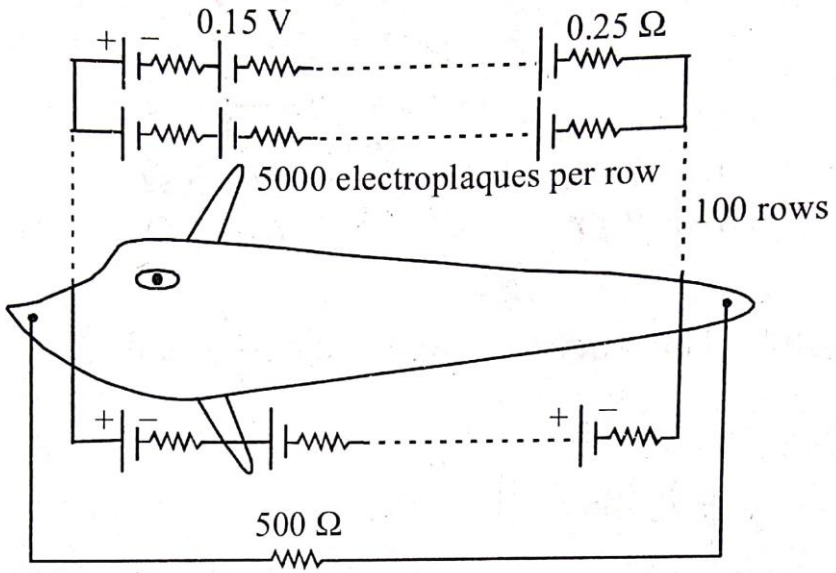
(b) $\frac{9}{13}$ A

(c) $\frac{4}{13}$ A

(d) $\frac{1}{3}$ A

AIIMS (2018)

Ans. d



Eels are able to generate current with biological cells called electroplaques. The electroplaques in an eel are arranged in 100 rows, each row stretching horizontally along the body of the fish containing 5000 electroplaques. The arrangement is suggestively shown here. Each electroplaques has an emf of 0.15 V and internal resistance of 0.25 Ω. The water surrounding the eel completes a circuit between the head and its tail. If the water surrounding it has a resistance of 500 Ω, the current an eel can produce in water is about

(a) 1.5 A (b) 3.0 A

(c) 15 A (d) 30 A. *(2004)*

AIIMS

Ans. a

PYQs on Following Subtopic:

Energy and Power, Heat lost across a resistor

Calculate the heat emitted by a bulb of 100 W in 1 min.

(a) 100 J (b) 1000 J

(c) 600 J (d) 6000 J *(2012)*

AIIMS

Ans. d

The heat produced by a 100 W heater in 2 min is equal to

(a) 10.5 kcal

(b) 16.3 kcal

(c) 2.8 kcal

(d) 14.2 kcal.

(1995)

AIIMS

Ans. c

. A battery is charged at a potential of 15 V for 8 h when the current flowing is 10 A. The battery on discharge supplies a current of 5 A for 15 h. The mean terminal voltage during discharge is 14 V. The watt-hour efficiency of the battery is *[CBSE AIPMT 2004]*

(a) 82.5% (b) 80% (c) 90% (d) 87.5%

Ans. d

Two resistance filaments of same length are connected first in series and then in parallel. Find the ratio of power dissipated in both cases assuming that equal current flows in the main circuit.

(a) 1 : 4 (b) 4 : 1

(c) 1 : 2 (d) 2 : 1.

AIIMS *(2000)*

Ans. b

A 60 W incandescent lamp operates at 120 V. The number of electrons passing through the filament per second will be

(a) 1.61×10^{12} (b) 3.12×10^{18}

(c) 7.21×10^{12} (d) 12.40×10^{13}.

(2000)

AIIMS

Ans. b

A metal rod consumes power P on passing current. If it is cut into two half and joined in parallel, it will consume power

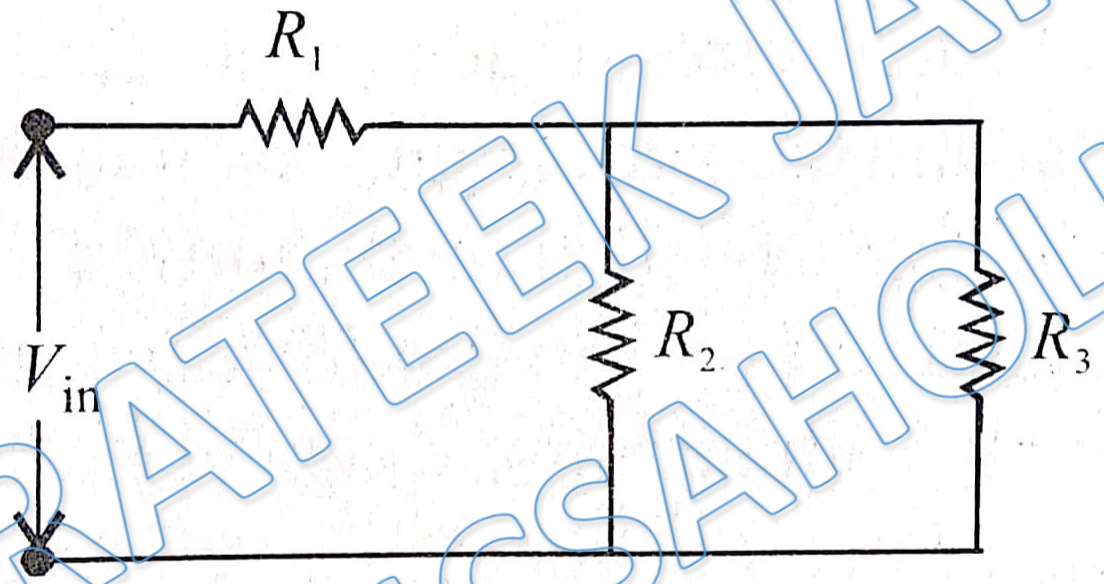
(a) P (b) $2P$

(c) $4P$ (d) $P/4$.

AIIMS (2001)

Ans. c

For ensuring dissipation of same energy in all three resistors (R_1, R_2, R_3) connected as shown in figure, their values must be related as



(a) $R_1 = R_2 = R_3$

(b) $R_2 = R_3$ and $R_1 = 4R_2$

(c) $R_2 = R_3$ and $R_1 = (1/4)R_2$

(d) $R_1 = R_2 + R_3$.

AIIMS

(2005)

Ans. c

Two heater wires, made of the same material and having the same length and the same radius, are first connected in series and then in parallel to a constant potential difference. If the rates of heat produced in the two cases are H_s and H_p respectively, then H_s/H_p will be

(a) 1/2 (b) 2

(c) 1/4 (d) 4.

AIIMS

(2008)

Ans. c

When a current is passed in a conductor, 5 °C rise in temperature is observed. If the strength of current is made thrice, rise in temperature will be

(a) 5 °C (b) 20 °C

(c) 45 °C (d) 15 °C

AIIMS

(2009, 2015)

Ans. c

PYQs on Following Subtopic:

Maximum power transfer theorem

Assertion : Current is passed through a metallic wire so that it becomes red hot. When cold water is poured on half of its portion, the rest of the half portion becomes more hot.

Reason : Resistance decreases due to decrease in temperature.

(2014)

AIIMS

Ans. a

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