Railway Recruitment Board

RRB JE

ELECTRICAL

&

ALLIED ENGINEERING

Chapterwise Solved Papers

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SYLLABUS

Government of India, Ministry of Railways, Railway Recruitment Boards

CENTRALISED EMPLOYMENT NOTICE (CEN) No.03/2018

Recruitment of Junior Engineer (JE), Junior Engineer (Information Technology) [JE(IT)], Depot Material Superintendent (DMS)

2nd Stage CBT : Short listing of Candidates for the 2nd Stage CBT exam shall be based on the normalized marks obtained by them in the 1st Stage CBT Exam. Total number of candidates to be shortlisted for 2nd Stage shall be 15 times the community wise total vacancy of Posts notified against the RRB as per their merit in 1st Stage CBT. However, Railways reserve the right to increase/decrease this limit in total or for any specific category(s) as required to ensure availability of adequate candidates for all the notified posts.

Duration : 120 minutes *(160 Minutes for eligible PwBD candidates accompanied with Scribe)*

No of Questions : 150

Syllabus : The Questions will be of objective type with multiple choices and are likely to include questions pertaining to General Awareness, Physics and Chemistry, Basics of Computers and Applications, Basics of Environment and Pollution Control and Technical abilities for the post. The syllabus for General Awareness, Physics and Chemistry, Basics of Computers and Applications, Basics of Environment and Pollution Control is common for all notified posts under this CEN as detailed below:-

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.

e) **Technical Abilities:** The educational qualifications mentioned against each post shown in Annexure-A, have been grouped into different exam groups as below. Questions on the Technical abilities will be framed in the syllabus defined for various Exam Groups given at Annexure-VII-A, B, C, D, E, F & G.

The section wise Number of questions and marks are as below :

Subjects	No. of Questions	Marks for each Section
	Stage-II	Stage-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.

Minimum percentage of marks for eligibility in various categories: UR -40%, OBC-30%, SC-30%, ST -25%. This percentage of marks for eligibility may be relaxed by 2% for PwBD candidates, in case of shortage of PwBD candidates against vacancies reserved for them.

Virtual calculator will be made available on the Computer Monitor during 2nd Stage CBT.

2nd Syllabus for Electrical & Allied Engineering Exam Group-JE

SI. No.	Subject
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-L and 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 coil 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 of 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.

UPMRC JE Electrical Syllabus

- **Basic Electrical Engg. And Elect. Measurements:** Concepts of currents, Voltage Resistance, Power and energy, their units, Ohm's law. Circuit Law. Kirchhoff's law Solution of simple network problems. Network theorems and their applications, Electro-magnetism concept of flux, Emf, Reluctance, Magnetic circuits, Electro-magnetic induction, Self and mutual inductance. A.C. fundamentals Instantaneous, peak, R.m.s. And average values of alternating waves. Equation of sinusoidal wave form, Simple series and parallel a.c. Circuits consisting of R.L. and C. Resonance, Measurement and measuring instruments moving coil and moving iron ammeters and voltmeters, Extension of range. Watt meters. Multimeters, Megger, Basic Electronics.
- **Electrical machines:** Basic principles D.C. motors of generators, their characteristics, Speed control and starting of D.C. motors. Losses and efficiency of D.C. machines.
- **1-phase and 3-phase Transformers:** Principles of Operation, Equivalent Circuit, Voltage Regulation O.C. and S.C Tests, Efficiency, Auto Transformers. Synchronous Machines. Generation of Three phase Emf, Armature Reaction. Voltage Regulation, Parallel operation of two alternators. synchronizing , Starting And Applications of synchronous Motors, 3-phase Induction Motor. Rotating Magnetic Field, principle of Operation Equivalent circuit. Torque speed characteristics, starting and speed control of 3-phase induction Motors, Fractional kW Motors, 1-phase induction motors A.C. series motor reluctance motor.
- **General, Transmission and Distribution:** Different types of power stations, Load factor, diversity factor, demand factor, simple problems theorem. cost of generation inter connection of power stations, power factor improvement. Various types of tariffs, Types of faults current for symmetrical faults, Switchgears-rating of circuit breakers. Principles of a arc extinction by oil and air, H.R.C. fuses, protection earthier leakage, Over current Buchholz relay Merge-Prize system of protection of generators & transformers, protection of feeders and bus bars. Lighting arresters, Various transmission and distribution systems, comparison of conductor materials, Efficiency for different systems.
- **Utilization of Electrical Energy:** Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.
- **BASIC ELECTRICAL ENGINEERING**
  Basic concepts and principles of D.C and A.C fundamental, AC circuits, batteries, electromagnetic induction etc. including constant voltage and current sources.
- **ANALOG ELECTRONICS**
  Fundamental concepts of basic electronics and basic understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactors diodes, working of transistors in various configurations; Concept of FETs and MOSFET etc.
- **CONTROL SYSTEMS**
  Basic elements of control system, open loop control system, closed loop control system, control system terminology, manually controlled closed loop systems, automatic controlled closed loop systems, basic elements of a servo mechanism, Examples of automatic control systems, use of equivalent systems for system analysis, linear systems, non-linear system, control system examples from chemical systems mechanical systems electrical systems, introduction to Laplace transform.
  Transfer function analysis of ac and dc servomotors synchronous, stepper motor, amplydyne. ac position control system, magnetic amplifier.
  Control system representation: Transfer function, block diagram, reduction of block diagram, problems on block diagram, Mason's formula signal flow graph
  Non-Linear Control System: Introduction, behavior of non-linear control system. Different types of nonlinearities, saturation, backlash, hysteresis, dead zone relay, function, characteristics of non-linear control system, limit cycles jump resonance, jump phenomenon. Difference between linear and non-linear control system.
- **ELECTRONIC COMPONENTS AND MATERIALS**
  - **Materials:** Classification of Materials, Conducting, semi-conducting and insulating materials through a brief reference to their atomic structure.
  - **Conducting Materials:** Resistors and factors affecting resistivity such as temperature, alloying and mechanical stressing. Classification of conducting materials into low resistivity and high resistivity materials.
  - **Insulating Materials:** Important relevant characteristics (electrical, mechanical and thermal) and applications of the following material: Mica, Glass, Copper, Sliver, PVC, Silicon, Rubber, Bakelite, Cotton, Ceramic, Polyester, Polythene and Varnish.
  - **Magnetic Materials:** Different Magnetic materials; (Dia, Para, Ferro) and their properties. Ferro-magnetism, Domains, permeability, Hysteresis loop. Soft and hard magnetic materials, their examples and typical applications.
- **MEASURING INSTRUMENTS**
  Introduction to Testing and Measurements, Measurement of Resistance, Inductance and Capacitance, Ammeter, Voltmeter and Multimeter, Power and Energy Measurements, Frequency and phase difference Measurement.
- **PRINCIPLES OF INSTRUMENTATION**
  Basic building blocks of any instrumentation systems, Performance characteristics of Oscillator Instruments, Instrument selection; Factors affecting instrument selection, accuracy, precision, linearity, resolution, sensitivity, hysteresis, reliability, serviceability, loading effect, range advantage and limitation cost effectiveness and availability Static and dynamic response-Environmental effects-Calibration tools
- **FUNDAMENTALS OF DIGITAL ELECTRONICS**
  Concepts of Digital electronics, Number system, gates, codes arithmetic logic circuits, flip-flops, shift resistors and counters.

ALP/Technician Online Exam Syllabus

Second Stage (CBT)

Total Duration : 2 hours and 30 minutes (for Part A and Part B together)
The Second Stage CBT shall have two parts viz Part A and Part B as detailed below.

PART A

Duration: 90 Min. **No. of Questions: 100**

Minimum percentage of marks for eligibuility in various categories: UR-40%, OBC-30%, SC-30%, ST-25%. These percentages of marks for eligibility may be relaxed by 2% for PWD candidates in case of shortage of PWD candidates against vacancies reserved for them.

The marks scored in Part A alone shall be used for short listing of candidates for further stages of recruitment process subject to the condition that the candidate is securing qualifying mark in Part B.

(A) Mathematics

Number system, BODMAS, Decimals, Fractions, LCM, HCF, Ratio and Proportion, Percentages, Mensuration, Time and Work; Time and Distance, Simple and Compound Interest, Profit and Loss, Algebra, Geometry and Trigonometry, Elementary Statistics, Square Root, Age Calculations, Calendar & Clock, Pipes & Cistern etc.

(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) Basic Science and Engineering

The board topics that are covered under this shall be Engineering Drawing (Projections, Views, Drawing Instruments, Lines, Geometric figures, Symbolic Representation), Units, Measurements, Mass Weight and Density, Work Power and Energy, Speed and Velocity, Heat and Temperature, Basic Electricity, Levers and Simple Machines, Occupational Safety and Health, Environment Education, IT Literacy etc.

General awareness on current affairs in Science & Technology, Sports, Culture, Personalities, Economics, Politics and other subjects of importance.

PART B

Duration: 60 Min. **No. of Questions: 75**
Qualifying Marks: 35%

Sl. No.	Engineering Discipline (Diploma/Degree)	Relevant trade for PART B Qualifying Test to be selected from
1.	Electrical Engineering and combination of various streams of Electrical Engineering	Electrician/Instrument Mechanic/Wiremen/Winder (Armature)/Refrigeration and Air Conditioning Mechanic

RRB JE Previous Exam Papers Analysis Chart

SR. NO	Exam.	Year	No. of Q.
RRB JE 2025			
1.	RRB JE	22.04.2025, Shift-I	100
2.	RRB JE (Cancelled)	22.04.2025, Shift-II	100
3.	RRB JE (Re-Exam)	04.06.2025, Shift-I	100
RRB JE 2023			
4.	RRB JE (CRIS) Electrical	19.02.2023	96
DFCCIL 2023			
5.	DFCCIL Executive (Electrical) 2023	20.12.2023	96
6.	DFCCIL (S & T) 2023	17.12.2023	60
7.	DFCCIL Executive (Electrical) 2021	30.09.2021	96
8.	DFCCIL Executive (Electrical) 2018	13.11.2018	96
RRB JE 2019			
9.	RRB JE 2019	19.09.2019	100
10.	RRB JE 2019	01.09.2019	100
11.	RRB JE 2019	30.08.2019	100
RRB JE 2015			
12.	RRB JE 2015	26.08.2015 Shift-I	27
13.	RRB JE 2015	26.08.2015 Shift-II	29
14.	RRB JE 2015	26.08.2015 Shift-III	28
15.	RRB JE 2015	27.08.2015 Shift-I	29
16.	RRB JE 2015	27.08.2015 Shift-II	28
17.	RRB JE 2015	27.08.2015 Shift-III	29
18.	RRB JE 2015	28.08.2015 Shift-I	28
19.	RRB JE 2015	28.08.2015 Shift-II	29
20.	RRB JE 2015	28.08.2015 Shift-III	27
21.	RRB JE 2015	29.08.2015 Shift-I	29
22.	RRB JE 2015	29.08.2015 Shift-II	29
23.	RRB JE 2015	29.08.2015 Shift-III	28
24.	RRB JE 2015	30.08.2015 Shift-III	29

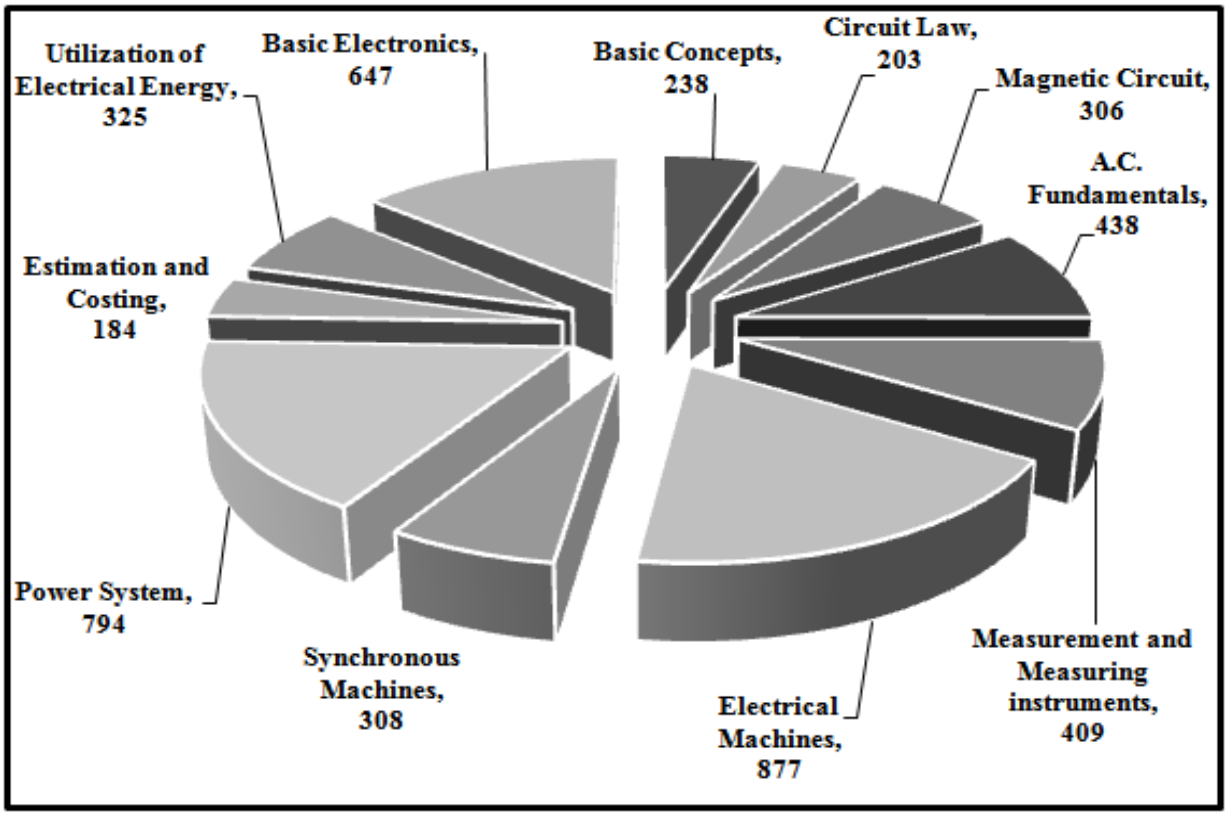
25.	RRB JE 2015	01.09.2015 Shift-I	28
26.	RRB JE 2015	01.09.2015 Shift-II	27
27.	RRB JE 2015	01.09.2015 Shift-III	29
28.	RRB JE 2015	02.09.2015 Shift-I	28
29.	RRB JE 2015	02.09.2015 Shift-II	27
30.	RRB JE 2015	02.09.2015 Shift-III	28
31.	RRB JE 2015	03.09.2015 Shift-I	26
32.	RRB JE 2015	03.09.2015 Shift-II	29
33.	RRB JE 2015	03.09.2015 Shift-III	27
34.	RRB JE 2015	04.09.2015 Shift-II	28
35.	RRB JE 2015	16.09.2015 Shift-I	29
36.	RRB Ranchi JE 2015	04.01.2015 Yellow Paper	28
37.	RRB Ranchi JE 2015	04.01.2015 Red Paper	29
RRB JE/Sr. SE Exam 2014			
38.	RRB SSE 2015	01.09.2015, Shift-I	28
39.	RRB SSE 2015	01.09.2015, Shift-II	29
40.	RRB SSE 2015	01.09.2015, Shift-III	28
41.	RRB SSE 2015	02.09.2015, Shift-I	29
42.	RRB SSE 2015	02.09.2015, Shift-II	27
43.	RRB SSE 2015	02.09.2015, Shift-III	29
44.	RRB SSE 2015	03.09.2015, Shift-I	28
45.	RRB SSE 2015	03.09.2015, Shift-II	27
46.	RRB SSE 2015	03.09.2015, Shift-III	29
47.	RRB JE (Bilaspur/Kolkata/Mumbai/Guwahati) 2014	14.12.2014 SET : 01 Red Paper	28
48.	RRB JE (CHENNAI) 2014	14.12.2014 SET : 02 Red Paper	29
49.	RRB JE (Bilaspur/Guwahati/Patna) 2014	14.12.2014 SET : 03 Green Paper	28
50.	RRB JE (Muzaffarpur) 2014	14.12.2014 SET : 04 Green Paper	29
51.	RRB JE (Bilaspur/Guwahati) 2014	14.12.2014 SET : 05 Yellow Paper	29
52.	RRB JE (Patna/Muzaffarpur/Chennai/Ahmedabad/ Bangalore) 2014	14.12.2014 SET : 06 Yellow Paper	28

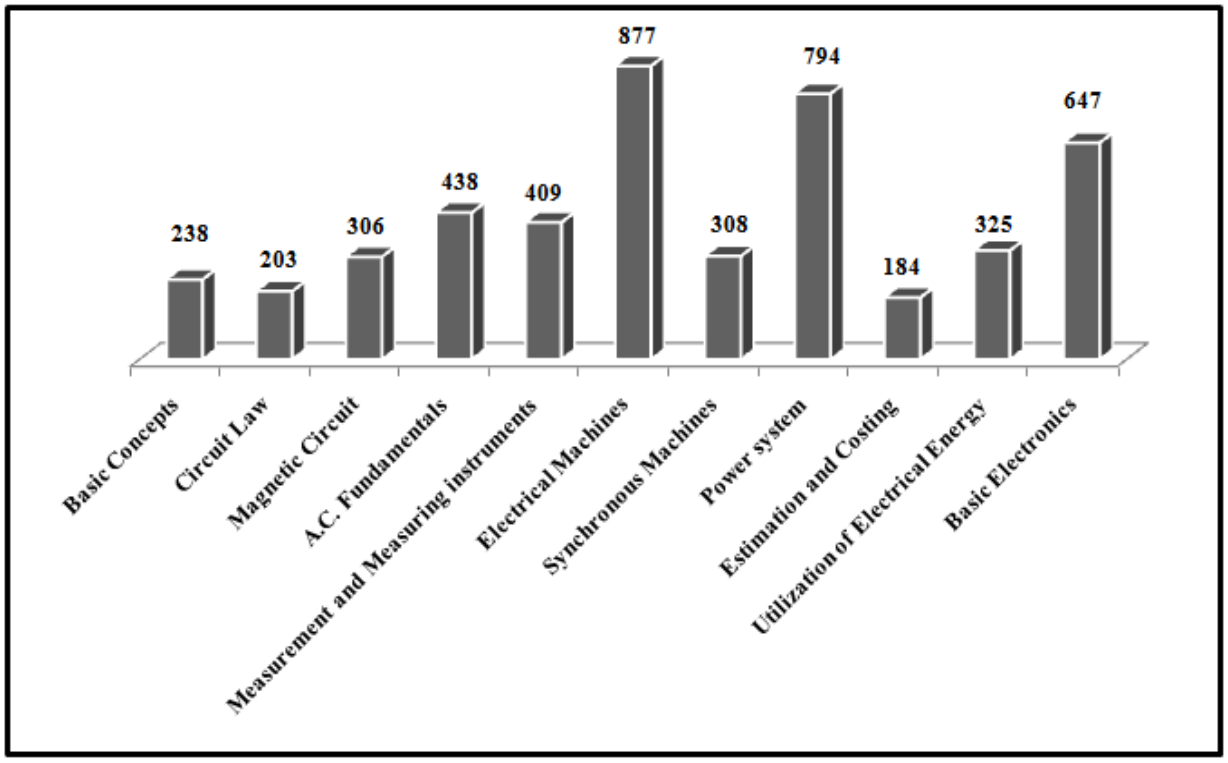
53.	RRB Sr. SE (Bilaspur/Secunderabad) 2014	21.12.2014 SET : 07 Red Paper	28
54.	RRB Sr. SE (Bilaspur/Secunderabad) 2014	21.12.2014 SET : 08 Green Paper	29
55.	RRB Sr. SE (Bilaspur/Secunderabad) 2014	21.12.2014 SET : 09 Yellow Paper	28
56.	RRB Sr. SE (BHOPAL) 2014	21.12.2014	29
DMRC JE Exam			
57.	DMRC JE 2020	26.02.2020	75
58.	DMRC JE 2020	20.02.2020	75
59.	DMRC JE 2018	20.04.2018	75
60.	DMRC JE 2018	09.04.2018 (4:00PM-6:45PM)	75
61.	DMRC JE 2018	09.04.2018 (12:15PM - 2:30PM)	75
62.	DMRC JE 2018	10.04.2018 (12:15PM - 2:30PM)	75
63.	DMRC JE 2017	18.02.2017	75
64.	DMRC JE 2017	22.09.2017	75
65.	DMRC JE 2016	06.03.2016	75
66.	DMRC JE 2015	15.03.2015	75
67.	DMRC JE 2014	07.09.2014	75
68.	DMRC JE 2013	21.07.2013	75
UPMRC/LMRC/JMRC/NMRC/BMRCL JE Exam			
69.	UPMRC JE 2023	03.01.2023 (9:00 -11AM)	90
70.	UPMRC SCTO 2021	17.04.2021 (12:00-2:00PM)	90
71.	JMRC JE 2019	05.02.2021	50
72.	NMRC JE 2019	15.09.2019	45
73.	LMRC JE 2016	17.03.2016	75
74.	LMRC JE 2015	26.06.2015	75
75.	JMRC JE 2012	23.12.2012	50
76.	NMRC JE 2017	05.03.2017	75
77.	JMRC JE 2017	10.06.2017	50
78.	BMRCL JE 2019	24 Feb. 2019	75

OTHER RAILWAY JE & SSE Exams.			
79.	RRB Bhubneshwar JE-II 2010	19.12.2010	31
80.	RRB Allahabad JE 2010	19.12.2010	28
81.	RRB Allabahad SSE 2010	19.12.2010	27
82	RRB Mumbai JE 2008	05.10.2008	30
83.	RRB Mumbai SSE 2008	05.10.2008	27
84.	RRB Mumbai JE 2010	19.12.2010	28
85.	RRB Mumbai SSE 2010	19.12.2010	27
86.	RRB Bhubneshwar JE-II 2010	19.12.2010	29
87.	Konkan Railway STA 2017	2017	28
88.	Konkan Railway TA 2017	2017	28
89.	Konkan Railway SSE 2015	2015	29
90.	RRB Kolkata Diesel JE 2009	25.10.2009	29
91.	RRB Chandigarh SSE 2009	25.10.2009	29
92.	RRB Mumbai C&G JE 2009	25.10.2009	29
93.	RRB Gorakhpur RDSO SSE 2009	25.10.2009	28
94.	RRB Jammu JE 2009	25.10.2009	29
95.	RRB Malda SSE 2009	25.10.2009	28
96.	RRB Allahabad JE 2009	25.10.2009	29
97.	RRB Mumbai C&G SSE 2009	25.10.2009	29
98.	RRB Patna JE	25.10.2009	28
99.	RRB Bhopal TM SSE 2009	25.10.2009	29
100.	RRB Allahabad SSE 2012	09.09.2012	29
101.	RRB Banglore SSE 2012	09.09.2012	29
102.	RRB Kolkala SSE 2012	09.09.2012	28
103.	RRB Gorakhpur Design SSE 2012	09.09.2012	29
104.	RRB Bhopal SSE 2012	09.09.2012	28
105.	RRB Chandigarh SSE 2012	09.09.2012	29
106.	RRB Jammu SSE 2012	09.09.2012	29
107.	RRB Allahabad JE 2012	09.09.2012	38
108.	RRB Bhubneshwar JE II 2008	29.11.2008	39
109.	Konkan Railway STA 2017	2017	38
110.	Konkan Railway TA 2017	2017	38

111.	Konkan Railway SSE 2015	2015	39
112.	RRB Kolkata Diesel JE 2009	25.10.2009	37
113.	RRB Bhopal Section Engineer,	24.11.2002	39
114.	RRB Bhopal & Mumbai Apprentice Section Engg.	23.03.2003	38
115.	RRB Secunderabad Section Engineer (Elect.)	29.06.2008	39
116	RRB Bangalore Section Engineer (Elect.)	01.02.2009	38
117.	RRB Chandigarh Section Engineer,	15.03.2009	39
118.	RRB Chennai Section Engineer,	12.02.2012	37
119.	RRB Chandigarh Section Engineer (Elect.)	26.02.2012	36
120.	RRB Chandigarh Section Engineer,	26.02.2012	39
121.	RRB Jammu Section Engg., 2013	2013	38
122.	RRB Bhubaneswar Section Engineer (Electrical)	19.08.2001	38
123.	RRB Kolkata Engineer (P.Way)	20.02.2000	38
124.	RRB Kolkata Apprentice Engineer	14.10.2001	39
125.	RRB Bangalore Material Engineer	21.11.2004	38
126.	RRB Bangalore Material Engineer	21.11.2004	39
127.	RRB Kolkata Mech. Engineer	06.02.2005	38
128.	RRB Allahabad Junior Engineer-II	08.01.2006	39
129.	RRB Kolkata Jr. Engineer-II Electrical DRG & Design,	11.06.2006	38
130.	RRB Kolkata Technical- Engineer	20.08.2006	38
131.	RRB Chennai Technical (Engineer)	15.04.2007	38
132.	RRB Bangalore Technical (Engineer)	22.04.2007	39
133.	RRB Secunderabad Technical (Engineer)	20.05.2007	37
134.	RRB Patna Technical Engineer,	27.07.2008	38
135.	RRB Thiruvananthapuram Section Eng. (Electrical)	04.01.2009	39
136.	RRB Bangalore Section Engineer (Electrical)	01.02.2009	37
137.	RRB Chandigarh Section Engineer (Electrical)	15.03.2009	38
138.	RRB Chandigarh Section Engineer (Electrical)	26.02.2012	37
139.	RRB Chandigarh Section Engineer (Electrical)	26.02.2012	39
140.	RRB Bhopal Section Engineer	24.11.2002	38
		Total	**5987**

Trend Analysis of Electrical Questions Through Pie Chart and Bar Graph





01. Basic Concepts

Basic concepts : Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.

1. 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)

Ans. (b) : The S.I. unit of work is joule and energy is joule.

- Both work and energy have same S.I. unit, which is Joule.

■ Work is defined as

Work = Force × Displacement
= Newton-meter
= Joule

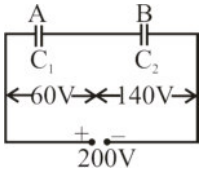
- Energy is the capacity to do work, and its unit is also joule.
- Watt is a unit of power, not work or energy.
- Newton is unit of force, not work or energy.

2. Two capacitors A and B are connected in series across a 200V DC supply. The PD across A is 60V. This PD is increased to 80 V when a 3 μF capacitor is connected in parallel with B. calculate the capacitance of B.

(a) 3.5 μF (b) 2.7 μF
(c) 7.8 μF (d) 5.4 μF

RRB JE 04.06.2025, Shift-I (Re-Exam)

Ans. (d) : Since capacitance are connected in series, charge on each capacitance is the same.

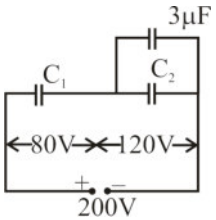


$Q_1 = Q_2$

$C_1 \times 60 = C_2 \times 140$

$C_1 = 2.33C_2$

When another capacitance (3μF) is connected in parallel with B-



$\therefore C_1 \times 80 = (C_2 + 3) \times 120$

$2.33C_2 \times 80 = 120C_2 + 360 \ (\because C_1 = 2.33C_2)$

$186.4C_2 = 120C_2 + 360$

$C_2 = 5.42\ \mu F$

3. 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

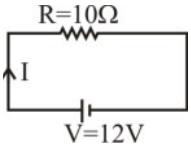
RRB JE 04.06.2025, Shift-I (Re-Exam)

Ans. (d) : V = IR

Given,

V = 12V

R = 10Ω



12= I×10

$\frac{12}{10} = 1.2A$

4. Power of an electrical system is measured in _____.

(a) Joule
(b) Newton-metre
(c) Watt-sec
(d) Watt

RRB JE 22.04.2025, Shift-I

Ans. (d) : Power of an electrical system is given by-

$P = VI \cos\phi$

Where V = Voltage across load
I = current flow through the circuit
$\cos\phi$ = power factor

In electrical system power is measured in Watt, Kilowatt, Megawatt etc.

5. Winding in wire wound resistor is made up of _____.

(a) Nickel-chromium alloy
(b) Carbon
(c) Chromium cobalt
(d) Nickel

RRB JE 22.04.2025, Shift-I

Ans. (a) : Winding in wire wound resistor is made up of Nickel-chromium alloy. The wire material must have high resistivity and stability over a wide range of temperatures.

6. The capacitance of a parallel plate capacitor depends upon:

(a) separation between plates
(b) type of metal used
(c) potential difference between plates
(d) thickness of plates

RRB JE 22.04.2025, Shift-I

Ans. (a) : The capacitance of a parallel plate capacitor depends upon separation between plates.

Capacitance of parallel plate capacitor is-

$$\boxed{C = \varepsilon.\frac{A}{d}} \qquad \boxed{\varepsilon = \varepsilon_0.\varepsilon_r}$$

Where,

ε_0 = Permittivity of free space.
ε_r = Relative permittivity (Dielectric constant)
d = Distance between plates.
A = Area of plate.

7. 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

Ans. (a) : Given that,

W = 6.8 J
Q = 1 mC
V = ?
W = Q.V

$$V = \frac{6.8}{1mC} = 6.8kV$$

8. 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 (CRIS) Electrical 19.02.2023, 12:30-2:30 PM
DMRC JE, 26.02.2020
RRB JE 01.09.2019 Shift-I
RRB Mumbai SSE 05.10.2008

Ans. (b) : Resistance is inversely proportional to the cross sectional area of the conductor.

Hence, if the cross sectional area increases then resistance of conductor decreases.

■ The resistance of the conductor is directly proportional to the length.

$$\boxed{R = \rho\frac{\ell}{A}\Omega}$$

Where,

R = Resistance
ℓ = Length
ρ = resistivity of conductor
A = Cross section area

9. 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 (CRIS) Electrical 19.02.2023, 12:30-2:30 PM
RRB JE 01.09.2019 Shift-I

Ans. (b) : Given, P = 100W
P = 0.1 kW
Time = 10 h
Energy in kWh = power (kW) × time (h)
= 0.1 × 10 = 1 kWh

10. 1 watt = _____ ergs per second,

(a) 10^7 (b) 10
(c) 10^{-7} (d) 100

DFCCIL Executive Electrical-20.12.2023

Ans. (a) :

1 watt = 10^7 ergs per second
1 watt = 1 Joule per second

The erg is a unit of energy and one erg equal to 10^{-7} Joules.

11. 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) Electrical 19.02.2023, 12:30-2:30 PM
DMRC JE, 26.02.2020

Ans. (b) : Given that,

$P_1 = 400W$, $P_2 = 100W$

$$P = \frac{V^2}{R}$$

If voltage rating of bulb is same-

$$P \propto \frac{1}{R}$$

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

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

$$\boxed{R_2 = 4R_1}$$

12. Ampere is the S.I. unit of .....

(a) Charge (b) Voltage
(c) Resistance (d) Current

DFCCIL Executive Electrical 30.09.2021
(Konkan Railway STA 2017)

Ans. (d) : Ampere is the SI unit of electric current. The rate of charge flow is called current.

Current $I = \frac{q}{t}$ = Coulomb/second

Parameter	Unit
Resistance	ohms
Voltage	Volt
Capacitor	Farad
Magnetic flux	Weber
Inductance	Henry

13. Two incandescent lamps of wattage 40W, 60 W are connected in series with voltage of 230 V. Which out of the two lamps will glow brighter?

(a) 40 W (b) 60 W

(c) both brightly (d) both dim

DFCCIL Executive Electrical-20.12.2023

(RRB Mumbai SSE 05.10.2008)

Ans. (a) : 40 watt lamp glow brighter

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

$R \propto \frac{1}{P}$ for given voltage

$R_1 = \frac{1}{40}, \quad R_2 = \frac{1}{60}$

$\boxed{R_1 > R_2}$

$P_1 = I^2R_1, \; P_2 = I^2R_2$ (In series I is same)

$I^2R_1 > I^2R_2$

As both resistance of lamp connected in series then current flowing in them will be square and power losses of a lamp is equivalent to I^2R. So that lamp glow brighter which resistance is larger or power rating will low. i.e. in which power losses will more then it glow brighter.

14. Which of the following is the base unit ?

(a) Frequency (b) Velocity

(c) Force (d) Time

DFCCIL Executive Electrical-20.12.2023

Ans. (d) : SI base unit is an international system of measurement that are used universally in technical and scientific research to avoid the confusion with the units.

Name of the Quantity	SI Unit
Length	Meter
Mass	Kilogram
Time	Second
Current	Ampere
Temperature	Kelvin
Amount of substance	Mole
Luminous intensity	Candela

15. An important consequence of Gauss's law is.....

(a) Ohm's law (b) Ampere's law

(c) Kirchhoff's law (d) Coulomb's law

DFCCIL Executive Electrical-20.12.2023

Ans. (d) : An important consequence of Gauss's law is Coulomb's law.

Gauss's law states that the net flux of an electric field in a closed surface is directly proportional to the enclosed electric charges.

$\boxed{\phi = \frac{Q}{\varepsilon_0}}$

16. If a resistance has the following colour code, find the value of resistance.

Gray, Red, Green, Silver

(a) $82k\Omega \pm 10\%$ (b) $8.2k\Omega \pm 10\%$

(c) $82M\Omega \pm 10\%$ (d) $8.2M\Omega \pm 10\%$

DMRC JE 20.02.2020

Ans. (d) : The value of resistance for given colour code is $8.2\ M\Omega \pm 10\%$.

Colour	Digit	Multiplier	Tolerance
Black	0	10^0	–
Brown	1	10^1	±1%
Red	2	10^2	±2%
Orange	3	10^3	–
Yellow	4	10^4	–
Green	5	10^5	± 0.5%
Blue	6	10^6	± 0.25%
Violet	7	10^7	± 0.1%
Gray	8	10^8	± 0.05%
White	9	10^9	–
Gold		10^{-1}	± 5%
Silver		10^{-2}	± 10%
Colourless		–	± 20%

Hence,
Gray, Red, Green, Silver.
$82\times10^5 \pm 10\%$
or $8.2\ M\Omega \pm 10\%$

17. An energy source flows a steady current of 2A to 10s in an electric bulb. If it emits 2.3 kJ of energy in the form of light and thermal energy. Find the voltage drop in the bulb?

(a) 130 V (b) 260 V

(c) 115 V (d) 230 V

DMRC JE 20.02.2020

Ans. (c) : Given that, i = 2A

t = 10s

$H = 2.3kJ = 2.3\times10^3J$

$H = i^2Rt$

$R = \frac{H}{i^2t} = \frac{2.3\times10^3}{4\times10} = 57.5\Omega$

Voltage drop = iR

$(V) = 2\times57.5 = 115V$

18. Which of the following type of resistors has highest value of temperature coefficient?

(a) Wire wound (b) Carbon film

(c) Metal film (d) Carbon composition

CRIS Electrical JE-19.02.2023

DMRC JE 20.02.2020

Ans. (c) : Metal film resistors has highest value of temperature coefficient from given option.

19. If the current flowing through the conductor is 5A, 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

Ans. (d) : Given that,
Current (i) = 5A, Time (t) = 1 sec
Charge on electron (e) = 1.6×10^{-19}Coulomb
We know that-

$Q = it$

$ne = it \quad (\because Q = ne)$

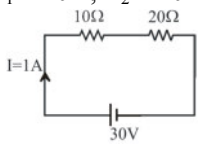
$$n = \frac{it}{e} = \frac{5\times1}{1.6\times10^{-19}} = 31.25\times10^{18} \approx 31.35\times10^{18}$$

20. Two resistors R_1= 10Ω and R_2= 20Ω are connected in series order to a 30V direct current (DC) source. Find the ratio (P_1/P_2) of the power expended by the resistors.

(a) P_1/P_2= 1/3 (b) P_1/P_2= 1/4
(c) P_1/P_2= 1/2 (d) P_1/P_2= 2/1

DMRC JE 20.02.2020

Ans. (c) : Given, $R_1 = 10\Omega$, $R_2 = 20\Omega$



$$I = \frac{V}{R} = \frac{30}{10+20} = \frac{30}{30} = 1A$$

$P_1 = I^2R_1 = 10W$

$P_2 = I^2R_2 = 20W$

P_1/P_2= 10/20 = 1/2

21. How much energy will be a 100W electric bulb spend in two hours?

(a) 72 kJ (b) 7200 J
(c) 720 J (d) 720 kJ

DMRC JE 20.02.2020

Ans. (d) : Given,
$P = 100W \qquad t = 2hr = 2\times3600$
$t = 7200$ Sec
Energy = Power × time
$E = P\times t$
$E = 100 \times 7200$
$E = 720$ kJ

22. 1 Joule of electrical energy equals:

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

DMRC JE 2018, Shift-I

Ans. (a) : Energy consumed in electrical power system is-

$E = P \times t$
Joule = watt.sec
1 Joule = 1 watt.sec

23. A varistor is made of:

(a) Copper (b) Carbon film
(c) Carborundum crystals (d) Aluminium

DMRC JE 2018, Shift-I

Ans. (c): A varistor is an electronic component with-an electrical resistance that varies with the applied voltage. It is made of carborundum crystals. It is also known as voltage dependent resistor. Silicon carbide is also known as corborundum crystal.

24. Two equal resistors are first connected in series and then in parallel across a dc supply. What is the ratio (series circuit to parallel circuit) of total heat dissipated by the resistors for the two cases at a given time?
(Assume that the current from the dc source is same in both cases.)

(a) 2:3 (b) 1:2
(c) 4:1 (d) 3:2

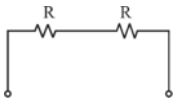
DMRC JE, 26.02.2020

Ans. (c) : Assume current from dc source is same in both (series & parallel) case is same-

For series connection-

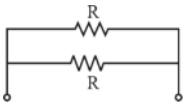
$R_{eq} = R + R = 2R$

Heat dissipated $H_1 = 2i^2Rt$



For parallel

$$R_{eq} = \frac{R}{2}$$



Heat dissipated $H_2 = i^2\frac{R}{2}t$

$$\frac{H_1}{H_2} = \frac{2i^2Rt}{i^2\frac{Rt}{2}} = \frac{4}{1}$$

$$\boxed{H_1 : H_2 = 4:1}$$

25. Capacitance of a capacitor is given by:

(a) $C = \frac{\varepsilon_0\varepsilon_r d}{A}$ (b) $C = \frac{\mu A}{d}$

(c) $C = \frac{A}{d}$ (d) $C = \frac{\varepsilon_0\varepsilon_r A}{d}$

DMRC JE 2018, Shift III

Ans. (d) : The capacitance of a parallel plates capacitor can be given by-

$$C = \frac{\varepsilon_0\varepsilon_r A}{d}$$

Where, ε_0 = Absolute permittivity
ε_r = Relative permittivity
A = Area of each plate
d = Distance between plates
■ Capacitance is measure in Farad.

26. An ideal voltage source is one which has:

(a) infinite internal resistance
(b) zero internal resistance
(c) very high internal resistance
(d) very low internal resistance

DMRC JE 2018, Shift III