Topicwise Segregated
Previous Years Questions of

RRB-JE

CBT II

RAILWAY RECRUITMENT BOARD - JUNIOR ENGINEER

alongwith various Metro Corporations Papers :

- DMRC
- LMRC
- JMRC
- NMRC
- BMRCL
- UPMRC

Detailed Solutions of

1800+ PYQs

Of Exams held between : 2014 - 2026

ELECTRICAL ENGINEERING

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RRB-JE (CBT-II)

alongwith various Metro Corporations Papers:

DMRC, LMRC, JMRC, NMRC, BMRCL, UPMRC

Topicwise Segregated Previous Years Questions

Editions

First Edition : 2026

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PREFACE



B. Singh (Ex. IES)

Railway Recruitment Board - Junior Engineer is a sought-after examination among engineering graduates aspiring to build a career in the Indian Railways. Previous year questions play an important role in preparation, as they help candidates understand the examination pattern, assess the level of difficulty, and identify important concepts.

This book presents a systematically compiled collection of RRB JE and Metro Corporations (DMRC, LMRC, JMRC, NMRC, BMRCL, UPMRC) previous year questions with clear and accurate solutions. The aim is to provide aspirants with a reliable resource for practice and revision while strengthening their conceptual understanding.

MADE EASY has taken due care to maintain the accuracy and clarity of the solutions. This book may also prove useful for other competitive engineering examinations. Suggestions from readers for further improvement are always welcome.

We hope this book serves as a valuable resource in your preparation and wish you success in your endeavours.

With Best Wishes

B. Singh (Ex. IES)

CMD, MADE EASY Group

Detailed Syllabus : RRB-JE

CBT-1 (STAGE-I) : Common for All

(a) **Mathematics:** Number systems, BODMAS, Decimals, Fractions, LCM and HCF, Ratio and Proportion, Percentages, Mensuration, Time and Work, Time and Distance, Simple and Compound Interest, Profit and Loss, Algebra, Geometry, Trigonometry, Elementary Statistics, Square Root, Age Calculations, Calendar & Clock, Pipes & Cistern.

(b) **General Intelligence and Reasoning:** Analogies, Alphabetical and Number Series, Coding and Decoding, Mathematical operations, Relationships, Syllogism, Jumbling, Venn Diagram, Data Interpretation and Sufficiency, Conclusions and Decision Making, Similarities and Differences, Analytical reasoning, Classification, Directions, Statement – Arguments and Assumptions etc.

(c) **General Awareness:** Knowledge of Current affairs, Indian geography, culture and history of India including freedom struggle, Indian Polity and constitution, Indian Economy, Environmental issues concerning India and the World, Sports, General Scientific and technological developments etc.

(d) **General Science:** Physics, Chemistry and Life Sciences (up to 10th Standard CBSE syllabus).

RRB-JE Exam Pattern : CBT-I		
Subjects	**No. of Questions**	**Marks for each Section**
	CBT-I	**CBT-I**
Mathematics	30	30
General Intelligence & Reasoning	25	25
General Awareness	15	15
General Science	30	30
Total	100	100
Time in Minutes	**90**	

- The section wise distribution given in the above table is only indicative and there may be some variations in the actual question papers.
- **Minimum percentage of marks for eligibility in various categories:** UR-40%, EWS-40%, OBC(NCL)-30%, SC-30%, ST -25%. This is also applicable to Ex-servicemen candidates, as per their community. These percentage of marks for eligibility may be relaxed by 2 marks for PwBD candidates in case of shortage of PwBD candidates against vacancies reserved for them.

Detailed Syllabus : RRB-JE

CBT-2 (STAGE-II)

(a) **General Awareness:** Knowledge of Current affairs, Indian geography, culture and history of India including freedom struggle, Indian Polity and Constitution, Indian Economy, Environmental issues concerning India and the World, Sports, General Scientific and Technological Developments etc.

(b) **Physics and Chemistry:** Up to 10th standard CBSE syllabus.

(c) **Basics of Computers and Applications:** Architecture of Computers; input and Output devices; Storage devices, Networking, Operating System like Windows, Unix, Linux; MS Office; Various data representation; Internet and Email; Websites & Web Browsers; Computer Virus.

(d) **Basics of Environment and Pollution Control:** Basics of Environment; Adverse effect of environmental pollution and control strategies; Air, water and Noise pollution, their effect and control; Waste Management, Global warming; Acid rain; Ozone depletion.

RRB-JE Exam Pattern : CBT-II		
Subjects	**No. of Questions**	**Marks for each Section**
	CBT-II	**CBT-II**
General Awareness	15	15
Physics & Chemistry	15	15
Basics of Computers and Applications	10	10
Basics of Environment and Pollution Control	10	10
Technical Abilities	100	100
Total	150	150
Time in Minutes	**120**	

- The section wise distribution given in the above table is only indicative and there may be some variations in the actual question papers.

Electrical & Allied Engineering Exam Group– JE

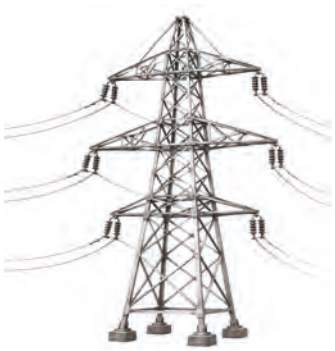
1. **Basic concepts:** Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.
2. **Circuit law:** Kirchhoff's law, Simple Circuit solution using network theorems.
3. **Magnetic Circuit:** Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.
4. **AC Fundamentals:** Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system – star and delta connection, 3 phase power, DC and sinusoidal response of R-Land R-C circuit.
5. **Measurement and Measuring Instruments:** Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving oil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.
6. **Electrical Machines:**

   (a) **D.C. Machine:** Construction, Basic Principles of D.C. motors and generators, their characteristics, speed control and starting of D.C. Motors. Method of braking motor, Losses and efficiency of D.C. Machines.

   (b) **1 phase and 3 phase transformers:** Construction, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency. Effect of voltage, frequency and wave form on losses. Parallel operation of 1 phase /3 phase transformers. Auto transformers.

   (c) 3 phase induction motors, rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3 phase induction motors. Methods of braking, effect of voltage and frequency variation on torque speed characteristics, Fractional Kilowatt Motors and Single Phase Induction Motors: Characteristics and applications.
7. **Synchronous Machines:** Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power. Starting and applications of synchronous motors.

8. **Generation, Transmission and Distribution:** Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults. Switchgears and Protection: Rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system. Cable – Different type of cables, cable rating and derating factor.
9. **Estimation and costing:** Estimation of lighting scheme, electric installation of machines and relevant IE rules. Earthing practices and IE Rules.
10. **Utilization of Electrical Energy:** Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.
11. **Basic Electronics:** Working of various electronic devices e.g. P N Junction diodes, Transistors (NPN and PNP type), BJT and JFET. Simple circuits using these devices.



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RRB-JE (CBT-II)

alongwith various Metro Corporations Papers:

DMRC, LMRC, JMRC, NMRC, BMRCL, UPMRC

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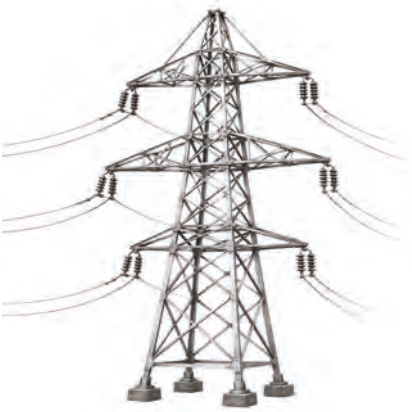
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1 CHAPTER

BASIC CONCEPTS

1 • Fundamentals, Units and Electrostatics

1.1 _____ at a point is defined as the force experienced per unit positive charge at a point placed in the electric field.
(a) Magnetic flux density
(b) Electric intensity
(c) Electric flux
(d) Voltage rating

[RRB-JE • 30.08.2019 Shift-II]

Sol. **(b)**
An electric field is defined as the electrostatic force (F) experienced per unit positive test charge (q) placed at that location:

$$E = \frac{F}{q}$$

Its SI unit is Newton per Coulomb (N/C) or Volts per meter (V/m).

1.2 A cluster of charges with an electric dipole moment is often called
(a) Electric dipoles
(b) Polarization
(c) Electric susceptibility
(d) Eddy currents

[RRB-JE • 01.09.2019 Shift-I]

Sol. **(a)**
A system comprising two equal and opposite charges separated by a small distance creates an electric dipole. The electric dipole moment (p) quantifies the system's overall polarity and separation of charges:

$$p = q \times d$$

Where q is the magnitude of the charge and d is the displacement vector separating them.
The SI unit of electric dipole moment is the Coulomb-meter (C·m).

1.3 What is the unit of electric current?
(a) Farad (b) Newton
(c) Ampere (d) Coulomb

[RRB-JE • 01.09.2019, Shift-I]

Sol. **(c)**
The SI unit of electric current is the Ampere (A).
Electric current (I) is defined as the rate of
Flow of electric charge per unit time ($I = Q/t$).
1 Ampere corresponds to the flow of 1 Coulomb of charge per second.
This equates to the movement of approximately 6.25×10^{18} electrons per second.
Note: Farad is the unit of capacitance; Newton is the unit of force; Coulomb is the unit of electric charge.

1.4 What is the SI unit of electric charge?
(a) Volt (V) (b) Joule (J)
(c) Coulomb (C) (d) Ampere (A)

[RRB-JE • 01.09.2019 Shift-I]

Sol. **(c)**
The SI unit of electric charge is the Coulomb (C).

Parameter	SI Unit
Electric Charge	Coulomb (C)
Voltage / Potential Difference	Volt (V)
Electrical Resistance	Ohm (Ω)
Capacitance	Farad (F)
Magnetic Flux	Weber (Wb)
Inductance	Henry (H)
Work / Energy	Joule (J)

1.5 The S.I. unit of work is ____ and energy is ____.
(a) Watt; Joule (b) Joule; Joule
(c) Newton; Newton (d) Joule; Newton

[RRB-JE • 04.06.2025, Shift-I (Re-Exam)]

Sol. **(b)**

- Work is performed when a force acts on an object causing displacement:
  Work = Force × Displacement = Newton × meter = Joule (J)
- Energy is fundamentally defined as the capacity or capability of a system to perform work. Therefore, work and energy share identical physical dimensions and units.
- The SI unit for both physical parameters is the Joule.

1.6 Calculate the potential difference of an energy source that provides 6.8 J for every milli Coulomb of charge that it delivers.

(a) 6.8 kV (b) 0.68 V
(c) 6.8 mV (d) 6.8 V

[RRB-JE • 22.04.2025, Shift-I]

Sol. **(a)**

Given: Work done/Energy (W) = 6.8 J
Charge delivered (Q) = 1 mC = 1×10^{-3} C
Potential difference (V) is defined as the work done per unit charge transferred ($W = Q \times V$):

$$V = \frac{W}{Q} = \frac{6.8\ J}{1\times10^{-3}\ C} = 6.8\times10^{3}\ \text{V} = 6.8\ \text{kV}$$

1.7 Which of the following statements about the force between two charges is true?

(a) Unlike charge repel each other
(b) Like charges attract each other
(c) No force exists between two unlike charges
(d) A force of repulsion exists between two like charges

[DMRC-JE • 03.08.2014]

Sol. **(d)**

According to Coulomb's Law and the fundamental principles of electrostatics:

- Charges of the same polarity (like charges, such as positive-positive or negative-negative) exert a repulsive force on each other.
- Charges of opposite polarity (unlike charges, such as positive-negative) exert an attractive force on each other.

1.8 In a conductor, current density is the :

(a) Current flowing per unit area
(b) Current flowing per unit volume
(c) Current flowing per unit mass
(d) Current flowing per unit length

[LMRC • 2015]

Sol. **(a)**

Current density (denoted by J) is a vector quantity defined as the amount of electric current flowing through a unit cross-sectional area perpendicular to the direction of current flow.

$$J = \frac{I}{A}$$

Its standard SI unit is Amperes per square meter (A/m^2).

1.9 In any electric circuit the flow of electron constitutes:

(a) magnetic charge
(b) an electric current
(c) an electric charge
(d) an electro motive force

[LMRC JE • Electrical - 2016]

Sol. **(b)**

An electric current is defined fundamentally as the rate of flow of electric charge.
In metallic conductors, this charge is carried by free electrons moving under the influence of an applied electric field. Therefore, the physical flow of electrons constitutes an electric current.

1.10 If 1 A current flows in a circuit, the number of electrons flowing through this circuit is

(a) 0.625×10^{19} (b) 1.6×10^{19}
(c) 1.6×10^{-19} (d) 0.625×10^{-19}

[DMRC- JE • 18.02.2017]

Sol. **(a)**

The number of electrons per second (t = 1s) for a current of 1 A:

$$n = \frac{I \cdot t}{e}$$

$$= \frac{1\times1}{1.6\times10^{-19}} = 0.625\times10^{19}$$

1.11 Electric charge of a body is a condition due to:

(a) Deficiency or excess of neutrons
(b) Deficiency of electrons
(c) Deficiency or excess of electrons
(d) Excess of electrons

[DMRC- JE • 18.02.2017]

Sol. **(c)**

Atoms consist of tightly bound protons (positive) and neutrons (neutral) in the nucleus, surrounded by a cloud of electrons (negative).

Neutrons carry no charge, and protons are largely immobile. Macroscopic bodies become electrically charged entirely due to the transfer of electrons.

A deficiency of electrons leaves a net positive charge.

An excess of electrons results in a net negative charge.

1.12 1 Volt = _____ .

(a) 1 Joule/ 1 Coulomb (b) 1 Watt/ 1 Ohm

(c) 1 Joule / 1 Watt (d) 1 Watt/1 Coulomb

[DMRC-JE • 18.02.2017]

Sol. **(a)**

Electric potential (Voltage) is defined as the amount of work done per unit of electric charge to move that charge between two points.

$$V = \frac{W}{Q}$$

Substituting the standard SI units (Work in Joules, Charge in Coulombs):

1 Volt = 1 Joule / 1 Coulomb

1.13 The value of free electron density of copper

(a) $16 \times 10^{28}/m^3$ (b) $1.69 \times 10^{19}/m^3$

(c) $8 \times 10^{28}/m^3$ (d) $8.5 \times 10^{28}/m^3$

[DMRC-JE • 18.02.2017]

Sol. **(d)**

The free electron density (also known as the carrier concentration) of a metal indicates how many conduction electrons exist in a unit volume.

For copper free electron density is approximately 8.5×10^{28} electrons/m^3.

1.14 The angular velocity of a sinusoidal voltage is:

(a) $\omega = 1/T$ (b) $\omega = 2\pi/f$

(c) $\omega = T/f$ (d) $\omega = 2\pi f$

[DMRC-JE • 18.02.2017]

Sol. **(d)**

In AC circuits, the angular velocity or angular frequency (ω) describes the rate of rotation of the phasor representing the sinusoidal waveform.

It is measured in radians per second (rad/s) and is directly related to the standard frequency f (measured in Hertz) by completing one full cycle of 2π radians every period.

$$\omega = 2\pi f$$

1.15 Inside a conducting sphere, _____ remains constant

(a) Potential (b) Charge

(c) Electric flux density (d) Current

[DMRC-JE • Electrical-2017]

Sol. **(a)**

When a conductor is in electrostatic equilibrium, charges distribute entirely on its outer surface, making the electric field $E = 0$ everywhere inside the bulk volume of the conductor.

The electric potential V and electric field E are related by

$$E = -\frac{dV}{dr}$$

Since $E = 0$ inside, the derivative of potential with respect to distance is zero, meaning the potential V does not change. It remains uniform and constant throughout the interior, equal to the potential at the surface.

1.16 Permittivity of vacuum is :

(a) 9×10^9 F/m (b) 8.854×10^{-12}F/m

(c) $4\pi \times 10^{-7}$ F/m (d) 8.987×10^{-9} F/m

[DMRC-JE • Electrical-2017]

Sol. **(b)**

The absolute permittivity of free space (vacuum), denoted by the physical constant ϵ_0, defines the capability of a vacuum to permit electric field lines. Its standard accepted value in SI units is 8.854×10^{-12} Farads/meter (F/m).

1.17 A spherical conductor of radius 'a' with charge 'q' is placed concentrically inside an uncharged and unearthed spherical conducting shell of inner and outer radii r_1 and r_2 respectively. Taking potential to be zero at infinity. The potential at any point within the shell ($r_1 < r < r_2$) will be?

(a) $\frac{q}{4\pi\varepsilon_0 a}$ (b) $\frac{q}{4\pi\varepsilon_0 r_2}$

(c) $\frac{q}{4\pi\varepsilon_0 r}$ (d) $\frac{q}{4\pi\varepsilon_0 r_1}$

[NMRC-JE • 2017]

Sol. **(d)**

The charge $+q$ on the inner sphere induces a charge of $-q$ on the inner surface (r_1) of the shell and $+q$ on the outer surface (r_2).

The space $r_1 < r < r_2$ lies inside the solid conducting material of the shell. In electrostatic equilibrium, the electric field inside a conductor is exactly zero ($E = 0$).

Because $E = 0$, the potential must be constant throughout the volume of the shell and is equal to the potential precisely at its outer surface (r_1).

The potential at the outer surface due to the enclosed net charge q is $V = \frac{q}{4\pi\varepsilon_0 r_1}$.

1.18 The total electric flux through any closed surface is equal to the amount of charge enclosed. The above statement is based on:

(a) Gauss's law (b) Ampere's law
(c) Maxwell's law (d) Coulomb's law

[NMRC-JE • 2017]

Sol. **(a)**

The statement provided is the direct definition of Gauss's Law in electrostatics.

Mathematically, it is expressed as

$$\oint_S E \cdot dA = \frac{Q_{enclosed}}{\varepsilon_0}$$

connecting the outward electric flux through a closed Gaussian surface directly to the charge inside.

1.19 Joule of electrical energy equals:

(a) 1 watt. sec (b) 1 watt
(c) 1 watt/sec (d) 1 volt ampere

[DMRC-JE • (Shift-I) 2018]

Sol. **(a)**

Power P (in Watts) is defined as the rate of energy transfer over time t (in seconds):

$$P = \frac{E}{t}$$

$$E = P \times t$$

Therefore, 1 Joule = 1 Watt × 1 second.

1.20 What is the force of attraction between two electric charge of opposite polarity having 1 Coulomb each when placed at a distance of 1m?

(a) $4\pi \times 10^9$ Newton (b) 8.854×10^{12} Newton
(c) 5.54×10^{11} Newton (d) 9×10^9 Newton

[DMRC-JE • (Shift-II) 10.04.2018]

Sol. **(d)**

Coulomb's Law calculates the force between two point charges as:

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

The constant $\frac{1}{4\pi\varepsilon_0}$ is approximately equal to $9 \times 10^9\ N \cdot m^2/C^2$.

Substituting the given values ($q_1 = 1$ C, $q_1 = 1$ C, $r = 1$ m):

$$F = 9 \times 10^9 \frac{1 \times 1}{1^2}$$

$$= 9 \times 10^9 \text{ Newtons}$$

1.21 The circuit whose properties or characteristics change with the direction of its operation is:

(a) Non-linear (b) Unilateral
(c) Linear (d) Bilateral

[DMRC-JE • 10.04.2018, Shift-II]

Sol. **(b)**

A unilateral circuit or element (like a diode or transistor) exhibits different V-I characteristics depending on the direction of current flow or polarity of the applied voltage.

A bilateral circuit (like a standard resistor) behaves the same way regardless of current direction.

1.22 For solid dielectric, the relation between electric field E, electric flux density D and the polarization P is given as?

(a) $D = P\varepsilon_0 + E$ (b) $D = E\varepsilon_0 + D$
(c) $E = D\varepsilon_0 + P$ (d) $D = E\varepsilon_0 + P$

[NMRC-JE • 2019]

Sol. **(d)**

When a dielectric material is subjected to an external electric field E, bound charges within the material shift, creating a macroscopic Polarization vector P.

The total electric flux density D is the sum of the free space contribution ($\varepsilon_0 E$) and the material's polarization contribution (P):

$$D = \varepsilon_0 E + P$$

1.23 If the current flowing through the conductor is 5 A, then electrons per second will flow in the conductor at any passage.
(a) 6.25×10^{18} (b) 31.35×10^{17}
(c) 31.35×10^{19} (d) 31.35×10^{18}
[DMRC-JE • 20.02.2020]

Sol. **(d)**
The number of electrons n flowing per second ($t = 1s$) is computed via $n = \frac{I}{e}$

Given $I = 5$ A and $e = 1.6 \times 10^{-19}$ C:

$$n = \frac{5}{1.6 \times 10^{-19}} = 3.125 \times 10^{19}$$
$$= 31.25 \times 10^{18}$$

2 • Resistance, Ohm's Law and Electrical Power

2.1 For a given conductor, if the cross-sectional area increases, then
(a) resistance of the conductor increases
(b) resistance of the conductor decreases
(c) current rating of the conductor decreases
(d) resistance of the conductor does not change
[RRB-JE • 01.09.2019 Shift-I]

Sol. **(b)**
The electrical resistance of a conductor depends on its physical dimensions according to the formula:

$$R = \rho \frac{l}{A} \Omega$$

Where
R = Resistance of the conductor (Ω)
ρ = Resistivity of the material ($\Omega \cdot$m)
l = Length of the conductor (m)
A = Cross-sectional area (m^2)
From the relation, resistance (R) is inversely proportional to the cross-sectional area (A): $R \propto 1/A$. Therefore, if the cross-sectional area increases, its resistance decreases.

2.2 If a 100 Watts bulb is ON for 10 hours, then that will be the amount of electricity consumed?
(a) 1500 Watts (b) 1 kWh
(c) 300 Watts (d) 100 Watts per hour
[RRB-JE • 01.09.2019 Shift-I]

Sol. **(b)**
Given: Power rating, $P = 100$ W $= 0.1$ kW
Time, $t = 10$ h
Energy = Power (kW) × Time (h)
Energy = 0.1 kW × 10 h = 1 kWh
Hence, the electricity consumed is 1 kWh (or 1 Unit).

2.3 Components which obey Ohm's law are known as-
(a) Resistors
(b) Capacitors
(c) Non-ohmic components
(d) Ohmic components
[RRB-JE • 19.09.2019 Shift-II]

Sol. **(d)**
Components that follow Ohm's law are strictly classified as Ohmic components. Ohm's law states that the current (I) flowing through a conductor between two points is directly proportional to the potential difference (V) across them, provided temperature and other physical parameters remain constant.

$$I = \frac{V}{R}$$

2.4 If a power of 100 W is being supplied across a potential difference of 200 V, find the current flowing through the circuit.
(a) 0.5 A (b) 1 A
(c) 20 A (d) 2 A
[RRB-JE • 01.09.2019 Shift-I]

Sol. **(a)**
Given: Power, $P = 100$ W
Potential Difference, $V = 200$ V

$$I = \frac{P}{V} = \frac{100}{200} = 0.5\ A$$

2.5 Two bulbs of 500 W and 200 W rated at 250 V will have resistance ratio as
(a) 2 : 3 (b) 2 : 5
(c) 3 : 2 (d) 5 : 2
[RRB-JE • 01.09.2019 Shift-I]

Sol. **(b)**
Given:
Power of first bulb (P_1) = 500 W
Power of second bulb (P_1) = 200 W

Both bulbs share the same rated voltage

$$V = 250\ V$$

The relationship between power, voltage, and resistance is:

$$P = \frac{V^2}{R}; \quad \Rightarrow R = \frac{V^2}{P}$$

Since the voltage is constant for both bulbs, resistance is inversely proportional to power $\left(R \propto \frac{1}{P}\right)$:

$$\frac{R_1}{R_2} = \frac{P_2}{P_1} = \frac{200}{500} = \frac{2}{5}$$

Therefore, the resistance ratio $R_1 : R_2 = 2 : 5$.

2.6 Calculate the total DC resistance of a 100 metre roll of 2.5 mm^2 copper wire if the resistivity of copper at 20° C is $1.72 \times 10^{-8}\ \Omega$ metre.

(a) 0.867 Ω (b) 0.713 Ω
(c) 0.214 Ω (d) 0.688 Ω

[RRB-JE • 01.09.2019 Shift-I]

Sol. (d)

Given:

Length (l) = 100 m

Cross-sectional area,

$$A = 2.5\ mm^2 = 2.5 \times 10^{-6}\ m^2$$

Resistivity, $\rho = 1.72 \times 10^{-8}\ \Omega m$

Using the resistance formula,

$$R = 1.72 \times 10^{-8} \times \frac{100}{2.5 \times 10^{-6}}$$

$$R = \frac{1.72 \times 10^{-6}}{2.5 \times 10^{-6}} = 0.688\ \Omega$$

2.7 If one of the parallel resistors in any parallel circuit is removed from the circuit, then the total resistance

(a) Doubled (b) Increases
(c) Remains the same (d) Decreases

[RRB-JE • 30.08.2019 Shift-II]

Sol. (b)

In a parallel circuit connection, the reciprocal of the total equivalent resistance is equal to

The sum of the reciprocals of the individual resistances:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \cdots$$

A fundamental property of parallel circuits is that the net equivalent resistance (R_{eq}) is always smaller than the smallest individual resistor in the combination. When a resistor is removed from this arrangement, the number of parallel paths decreases.

As a result, the overall current capability drops for a given voltage, meaning the total equivalent resistance increases.

2.8 What is the relation between resistance (R_1 and R_2) of two bulbs rated for the same voltage and having powers of 400 W and 100 W respectively?

(a) $R_1 = 4R_2$ (b) $R_2 = 4R_1$
(c) $R_2 = 2R_2$ (d) $R_2 = 2R_1$

[RRB-JE • (CRIS) EE 19.02.2023]

Sol. (b)

Given:

Power rating of bulb 1(P_1) = 400 W

Power rating of bulb 2(P_1) = 100 W

Voltage rating (V) is identical for both bulbs

Using the electrical power expression:

$$P = \frac{V^2}{R} \Rightarrow P \propto \frac{1}{R} \text{ (when } V \text{ is constant)}$$

$$\frac{P_1}{P_2} = \frac{R_2}{R_1}$$

$$\frac{400}{100} = \frac{R_2}{R_1}$$

$$\Rightarrow \quad 4 = \frac{R_2}{R_1}$$

$$R_2 = 4R_1$$

2.9 A 10-ohm resistor is connected across a 12-V battery. How much current flows through the resistor?

(a) 2.0 A (b) 0.8 A
(c) 120 A (d) 1.2 A

[RRB-JE • 04.06.2025, Shift-I (Re-Exam)]

Sol. (d)

Given:

Resistance, $R = 10\ \Omega$

Voltage, $V = 12\ V$

Applying Ohm's law,

$$V = IR$$

$$I = \frac{V}{R} = \frac{12\ V}{10\ \Omega} = 1.2\ A$$