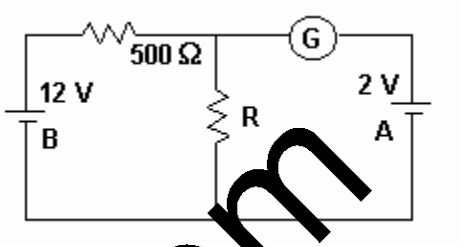
14 - CURRENT ELECTRICITY

(Answers at the end of all questions)

1) In the circuit, the galvanometer G shows zero deflection. If the batteries A and B have negligible internal resistance, the value of the resistor R will be



(a) 100 Ω (b) 200 Ω
(c) 1000 Ω (d) 500Ω [AIEEE 2005]

2) A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be

(a) 10^5 (b) 10^3 (c) 9995 (d) 99995 [AIEEE 2005]

3) Two sources of equal emf are connected to an external resistance R. The internal resistances of the two sources are R_1 and R_2 ($R_2 > R_1$). If the potential difference across the source having internal resistance R_2 is zero, then

(a) $R = R_2 - R_1$ (b) $R = R_2 \times \frac{R_1 + R_2}{R_2 - R_1}$ (c) $R = \frac{R_1 R_2}{R_2 - R_1}$ (d) $R = \frac{R_1 R_2}{R_1 + R_2}$

[AIEEE 2005]

4) In a potentiometer experiment the balancing with a cell is at 240 cm. On shunting the cell with a resistance of 2 Ω, the balancing length becomes 120 cm. The internal resistance of the cell is

(a) 0.5 Ω (b) 1 Ω (c) 2 Ω (d) 4 Ω [AIEEE 2005]

5) The resistance of hot tungsten filament is about 10 times the cold resistance. What will be the resistance of 100 W and 200 V lamp when not in use ?

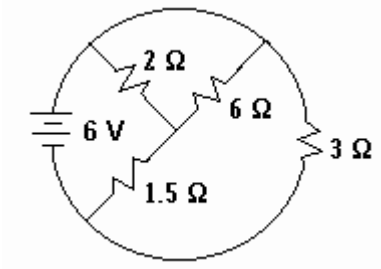
(a) 20 Ω (b) 40 Ω (c) 200 Ω (d) 400 Ω [AIEEE 2005]

6) An energy source will supply a constant current into the load if its internal resistance is

(a) very large as compared to the load resistance
(b) equal to the resistance of he load
(c) non-zero but less than the resistance of the load
(d) zero

[AIEEE 2005]

7) The total current supplied to the circuit by the battery is



(a) 1 A
(b) 2 A
(c) 4 A
(d) 6 A [AIEEE 2004]

8) An electric current is passed through a circuit containing two wires of the same material, connected in parallel. If the lengths and radii of the wires are in the ratio of 4 / 3 and 2 / 3, then the ratio of the currents passing through the wires will be

(a) 3 (b) 1 / 3 (c) 8 / 9 (d) 2 [AIEEE 2004]

9) The resistance of the series combination of two resistors is S. When they are joined in parallel, the total resistance is P. If S = nP, then the minimum possible value of n is

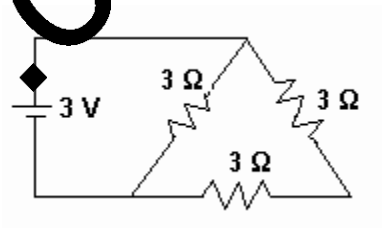
(a) 4 (b) 3 (c) 2 (d) 1 [AIEEE 2004]

(Answers at the end of all questions)

10) In a meter bridge experiment, null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If X < Y, then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y ?
(a) 50 cm (b) 80 cm (c) 40 cm (d) 70 cm [AIEEE 2004]

11) The thermistors are usually made of
(a) metals with low temperature coefficient of resistivity
(b) metals with high temperature coefficient of resistivity
(c) metal oxides with high temperature coefficient of resistivity
(d) semiconducting materials having low temperature coefficient of resistivity
[AIEEE 2004]

12) A 3 volt battery with negligible internal resistance is connected in a circuit as shown in the figure. The current I in the circuit will be
(a) 1 / 3 A (b) 1 A
(c) 1.5 A (d) 2 A
[AIEEE 2003]



13) The length of a given cylindrical wire is increased by 100 %. Due to this decrease in its diameter, the change in the resistance of the wire will be
(a) 300 % (b) 200 % (c) 100 % (d) 50 % [AIEEE 2003]

14) An ammeter reads upto 1 ampere. Its internal resistance 0.81 ohm. To increase the range to 10 ampere, the value of the required shunt is
(a) 0.09 Ω (b) 0.03 Ω (c) 0.3 Ω (d) 0.9 Ω [AIEEE 2003]

15) The length of a wire of potentiometer is 100 cm and the e.m.f. of its standard cell is E volt. It is employed to measure the e.m.f. of a battery whose internal resistance is 0.5 Ω. If the balance point is obtained at l = 30 cm from the positive end, the e.m.f. of the battery is
(a) 0.2 E (b) 0.3 E (c) 0.4 E (d) 0.5 E [AIEEE 2003]
(Note: The concept of potentiometer is incorrectly used in this question.)

16) The thermo-emf of a thermocouple is 25 μV / °C at room temperature. A galvanometer of 40 Ω, capable of detecting current as low as 10^{-5} A, is connected with the thermocouple. The smallest temperature difference that can be detected by the system is
(a) 20 °C (b) 16 °C (c) 12 °C (d) 8 °C [AIEEE 2003]

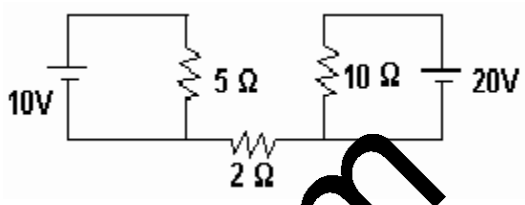
17) The resistance of a coil at 100 °C is 4.2 Ω. If temperature coefficient of resistance is 0.004 / °C, then its resistance at 0 °C is
(a) 6.5 Ω (b) 5 Ω (c) 3 Ω (d) 2.5 Ω [AIEEE 2002]

18) If a wire of resistance R is melted and recasted to half of its length, then the new resistance of the wire will be
(a) R / 4 (b) R / 2 (c) R (d) 2 R [AIEEE 2002]

19) A steady current flows in a metallic conductor of non-uniform cross-section. Which of the following quantity is constant along the conductor ?
(a) current (b) drift speed (c) current density (d) none of these [AIEEE 2002]

(Answers at the end of all questions)

20) Find out current in 2 Ω resistance.



(a) 0 (b) 2 A (c) 3 A (d) 5 A

[IIT 2005]

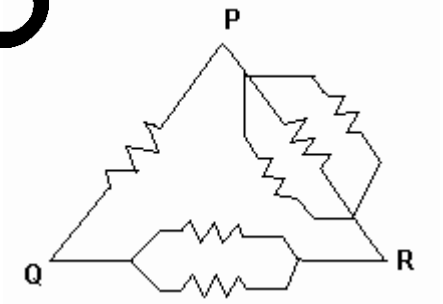
21) A galvanometer of resistance 100 Ω is converted to an ammeter using a resistance of 0.1 Ω. It gives full scale deflection at 100 μA. The minimum current in the circuit for maximum deflection is

(a) 100.1 mA (b) 1000.1 mA (c) 1.001 mA (d) 10.01 mA [IIT 2005]

22) A rigid container with thermally insulated walls contains a coil of resistance 100 Ω carrying current 1 A. Change in internal energy after 5 minutes is

(a) 0 kJ (b) 10 kJ (c) 20 kJ (d) 30 kJ [IIT 2005]

23) Six equal resistors are connected between points P, Q and R as shown in the figure. Then the next resistance will be maximum between

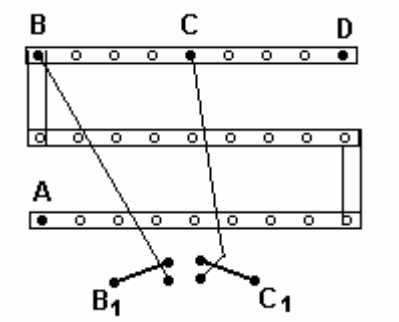


(a) P and Q (b) Q and R

(c) P and R (d) any two points

[IIT 2004]

24) For the post office box arrangement to determine the value of unknown resistance, the unknown resistance should be connected between



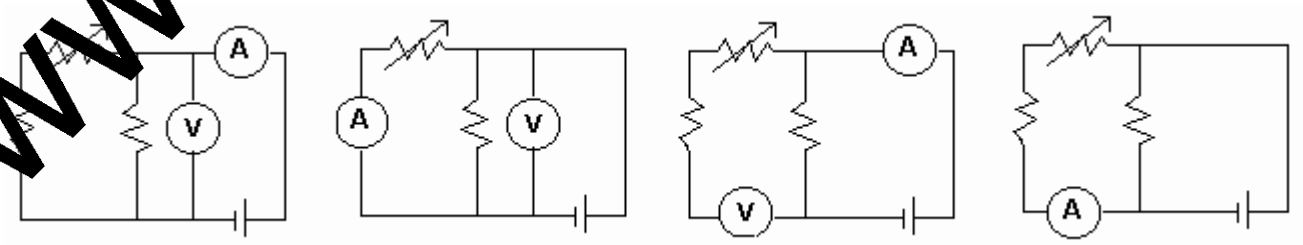
(a) B and C

(b) C and D

(c) A and D

(d) B_1 and C_1 [IIT 2004]

25) Express which of the following set ups can be used to verify Ohm's law ?



(a) (b) (c) (d)

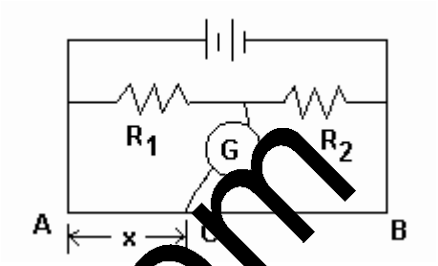
[IIT 2003]

26) The temperature coefficient of resistance of a wire is 0.00125 per °C. At 300 K its resistance is 1 ohm. The resistance of the wire will be 2 ohm at

(a) 1154 K (b) 1100 K (c) 1400 K (d) 1127 K [IIT 1980]

(Answers at the end of all questions)

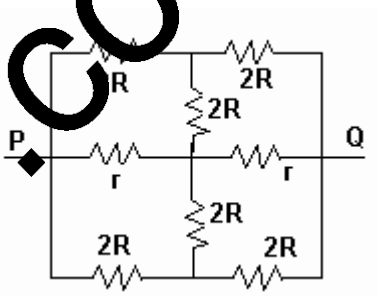
27) In the sown arrangement of the experiment of the meter bridge if AC corresponding to null deflection of galvanometer is x, what would be its value if the radius of the wire AB is doubled ?



(a) x (b) x / 4 (c) 4x (d) 2x

[IIT 2003]

28) The effective resistance between points P and Q of the electrical circuit shown in the figure is



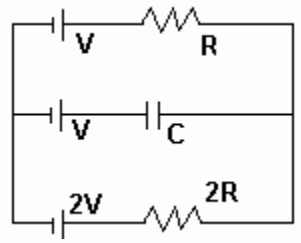
(a) $\frac{2Rr}{R+r}$ (b) $\frac{8R(R+r)}{3R+r}$

(c) 2r + 4R (d) 5R /2 + 2r [IIT 2002]

29) The potential difference applied to an X-ray tube is 5 kV and the current through it is 3.2 mA. Then the number of electrons striking the target per second is

(a) 2×10^{16} (b) 5×10^{6} (c) 1×10^{7} (d) 4×10^{15} [IIT 2002]

30) In the given circuit, with steady current, the potential drop across the capacitor must be

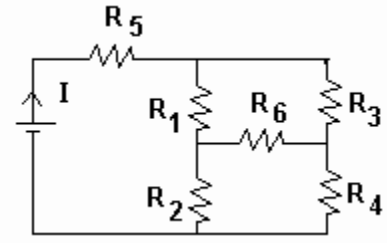


(a) V (b) V / 2

(b) V / 3 (d) 2V / 3

[IIT 2001]

31) In the given circuit, it is observed that the current I is independent of the value of the resistance R_6. Then the resistance values must satisfy

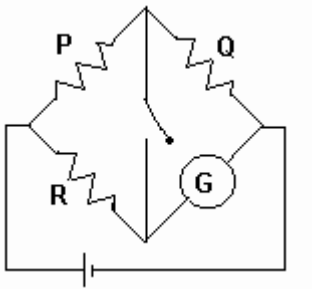


(a) $R_1 R_2 R_5 = R_3 R_4 R_6$

(b) $\frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{R_1 + R_2} + \frac{1}{R_3 + R_4}$

(c) $R_1 R_4 = R_2 R_3$ (d) $R_1 R_2 = R_2 R_4$ [IIT 2001]

32) In the circuit shown, P ≠ R. The reading in the galvanometer is the same with switch S open or closed. Then

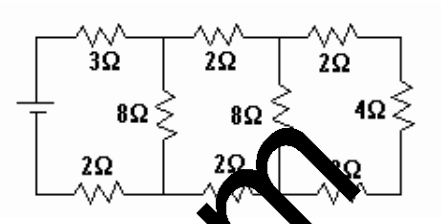


(a) $I_R = I_G$ (b) $I_P = I_G$

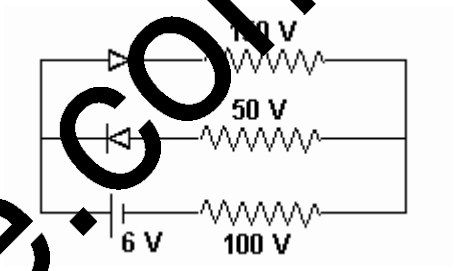
(c) $I_Q = I_G$ (d) $I_Q = I_R$ [IIT 1999]

(Answers at the end of all questions)

33) In the circuit shown in the figure, the current through
(a) the 3Ω resistor is 0.50 A
(b) the 3Ω resistor is 0.25 A
(c) the 4Ω resistor is 0.50 A
(d) the 4Ω resistor is 0.25 A [IIT 1998]

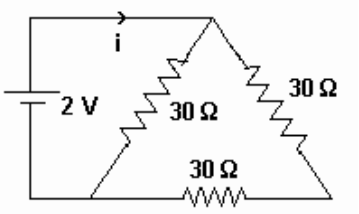


34) The circuit shown in the figure contains two diodes each with a forward resistance of 50 Ω and with infinite backward resistance. If the battery voltage is 6 V, the current through the 100 Ω resistor (in A) is
(a) zero (b) 0.02 (c) 0.03 (d) 0.036
[IIT 1997]



35) A steady current flows in a metallic conductor of non-uniform cross-section. The quantity / quantities constant along the length of the conductor is / are
(a) current, electric field and drift velocity
(b) drift speed only
(c) current and drift speed
(d) current only [IIT 1997]

36) The current i in the circuit is



(a) 1 / 45 A (b) 1 / 15 A
(c) 1 / 10 A (d) 1 / 5 A
[IIT 1983]

37) A charge of 3 C experiences a force of 3000 N when it is moved in a uniform electric field. What is the potential difference between two points separated by a distance of 1 cm ?
(a) 10 V (b) 90 V (c) 1000 V (d) 100 V

38) A current I flows in a wire of circular cross-section with the free electrons traveling with a drift velocity V. What is the drift velocity of electrons when a current 2 I flows in another wire of twice the radius and of the same material ?
(a) 2 V (b) V (c) V / 2 (d) V / 4

39) A piece of copper wire is cut into ten equal parts. These parts are connected in parallel. The joint resistance of the parallel combination will be equal to the original resistance of the uncut wire, multiplied by a factor of
(a) 0.01 (b) 0.1 (c) 1 (d) 10

40) Using the resistors R_1 and R_2 singly, in series and in parallel combination, we can get 4, 5, 20 and 25 Ω. Then R_1, R_2 are
(a) 4, 5 (b) 5, 20 (c) 20, 25 (d) 25, 4

(Answers at the end of all questions)

41) Six wires each of resistance R are connected to form a hexagon. To each vertex of the hexagon one end of a wire of resistance R is connected. The other ends of six such resistors connected to the vertices of the hexagon are connected to a common point 'A'. Similarly, six more such resistors of resistance R are connected to the vertices and their other ends are connected to a common point 'B'. The equivalent resistance of the combination across 'A' and 'B' is
(a) 6 R (b) R / 2 (c) R / 3 (d) 18 R

42) The masses of the three wires of copper are in the ratio of 1 : 3 : 5 and their lengths are in the ratio of 5 : 3 : 1. The ratio of their electrical resistances is
(a) 1 : 3 : 5 (b) 5 : 3 : 1 (c) 1 : 15 : 125 (d) 125 : 15 : 1

43) The resistance of 20 cm long wire is 5 Ω. If it is stretched to 40 cm length, the new resistance in ohm is
(a) 5 (b) 10 (c) 20 (d) 40

44) The resistance of a carbon filament at 0° C is 100 Ω. It is connected in series to an iron wire. The temperature coefficient of resistivity of carbon and iron are - 0.0003 and + 0.0052 per °C. respectively. The resistance of iron wire so that the combined resistance does not change with temperature is
(a) 15 Ω (b) 6 Ω (c) 1.5 Ω (d) 18 Ω

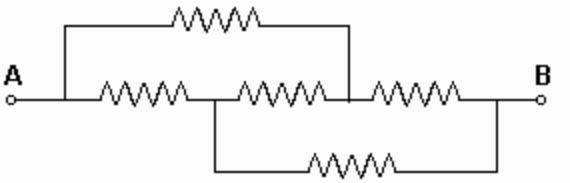
45) Resistivity of iron is 10^{-7} Ω-m. The resistance of an iron wire is 1 Ω. If its diameter is halved and length doubled, the resistivity in Ω-m will be equal to
(a) 10^{-7} (b) 2×10^{-7} (c) 3×10^{-7} (d) 4×10^{-7}

46) The number of free electrons per unit volume in copper is n. The electrons each of charge q flowing with velocity v constitute current I. If A is the cross-sectional area of the wire, the current density in the wire is
(a) n A q / v (b) n q / v (c) n A q v (d) n q v

47) If the change in resistance of a copper wire on stretching is 0.4 %, then its length is stretched by
(a) 0.1 % (b) 0.2 % (c) 0.4 % (d) 0.6 %

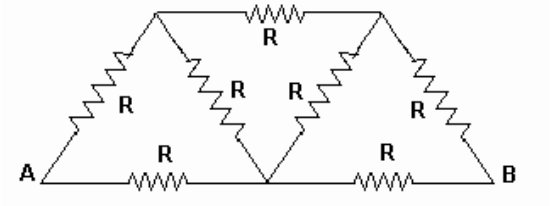
48) If an electron makes 25×10^{15} rev / s around the nucleus of an atom in an orbit of radius 1 Å, the equivalent current is nearly
(a) 4×10^{-2} A (b) 4×10^{-3} A (c) 1.6×10^{-4} A (d) 10^{-3} A

49) Five resistors, each equal to r ohm are connected as shown in the figure. The equivalent resistance between A and B is



(a) r (b) 5 r (c) r / 5 (d) 2 r / 3

50) In the network shown in the circuit, each resistance is R ohm. The effective resistance between A and B is

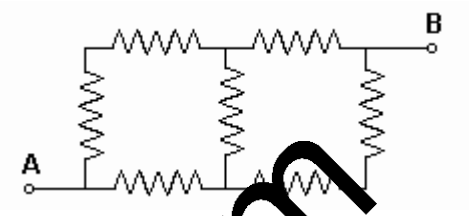


(a) (4 / 3) R (b) (3 / 2) R
(c) 7 R (d) (8 / 7) R

14 - CURRENT ELECTRICITY

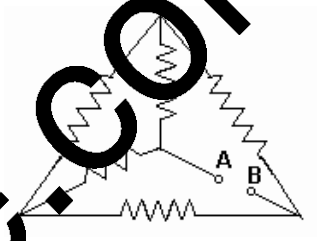
(Answers at the end of all questions)

51) In the network shown, each resistance is of 10 Ω. The equivalent resistance between A and B is



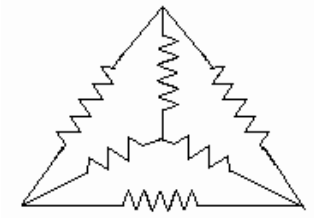
(a) 70 Ω (b) 50 Ω (c) 10 Ω (d) 14 Ω

52) In the network shown, each resistance is r ohm. The equivalent resistance between A and B is



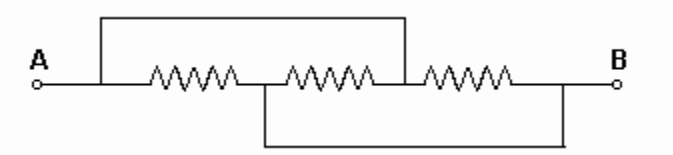
(a) r / 2 (b) r (c) 2 r (d) 3 r

53) In the network shown, each resistor is of 10 Ω. The equivalent resistance between any two corners is



(a) 60 Ω (b) 30 Ω (c) 20 Ω (d) 5 Ω

54) Three resistors, 1, 2 and 3 Ω are connected end to end in the circuit shown in the figure. The equivalent resistance between A and B in ohm is



(a) 6 / 11 (b) 11 / 6

(c) 6 (d) 5

Answers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
a	c	a	c	b	a	c	b	a	a	d	c	a	a	b	b	c	a	a	a

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
a	d	a	c	a	d	a	a	a	c	c	a	d	b	d	c	a	c	a	b

41	42	43	44	45	46	47	48	49	50	51	52	53	54
c	d	c	b	a	d	b	b	a	d	d	b	d	a