ELECTRIC CURRENT DPP

1. In an electrical cable there is a single wire of radius 9 *mm* of copper. Its resistance is $5\,\Omega$. The cable is replaced by 6 different insulated copper wires, the radius of each wire is $3\,mm$. Now the total resistance of the cable will be

(a) $7.5\,\Omega$ (b) $45\,\Omega$

(c) $90\,\Omega$ (d) $270\,\Omega$

2. Two uniform wires A and B are of the same metal and have equal masses. The radius of wire A is twice that of wire B. The total resistance of A and B when connected in parallel is

(a) $4\,\Omega$ when the resistance of wire A is $4.25\,\Omega$

(b) $5\,\Omega$ when the resistance of wire A is $4.25\,\Omega$

(c) $4\,\Omega$ when the resistance of wire B is $4.25\,\Omega$

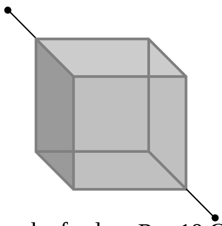
(d) $4\,\Omega$ when the resistance of wire B is $4.25\,\Omega$

3. Twelve wires of equal length and same cross-section are connected in the form of a cube. If the resistance of each of the wires is R, then the effective resistance between the two diagonal ends would be

(a) $2\,R$

(b) $12\,R$

(c) $\frac{5}{6}R$



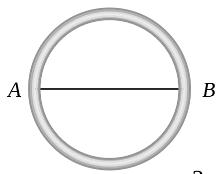
(d) $8\,R$

4. You are given several identical resistances each of value $R = 10\,\Omega$ and each capable of carrying maximum current of 1 ampere. It is required to make a suitable combination of these resistances to produce a resistance of $5\,\Omega$ which can carry a current of 4 amperes. The minimum number of resistances of the type R that will be required for this job

(a) 4 (b) 10

(c) 8 (d) 20

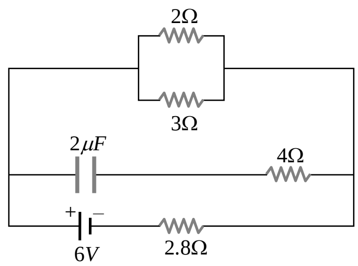
5. The resistance of a wire is $10^{-6}\,\Omega$ per metre. It is bend in the form of a circle of diameter $2\,m$. A wire of the same material is connected across its diameter. The total resistance across its diameter *AB* will be



(a) $\frac{4}{3}\pi \times 10^{-6}\,\Omega$ (b) $\frac{2}{3}\pi \times 10^{-6}\,\Omega$

(c) $0.88 \times 10^{-6}\,\Omega$ (d) $14\pi \times 10^{-6}\,\Omega$

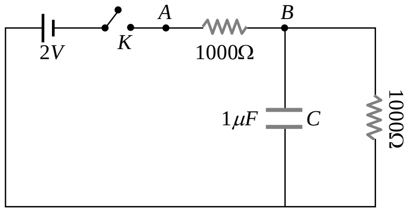
6. In the figure shown, the capacity of the condenser C is $2\,\mu F$. The current in $2\,\Omega$ resistor is



(a) $9\,A$ (b) $0.9\,A$

(c) $\frac{1}{9}A$ (d) $\frac{1}{0.9}A$

7. When the key K is pressed at time $t = 0$, which of the following statements about the current I in the resistor AB of the given circuit is true



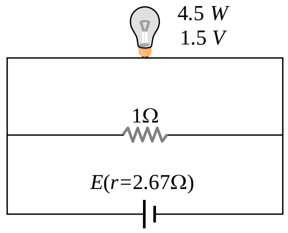
(a) $I = 2\ mA$ at all t

(b) I oscillates between 1 mA and 2mA

(c) $I = 1\ mA$ at all t

(d) At $t = 0$, $I = 2\ mA$ and with time it goes to 1 mA

8. A torch bulb rated as 4.5 W, 1.5 V is connected as shown in the figure. The *e.m.f.* of the cell needed to make the bulb glow at full intensity is



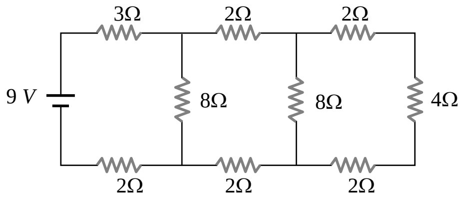
(a) 4.5 V

(b) 1.5 V

(c) 2.67 V

(d) 13.5 V

9. In the circuit shown in the figure, the current through



(a) The 3Ω resistor is 0.50A

(b) The 3Ω resistor is 0.25 A

(c) The 4Ω resistor is 0.50A

(d) The 4Ω resistor is 0.25 A

10. There are three resistance coils of equal resistance. The maximum number of resistances you can obtain by connecting them in any manner you choose, being free to use any number of the coils in any way is

(a) 3

(b) 4

(c) 6

(d) 5

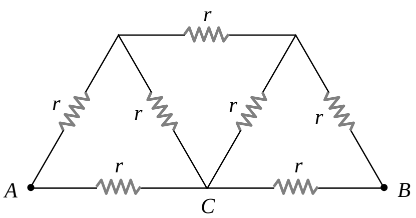
11. In the circuit shown, the value of each resistance is r, then equivalent resistance of circuit between points A and B will be

(a) (4/3) r

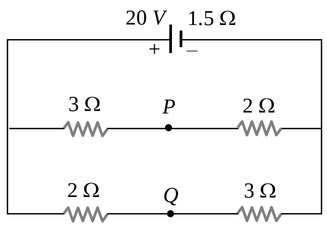
(b) 3r / 2

(c) r / 3

(d) 8r / 7



12. If in the circuit shown below, the internal resistance of the battery is 1.5 Ω and V_P and V_Q are the potentials at P and Q respectively, what is the potential difference between the points P and Q



(a) Zero

(b) 4 *volts* ($V_P > V_Q$)

(c) 4 *volts* ($V_Q > V_P$)

(d) 2.5 *volts* ($V_Q > V_P$)

13. Two wires of resistance R_1 and R_2 have temperature coefficient of resistance α_1 and α_2, respectively. These are joined in series. The effective temperature coefficient of resistance is

(a) $\frac{\alpha_1 + \alpha_2}{2}$ (b) $\sqrt{\alpha_1 \alpha_2}$

(c) $\frac{\alpha_1 R_1 + \alpha_2 R_2}{R_1 + R_2}$ (d) $\frac{\sqrt{R_1 R_2 \alpha_1 \alpha_2}}{\sqrt{R_1^2 + R_2^2}}$

14. Two cells of equal *e.m.f.* and of internal resistances r_1 and $r_2 (r_1 > r_2)$ are connected in series. On connecting this combination to an external resistance R, it is observed that the potential difference across the first cell becomes zero. The value of R will be

(a) $r_1 + r_2$ (b) $r_1 - r_2$

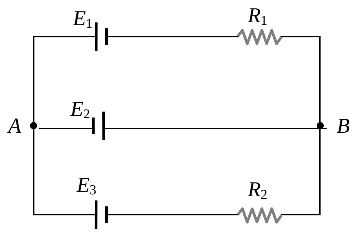
(c) $\frac{r_1 + r_2}{2}$ (d) $\frac{r_1 - r_2}{2}$

15. When connected across the terminals of a cell, a voltmeter measures 5 *V* and a connected ammeter measures 10 *A* of current. A resistance of 2 *ohms* is connected across the terminals of the cell. The current flowing through this resistance will be

(a) 2.5 *A* (b) 2.0 *A*

(c) 5.0 *A* (d) 7.5 *A*

16. In the circuit shown here, $E_1 = E_2 = E_3 = 2$ *V* and $R_1 = R_2 = 4$ *ohms*. The current flowing between points *A* and *B* through battery E_2 is



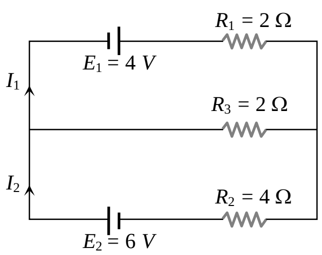
(a) Zero

(b) 2 *amp* from *A* to *B*

(c) 2 *amp* from *B* to *A*

(d) None of the above

17. In the circuit shown below $E_1 = 4.0$ *V*, $R_1 = 2\ \Omega$, $E_2 = 6.0$ *V*, $R_2 = 4\ \Omega$ and $R_3 = 2\ \Omega$. The current I_1 is



(a) 1.6 *A*

(b) 1.8 *A*

(c) 1.25 *A*

(d) 1.0 *A*

18. A microammeter has a resistance of $100\ \Omega$ and full scale range of $50\ \mu A$. It can be used as a voltmeter or as a higher range ammeter provided a resistance is added to it. Pick the correct range and resistance combination

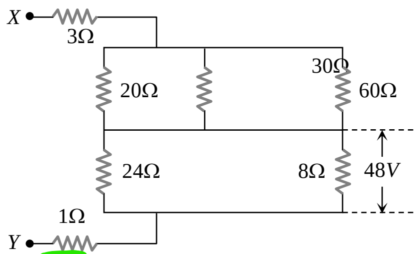
(a) 50 *V* range with $10\ k\Omega$ resistance in series

(b) 10 *V* range with $200\ k\Omega$ resistance in series

(c) 10 *mA* range with 1Ω resistance in parallel

(d) 10 *mA* range with 0.1Ω resistance in parallel

19. The potential difference across 8 *ohm* resistance is 48 *volt* as shown in the figure. The value of potential difference across *X* and *Y* points will be



(a) 160 *volt*

(b) 128 *volt*

(c) 80 *volt*

(d) 62 *volt*

20. Two resistances R_1 and R_2 are made of different materials. The temperature coefficient of the material of R_1 is α and of the material of R_2 is $-\beta$. The resistance of the series combination of R_1 and R_2 will not change with temperature, if R_1 / R_2 equals

(a) $\frac{\alpha}{\beta}$ (b) $\frac{\alpha+\beta}{\alpha-\beta}$

(c) $\frac{\alpha^2+\beta^2}{\alpha\beta}$ (d) $\frac{\beta}{\alpha}$

21. An ionization chamber with parallel conducting plates as anode and cathode has 5×10^7 electrons and the same number of singly-charged positive ions per cm^3. The electrons are moving at 0.4 *m/s*. The current density from anode to cathode is $4\ \mu A/m^2$. The velocity of positive ions moving towards cathode is

(a) 0.4 *m/s* (b) 16 *m/s*

(c) Zero (d) 0.1 *m/s*

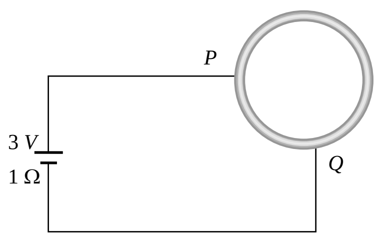
22. A wire of resistance 10 Ω is bent to form a circle. *P* and *Q* are points on the circumference of the circle dividing it into a quadrant and are connected to a Battery of 3 *V* and internal resistance 1 Ω as shown in the figure. The currents in the two parts of the circle are

(a) $\frac{6}{23}A$ and $\frac{18}{23}A$

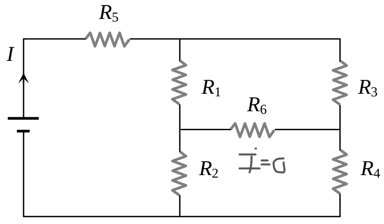
(b) $\frac{5}{26}A$ and $\frac{15}{26}A$

(c) $\frac{4}{25}A$ and $\frac{12}{25}A$

(d) $\frac{3}{25}A$ and $\frac{9}{25}A$



23. 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) $R_1R_2R_5 = R_3R_4R_6$

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

(c) $R_1R_4 = R_2R_3$

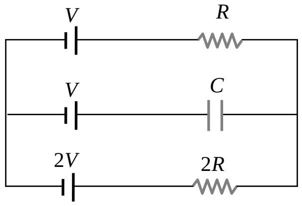
(d) $R_1R_3 = R_2R_4 = R_5R_6$

24. In the given circuit, with steady current, the potential drop across the capacitor must be

(a) V

(b) $V/2$

(c) $V/3$



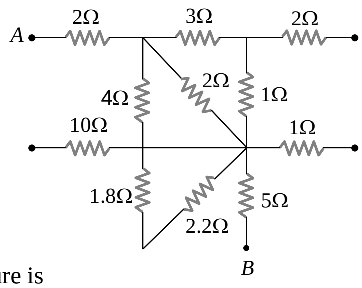
(d) $2V/3$

25. A wire of length L and 3 identical cells of negligible internal resistances are connected in series. Due to current, the temperature of the wire is raised by ΔT in a time t. A number N of similar cells is now connected in series with a wire of the same material and cross–section but of length 2 L. The temperature of the wire is raised by the same amount ΔT in the same time t. the value of N is

(a) 4 (b) 6

(c) 8 (d) 9

26. What is the equivalent resistance between the points A and B of the network



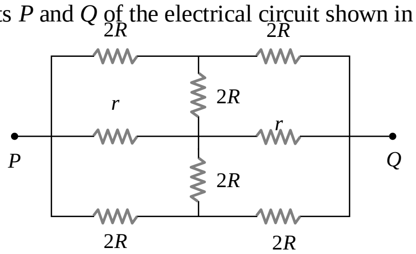
(a) $\dfrac{57}{7}\Omega$

(b) $8\,\Omega$

(c) $6\,\Omega$

(d) $\dfrac{57}{5}\Omega$

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



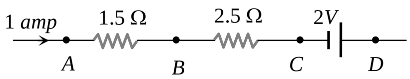
(a) $2Rr/(R+r)$

(b) $8R(R+r)/(3R+r)$

(c) $2r + 4R$

(d) $5R/2 + 2r$

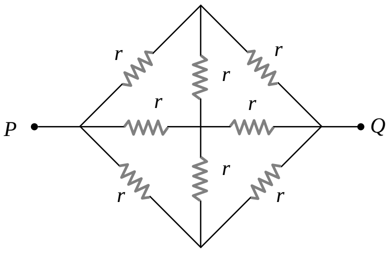
28. In the circuit element given here, if the potential at point B, $V_B = 0$, then the potentials of A and D are given as



(a) $V_A = -1.5\,V, V_D = +2\,V$ (b) $V_A = +1.5\,V, V_D = +2\,V$

(c) $V_A = +1.5\,V, V_D = +0.5\,V$ (d) $V_A = +1.5\,V, V_D = -0.5\,V$

29. The equivalent resistance between the points P and Q in the network given here is equal to (given $r = \frac{3}{2}\Omega$)



(a) $\frac{1}{2}\,\Omega$

(b) $1\,\Omega$

(c) $\frac{3}{2}\,\Omega$

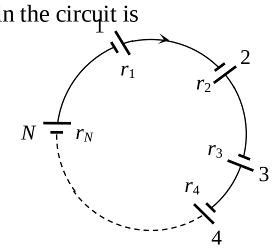
(d) $2\,\Omega$

30. The current in a conductor varies with time t as $I = 2t + 3t^2$ where I is in *ampere* and t in *seconds*. Electric charge flowing through a section of the conductor during $t = 2$ *sec* to $t = 3$ *sec* is

(a) 10 C (b) 24 C

(c) 33 C (d) 44 C

31. A group of N cells whose *emf* varies directly with the internal resistance as per the equation $E_N = 1.5\, r_N$ are connected as shown in the figure below. The current I in the circuit is



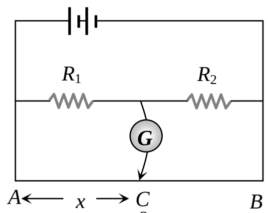
(a) 0.51 *amp*

(b) 5.1 *amp*

(c) 0.15 *amp*

(d) 1.5 *amp*

32. In the shown 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) $4x$

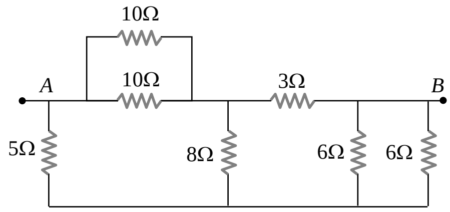
(d) $2x$

33. The resistance of a wire of iron is 10 *ohms* and temp. coefficient of resistivity is $5 \times 10^{-3}/°C$. At $20°C$ it carries 30 *milliamperes* of current. Keeping constant potential difference between its ends, the temperature of the wire is raised to $120°C$. The current in *milliamperes* that flows in the wire is

(a) 20 (b) 15

(c) 10 (d) 40

34. Seven resistances are connected as shown in the figure. The equivalent resistance between A and B is



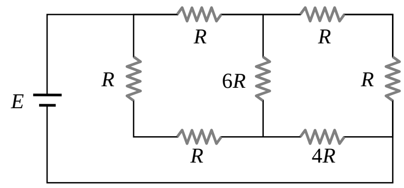
(a) $3\,\Omega$

(b) $4\,\Omega$

(c) $4.5\,\Omega$

(d) $5\,\Omega$

35. A battery of internal resistance 4Ω is connected to the network of resistances as shown. In order to give the maximum power to the network, the value of R (in Ω) should be



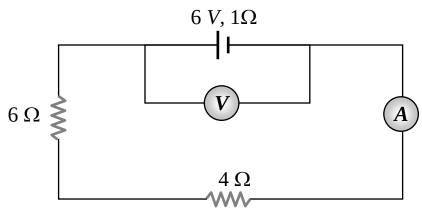
(a) 4/9

(b) 8/9

(c) 2

(d) 18

36. In the circuit shown here, the readings of the ammeter and voltmeter are



(a) 6 A, 60 V

(b) 0.6 A, 6 V

(c) 6/11 A, 60/11 V

(d) 11/6 *A*, 11/60 *V*

37. Length of a hollow tube is 5*m*, it's outer diameter is 10 *cm* and thickness of it's wall is 5 *mm*. If resistivity of the material of the tube is 1.7×10^{-8} $\Omega \times m$ then resistance of tube will be

(a) $5.6 \times 10^{-5}\ \Omega$ (b) $2 \times 10^{-5}\ \Omega$

(c) $4 \times 10^{-5}\ \Omega$ (d) None of these

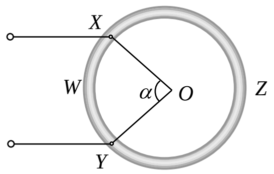
38. A wire of resistor *R* is bent into a circular ring of radius *r*. Equivalent resistance between two points *X* and *Y* on its circumference, when angle *XOY* is α, can be given by

(a) $\frac{R\alpha}{4\pi^2}(2\pi - \alpha)$

(b) $\frac{R}{2\pi}(2\pi - \alpha)$

(c) $R\,(2\pi - \alpha)$

(d) $\frac{4\pi}{R\alpha}(2\pi - \alpha)$



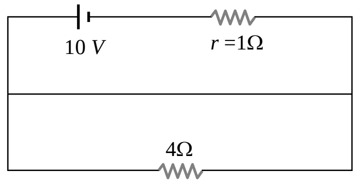
39. Potential difference across the terminals of the battery shown in figure is (*r* = internal resistance of battery)

(a) 8 *V*

(b) 10 *V*

(c) 6 *V*

(d) Zero



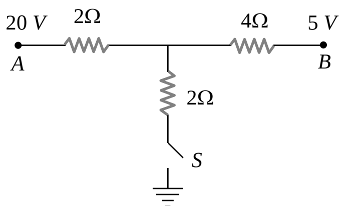
40. As the switch *S* is closed in the circuit shown in figure, current passed through it is

(a) 4.5 *A*

(b) 6.0 *A*

(c) 3.0 *A*

(d) Zero



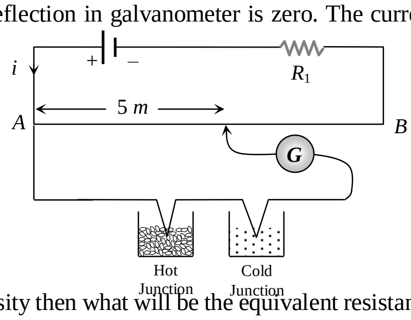
41. In the following circuit a 10 *m* long potentiometer wire with resistance 1.2 *ohm/m*, a resistance R_1 and an accumulator of emf 2 *V* are connected in series. When the emf of thermocouple is 2.4 *mV* then the deflection in galvanometer is zero. The current supplied by the accumulator will be

(a) $4 \times 10^{-4}\ A$

(b) $8 \times 10^{-4}\ A$

(c) $4 \times 10^{-3}\ A$

(d) $8 \times 10^{-3}\ A$



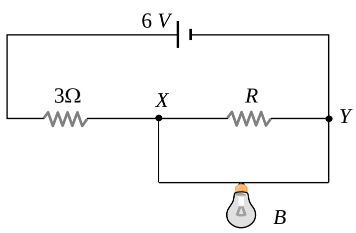
42. In the following circuit, bulb rated as 1.5 *V*, 0.45 *W*. If bulbs glows with full intensity then what will be the equivalent resistance between *X* and *Y*

(a) 0.45 Ω

(b) 1 Ω

(c) 3 Ω

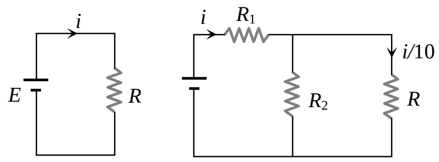
(d) 5 Ω



43. Consider the circuits shown in the figure. Both the circuits are taking same current from battery but current through *R* in the second circuit is $\frac{1}{10}$ *th* of current through *R* in the first circuit. If *R* is 11 Ω, the value of R_1

(a) 9.9 Ω

(b) 11 Ω



(a) (b)

(c) 8.8 Ω

(d) 7.7 Ω

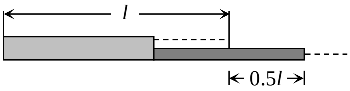
44. In order to quadruple the resistance of a uniform wire, a part of its length was uniformly stretched till the final length of the entire wire was 1.5 times the original length, the part of the wire was fraction equal to

(a) 1 / 8

(b) 1 / 6

(c) 1 / 10

(d) 1 / 4



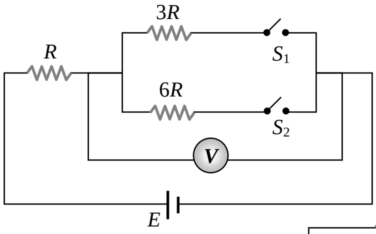
45. In the circuit shown in figure reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then

(a) $V_3 > V_2 > V_1$

(b) $V_2 > V_1 > V_3$

(c) $V_3 > V_1 > V_2$

(d) $V_1 > V_2 > V_3$



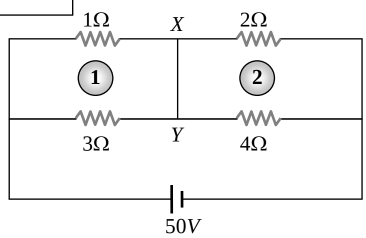
46. Current through wire XY of circuit shown is

(a) 1 A

(b) 4 A

(c) 2 A

(d) 3 A

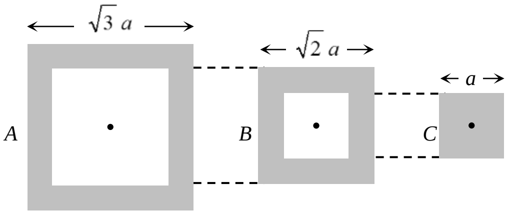


47. 12 cells each having same emf are connected in series with some cells wrongly connected. The arrangement is connected in series with an ammeter and two cells which are in series. Current is 3 A when cells and battery aid each other and is 2 A when cells and battery oppose each other. The number of cells wrongly connected is

(a) 4 (b) 1

(c) 3 (d) 2

48. Following figure shows cross-sections through three long conductors of the same length and material, with square cross-section of edge lengths as shown. Conductor B will fit snugly within conductor A, and conductor C will fit snugly within conductor B. Relationship between their end to end resistance is



(a) $R_A = R_B = R_C$

(b) $R_A > R_B > R_C$

(c) $R_A < R_B < R$

(d) Information is not sufficient

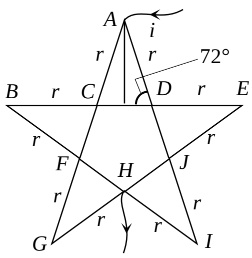
49. In the following star circuit diagram (figure), the equivalent resistance between the points A and H will be

(a) 1.944 r

(b) 0.973 r

(c) 0.486 r

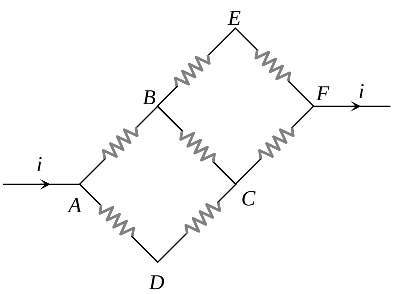
(d) 0.243 r



50. In the adjoining circuit diagram each resistance is of 10 Ω. The current in the arm AD will be

(a) $\frac{2i}{5}$

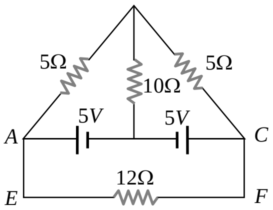
(b) $\frac{3i}{5}$



(c) $\frac{4i}{5}$

(d) $\frac{i}{5}$

51. In the circuit of adjoining figure the current through 12 Ω resister will be



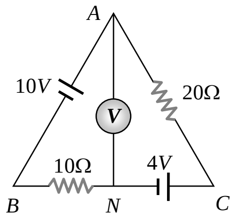
(a) 1 A

(b) $\frac{1}{5}A$

(c) $\frac{2}{5}A$

(d) 0 A

52. The reading of the ideal voltmeter in the adjoining diagram will be



(a) 4 V

(b) 8 V

(c) 12 V

(d) 14 V

53. The resistance of the series combination of two resistance 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

54. 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) 99995 (b) 9995

(c) 10^3 (d) 10^5

ANSWER KEY

1	a	2	a	3	c	4	c	5	c
6	b	7	d	8	d	9	d	10	b
11	d	12	d	13	c	14	b	15	b
16	b	17	b	18	b	19	a	20	d
21	d	22	a	23	c	24	c	25	b
26	b	27	a	28	d	29	b	30	b
31	d	32	a	33	a	34	b	35	c
36	c	37	a	38	a	39	d	40	a
41	a	42	b	43	a	44	a	45	b
46	c	47	b	48	a	49	b	50	a
51	d	52	b	53	a	54	b		