CLASS : CC (ADVANCED) **CURRENT ELECTRICITY** **MM : 78** **TEST - 4**

[SINGLE CORRECT CHOICE TYPE]

Q.1 n identical cells each of emf ε and internal resistance r are joined in series so as to form a closed circuit. The P.D. across any one cell is **[3]**

(A) zero (B) ε (C) ε/n (D) $\frac{n-1}{n}\varepsilon$

Q.2 A millimeters of range 10 mA has a coil of resistance 1Ω .To use it as an ammeter of range 1 A, the required shunt must have a resistance of **[3]**

(A) $\frac{1}{101}\ \Omega$ (B) $\frac{1}{100}\Omega$ (C) $\frac{1}{99}\ \Omega$ (D) $\frac{1}{9}\Omega$

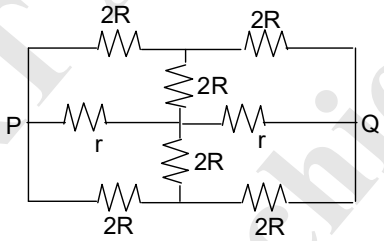
Q.3 The charge on a capacitor is reduced to η times in time t, when it discharges through a circuit with a time constant τ. Then t is given by **[3]**

(A) $t = \eta\tau$ (B) $t = \tau \ln \eta$ (C) $t = \tau \ln(\eta - 1)$ (D) $t = \tau \ln\left(1-\frac{1}{\eta}\right)$

Q.4 A cell of e.m.f. E and internal resistance r is connected in series with an external resistance nr, then the ratio of the terminal potential difference to E.M.F. is **[3]**

(A) 1/n (B) $\frac{1}{n+1}$ (C) $\frac{n}{n+1}$ (D) $\frac{n+1}{n}$

Q.5 The effective resistance between points P and Q of the electrical circuit in figure is **[3]**

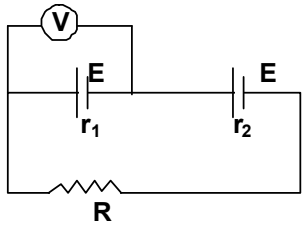


(A) 2Rr / (R + r) (B) 8R(R + r)/ 3R + r (C) 2r + 4R (C) 5R/2+2r

Q.6 If two bulbs of 25 W & 100 W rated at 200 volts are connected in series across a 440 volts supply, then **[3]**

(A) 100 watt bulb will fuse (B) 25 watt bulb will fuse
(C) None of the bulb will fuse (D) both the bulbs will fuse

Q.7 In the adjoining figure, the reading of an ideal voltmeter V is zero, then the relation between resistance R, r_1 & r_2 is **[3]**



(A) $R = r_2 - r_1$ (B) $R = r_1 - r_2$ (C) $R = r_1 + r_2$ (D) $R = \frac{r_1 r_2}{r_2 + r_1}$

Q.8 The temperature coefficient of resistance of a wire is 0.00125 $^oC^{-1}$. At 300 K its resistance is one ohm. The resistance of the wire will be 2 ohm at **[3]**

(A) 854 K (B) 1100 K (C) 1400 K (D) 1127 K

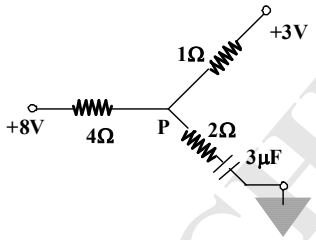
Q.9 In the experiment of calibration of voltmeter a 1.1 V standard cell gets balanced at 440 cm length of wire. The balancing length corresponding to a potential difference between the end of a resistance comes cut to be 190 cm. A voltmeter shows 0.5 V for this potential difference. The error in the reading of voltmeter will be **[3]**

(A) 0.025 V (B) 25 V (C) 2.5 V (D) 0.25 V

Q.10 A house wiring supplied with 220 V supply line is protected by a 9 A fuse. The maximum number of 60 W bulbs in parallel that can be turned on is **[3]**

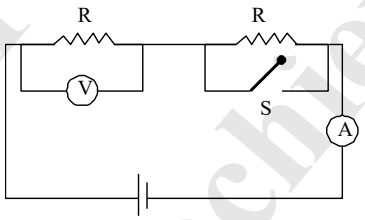
(A) 44 (B) 33 (C) 22 (D) 11

Q.11 The energy stored in the capacitor in the steady state is **[3]**



(A) 6 μJ (B) 24 μJ (C) 96 μJ (D) none of these

Q.12 In the circuit in figure below V is high resistance voltmeter and A is a low resistance ammeter. Switch S is open. **[3]**



The effect on the voltmeter and ammeter reading respectively when switch S is closed is

(A) increases, increases (B) increases, decreases

(C) increases, remains same (D) decreases, decreases

Q.13 Charge Q is evenly distributed over a non conducting disc of radius R. If it rotates about its axis with an angular velocity ω, the equivalent current across its one of the radius is **[3]**

(A) Zero (B) Q ω/π (C) Q ω/2π (D) Q ω/4π

Q.14 The current in a wire varies with time according to the equation I = 4 + 2t, where I is in ampere and t is in sec. The quantity of charge which has passed through a cross-section of the wire during the time t = 2 sec to t = 6 sec will be **[3]**

(A) 60 coulomb (B) 24 coulomb (C) 48 coulomb (D) 30 coulomb

Q.15 To measure potential difference across a resistor of resistance RΩ connected to a battery, a voltmeter of resistance R_v is used. To measure the potential with a minimum accuracy of 95 %, then **[3]**

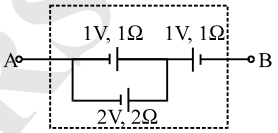
(A) $R_v \le 5R$ (B) $R_v \le 19R$ (C) $R_v \ge 10R$ (D) $R_v \ge 19R$

Q.16 A 24 V battery of internal resistance r = 4Ω is connected to a variable resistance R. The rate of heat dissipated in the resistor is maximum when the current drawn from the battery is I. The current drawn from the battery will be I/2 when R is equal to **[3]**

(A) 8Ω (B) 12Ω (C) 16Ω (D) 20Ω

[MULTIPLE CORRECT CHOICE TYPE]

Q.17 An electric box contains three e.m.f. sources as shown in the figure **[4]**



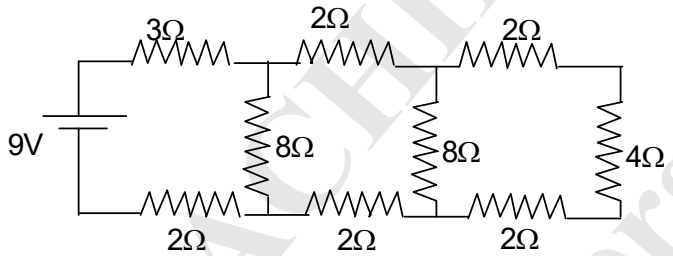
(A) emf of the electric box is $\frac{1}{3}$ V

(B) point B is at higher potential than point A

(C) internal resistance of the box is $\frac{5}{3}\Omega$

(D) terminal voltage for 2V source is $\frac{4}{3}$ V

Q.18 In the circuit shown in figure below the current through **[4]**



(A) the 3Ω resistor is 1 A (B) the 3Ω resistor is 0.2 A

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Q.19 A constant voltage is applied between two ends of a uniform conducting wire, if both the length and radius of the wire are doubled **[4]**

(A) the heat produced in the wire will doubled

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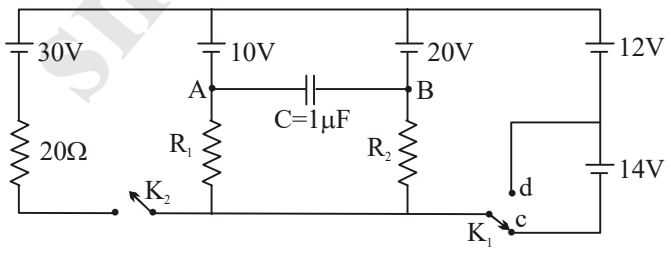
[MATRIX TYPE]

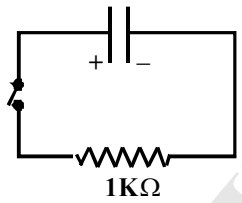
Q.20 A circuit involving five ideal cells, three resistance (R_1, R_2 and 20Ω) and a capacitor of capacitance C = 1 μF is shown. Match the conditions in Column-I with results given in Column-II. [Assuming circuit is in steady state] **[8]**



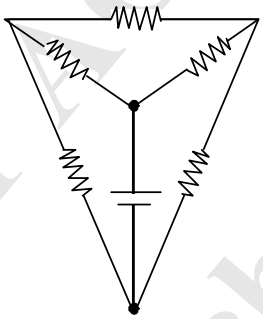
Column I	Column II
(A) K_2 is open and K_1 is in position C	(P) Potential at point A is greater than potential at B
(B) K_2 is open and K_1 is in position D	(Q) Current through R_1 is downward
(C) K_2 is closed and K_1 is in position C	(R) Current through R_2 is upward
(D) K_2 is closed and K_1 is in position D	(S) Charge on capacitor is 10 μC.

[SUBJECTIVE TYPE]

Q.21 A charged parallel plate capacitor is allowed to discharge through a 1 kΩ resistor at t = 0, by closing the key. After ln16 sec the total energy dissipated in the resistor is found to be three times the electrical potential energy left in the capacitor at that instant. Find the capacitance. **[5]**



Q.22 If all resistors in the shown network are of equal resistance, and the battery is of emf equal to 10 V and internal resistance equal to 1Ω, what should be resistance of each resistor so that the battery delivers maximum power to external circuit? **[5]**



ANSWER KEY

Q.1	A	Q.2	C	Q.3	B	Q.4	C	Q.5	A
Q.6	B	Q.7	B	Q.8	A	Q.9	A	Q.10	B
Q.11	B	Q.12	A	Q.13	C	Q.14	C	Q.15	D
Q.16	B	Q.17	ABCD	Q.18	A	Q.19	A		
Q.20	(A) PQS (B) PQRS (C) PQS (D) PQRS					Q.21	4 mF	Q.22	1Ω

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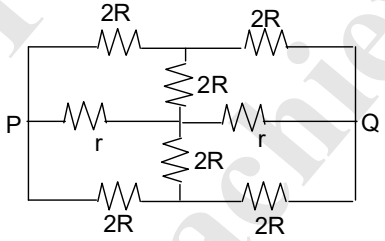

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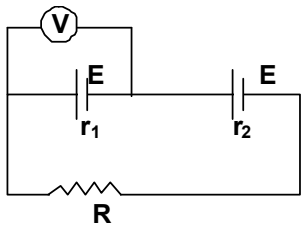

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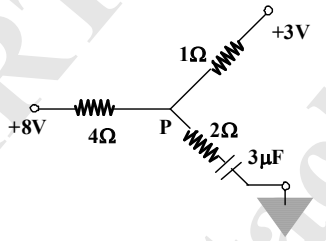

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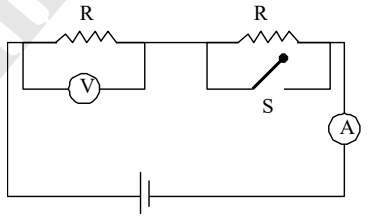

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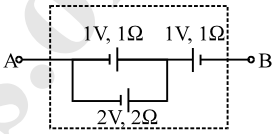

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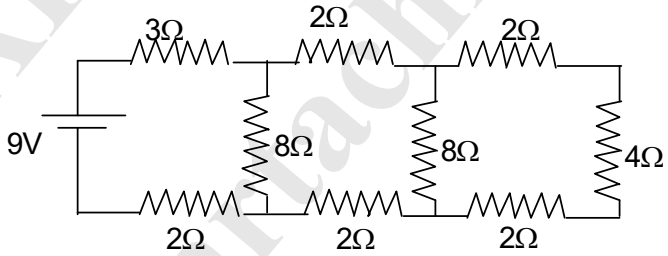

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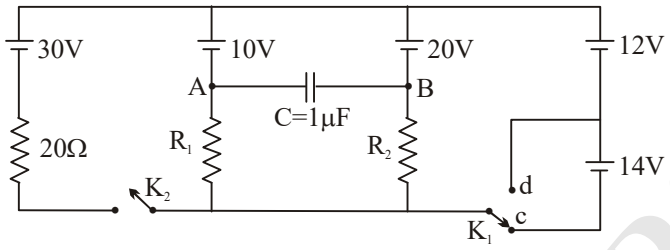

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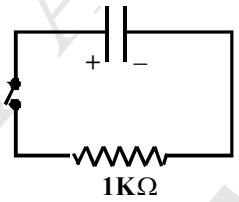
(C) K_2 is closed and K_1 is in position C	(R) Current through R_2 is upward
(D) K_2 is closed and K_1 is in position D	(S) Charge on capacitor is 10 μC.

[Ans. (A) P,Q,S ; (B) P,Q,R,S ; (C) P,Q,S ; (D) P,Q,R,S]

[SUBJECTIVE TYPE]

Q.21 A charged parallel plate capacitor is allowed to discharge through a 1 kΩ resistor at t = 0, by closing the key. After ln16 sec the total energy dissipated in the resistor is found to be three times the electrical potential energy left in the capacitor at that instant. Find the capacitance. **[5]**



[Ans. 4 mF]

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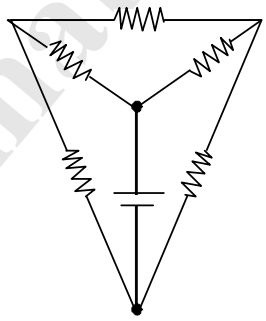

Ans. 1Ω