RRB ALP Stage-II Electrician Trade

&

Electronic Mechanics Trade

PART- A & B

Solved Papers

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CONTENT

RRB ALP Stage-II

PART-I

PART-II

Technician (Electrician)

Electronics Mechanics

Electronics Instrumentation Mechanics

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
2.	Electronics Engineering and combination of various streams of Electronics Engineering	Electronics Mechanic/Mechanic Radio &TV

Electronic Mechanic/ Radio & Television :

Semester-I :

Importane of safety and general precautions. Trade and Orientation, Hand Tools and their uses, Basics of AC and Electrical Cables, Cells & Batteries, Passive Components, Transformers, AC & DC measurements, Soldering & De-soldering and switches, Rectifiers, IC Regulartors, Computer Hardware, OS, MS office Networking, Computer Networking.

Semester-II :

Transistor, Amplifier, Wave shaping circuits, Power Electronic Components, Mosfet & IGBT, Opto Electronics, Basic SMD (2,3,4 terminal components), Basic Gates, Combinational Circuits, Flip Flops, Electronic circuit simulation software, Counter & shift Registers, Op-Amp & Timer 555 Applications.

Semester-III :

Digital Storage Oscilloscope, SMD Soldering and De-soldering, PCB Rework, Protection devices, Electrical control circuits, Electronic Cables & Connectors, Communication electronics, Microproccessor & Microcontroller, Sensors, Transducers and Applications, Analog IC Applications, Digital IC Applications.

Semester-IV :

Fiber optic communication, Digital panel Meter, SMPS, UPS, Solar Power (Renewable Energy System), Cell phones, LED Lights, LCD and LED TV.

Syllabus of Semester System For The Trade of ELECTRICIAN

UNDER CRAFTSMAN TRAINING SCHEME (CTS)

By Government of India Ministry of Labour & Employment (DGE&T)

First Semester –

- **Occupational Safety & Health–** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard.
- **Soft Skills**– its importance and Job area after completion of training.Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure. Identification of Trade-Hand tools-Specifications. Fundamental of electricity. Electron theory- free electron, Fundamental terms, definitions, units & effects of electric current. Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code 2011 Explanation, Definition and properties of conductors, insulators and semi-conductors. Voltage grading of different types of Insulators, Temp. Rise permissible Types of wires & cables standard wire gauge Specification of wires & Cables-insulation & voltage grades -Low , medium & high voltage Precautions in using various types of cables / Ferrules
- **Ohm's Law -** Simple electrical circuits and problems. Reading of simple Electrical Layout.
- **Resistors -**Law of Resistance. Series and parallel circuits.
- **Kirchoff's** Laws and applications. Wheatstone bridge principle And its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. Common Electrical Accessories, their specifications in line with NEC 2011-Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB.
- **Chemical effect of electric current-**Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electro-plating and Electro chemical equivalents. Explanation of Anodes and cathodes. Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Ni-cadmium & Lithium cell, Cathodic protection. Electroplating, Anodising. Different types of lead acid cells. Rechargeable dry cell, description advantages and disadvantages. Care and maintenance of cells Grouping of cells of specified voltage & current, Sealed Maintenance free Batteries, Solar battery. Inverter, Battery Charger, UPS-Principle of working. Lead Acid cell, general defects & remedies. Nickel Alkali Cell-description charging. Power & capacity of cells. Efficiency of cells.
- **ALLIED TRADES–** Introduction of fitting trade. Safety precautions to be observed Description of files, hammers, chisels hacksaw frames & blades-their specification & grades. Care & maintenance of steel rule try square and files. Marking tools description & use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing & holding tools-their care and maintenance.
- **Types of drills description & drilling machines–** proper use, care and maintenance. Description of taps & dies, types in rivets & riveted joints. Use of thread gauge. Description of marking & cutting tools such as snubs shears punches & other tools like hammers, mallets etc. used by sheet metal workers. Types of soldering irons-their proper uses. Use of different bench tools used by sheet metal worker. Soldering materials, fluxes and process.
- **Magnetism -** Classification of magnets, methods of magnetising, magnetic materials. Properties, care and maintenance. Para and Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor- Different types, functions and uses.
- **Alternating Current -**Comparison and Advantages D.C and A.C. Related terms frequency Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor (p.f). Active and Reactive power, Simple problems on A.C. circuits, single Phase and three-phase system etc. Problems on A.C. circuits. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.

- **Earthing**- Principle of different methods of earthing. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines.
- **Basic electronics**- Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials –P-N-junction. Classification of Diodes – Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter.

Second Semester–

- **Working principle and uses of an oscilloscope–**Explanation of principle of working of a transistor & configuration. Types of transistors & its application. Specification and rating of transistors. Explanation of transistor Amplifiers, Amplifiers. – class A,B and C Power amplifier
- **Explanation of oscillator–**working principle Explanation of stages and types. Multivibrator – applications. Introduction of basic concept of ICs, U.J.T., F.E.T. Basic concept of power electronics devices e.g. S.C.R., Diac, Triac, power MOSFET, G.T.O and I.G.B.T.
- **Digital Electronics** -Binary numbers, logic gates and combinational circuits
- **Electric wirings**– I.E. rules. Types of wirings both domestic and industrial. Specifications for wiring. Grading of cables and current ratings. Principle of laying out in domestic wiring. Voltage drop concept.
- **Wiring system–** P.V.C., concealed system. Maintenance and Repairing data sheet preparation. Specifications, standards for conduits and accessories - Power Wiring - Control Wiring - Information Communication - Entertainment Wiring. Testing of wiring installation by meggar. Study of Fuses, Relays, Miniature circuit breakers (MCB), ELCB, etc.
- **D.C. Machines–** General concept of Electrical Machines.
- **Principle of D.C. generator–** Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring Brushes, Laminated core. Explanation of **D.C. Generators**-types, parts. **E.M.F**. equation-self excitation and separately excited Generators-Practical uses. Brief description of series, shunt and compound generators. Explanation of Armature reaction, inter poles and their uses, connection of inter poles, Commutation. Losses & Efficiency of D.C.Generator, Parallel Operation of D.C.Generator. Application of D.C. generators. Care, Routine & preventive maintenance.
- **DC Motors**– Termsused in D.C. motor-Torque, Brake Torque, speed, Back-e.m.f. etc. and their relations, Types of D.C.Motor. Starters used in D.C. motors Related problems Characteristics of D.C.Motor, Losses & Efficiency, Application of D.C. motors. Care, Routine & preventive maintenance. Types of speed control of DC motors in industry. Control system. AC-DC, DC-DC control.
- **Working principle of Transformer–** classification C.T., P.T. Instrument and Auto Transformer(Variac), Construction, Single phase and Poly phase. E.M.F. equation, parallel operation of transformer, their connections. Regulation and efficiency. Type of Cooling for transformer. Protective devices. Specifications, simple problems on e.m.f. Equation, turn ratio, regulations and efficiency. Special transformers. Transformer –Classification of transformer. Components, Auxiliary parts i.e. breather, Conservator, buchholze relay, other protective devices. Transformer oil testing and Tap changer (off load and on load). Dry type transformer. Bushings and termination.
- **Electrical Measuring Instruments–** -types, indicating types. Deflecting torque, Controlling torque and Damping torque , PMMC & MI meter (Ammeter, Voltmeter) -Range extension -Multimeter(Digital/Analog) -Wattmeter - P.F. meter - Energy meter (Digital/analog) –Insulation Tester (Megger), Earth tester. -Frequency meter -Phase Sequence meter -Multimeter –Analog and Digital -Tong tester -Techometer.

Third Semester–

- **Three phase Induction motor –**Working principle –Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor. Construction , characteristics and Speed control, Slip & Torque . Control & Power circuit of starters D.O.L Starter, Star /Delta starter, Autotransformer starter, Rotor resistance starter, etc Single phasing preventer. Losses & efficiency. Application of Induction Motor Care, Routine & preventive maintenance.
- **Single phase induction motor-** Working principle, different method of starting and running (capacitor start, permanent capacitor, capacitor start & run, shaded pole technique). FHP motors, Repulsion motor, stepper motor, Hysteresis motor, Reluctance motor. Application of Single phase induction motor
- **Universal motor**-advantages, Principle, characteristics, applications in domestic and industrial appliances, Fault Location and Rectification. Braking system of motor. Application of Universal motor.
- **Alternator–**Explanation of alternator, types of prime mover, efficiency, regulations, phase sequence, Parallel operation. Specification of alternators and Brushless alternator. Verify the effect of changing the field excitation and Power factor correction of Industrial load.

- **SYNCHRONOUS MOTOR–** Working principle, effect of change of excitation and load. V and anti V curve. Cause of low power factor. Method of power factor improvement. Rotary Converter- Inverter, M.G. Set description, Characteristics, specifications**-** running and Maintenance. Solid state controller and Invertors.
- **TRANSFORMER Winding–** Small Transformer winding techniques
- **DC machine Winding--** Armature winding terms, pole pitch, coil pitch, back pitch, front pitch , Lap and Wave winding, Progressive and retrogressive Winding, developed diagram. Growler construction, working & application.
- **ACmachine Winding—**Motor winding terminology – classification of conducting and insulating materials used in winding – Types and methods of winding in single and three phase motors. Stator winding terms, coil side, end coil and grouping of coils. Connection to adjacent poles, connected stator winding, alternate pole connection, developed diagram.
- **Illumination–** Laws of Illuminations, terminology used , Illumination factors, intensity of light –importance of light, human eye factor, , units. Types of illumination Type of lamps -Neon sign Halogen, Mercury vapour, sodium vapour, Fluorescent tube, CFL, LED, Solar lamp & photo cell applications, Decoration lighting, Drum Switches, efficiency in lumens per watt, Calculations of lumens. Estimating placement of lights, fans and ratings.
- **Industrial wiring**– Code of practice and relevant span. Wiring of electric motors, control panel, etc. Types, specifications, advantages of different types of circuit brackets construction and maintenance. Working principle and construction of domestic and agricultural appliances-their maintenance.
- **Complete House–** wiring layout. Splitting load wire in accordance with NEC I.E.E. Rules. Multi-storeyed system. Fault finding and trouble shooting.

Fourth Semester–

- **Machine control cabinet /Control Panel Layout, Assembly & Wiring**:– Layout of Control cabinet & control panel Study & Understand Layout drawing of control cabinet , panel, power & control circuits.
- **Control Elements:–** Isolator, pushbutton switches, Indicating lamps, MCB, Fuse, Contactor, Relays, Overload Relay, Timers, Rectifier, Limit switches, control transformers. Wiring Accessories: Race ways/ cable channel, DIN Rail, Terminal Connectors, Thimbles, Lugs, Ferrules, cable binding strap & buttons, nylon cable ties, sleeves, Gromats& clips
- **Domestic Appliances:–** Working principles and circuits of common domestic equipment and appliances. – Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light. Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, , Motor Pump set, etc. Concept of Neutral and Earth.
- **POWER GENERATION :–** Generation sources of energy, Comparison of energy resources. Types of fuels. Advantages of liquid fuel & solid fuel. Various ways of electrical power generation. • Thermal • Hydro electric • Nuclear • Non-Conventional Thermal Coal based, diesel based & Gas based Turbine. Constituents in steam power station.
- **Hydro Electric:–** Schematic arrangement of Hydro-Electric Power Station. Constituents of Hydro Electric Plant. Types of Hydro Electric Power station. Advantages &disadvantages.
- **Nuclear:–** Schematic arrangement of Nuclear Power Station. Composition of an atomic Nucleus. Advantages & disadvantages. Comparison of above Power Plant.
- **Non-Conventional–** An introduction to Power generation through non-conventional power generation such as Solar, Bio-Gas, Wind energy and Micro-hydel, Tidal waves, etc. Basic principal, Advantages & disadvantages of each.
- **TRANSMISSION OF ELECTRICAL POWER–** Electrical Supply System : Comparison of AC and DC transmission. Advantages of High transmission voltage. Introduction to Single phase , three phase-3 wire system in transmission lines Overhead Lines: Main components of overhead lines-Types of power line Low voltage line medium Voltage line & high voltage line Voltage standard Conductor materials, line supports, Insulators, types of Insulators
- **Under Ground Cable:–** Construction of cables. Material for cables, its insulation. Classification of cables, cables for 3-phase service, Laying of underground cable. Types of cable faults and their location.
- **DISTRIBUTION OF POWER–** Function and equipment used in substation. Classification of distribution system-AC distribution, Overhead v/s underground distribution system. Essential features of switchgears. Isolator, Switch gear equipments, bus-bar arrangement, Short circuit, faults in power system.
- **Circuit breakers**– Introduction & Classification of circuit breakers lightening arrestors used in HT lines. Introduction, Construction & Working of power transistor, thyristor. Introduction, Construction, Working, Parameters & application of DC drive. Speed control of 3 phase induction motor by using VVVF/AC Drive. Introduction, Construction, Working, Parameters & application of AC drive Schedule of electrical preventive maintenance. Break down, Routine & Preventive maintenance of DC/AC machines, Voltage stabilizer, U.P.S. &Equipments.

RRB Assistant Loco Pilot Exam 2025
Technician (Electrician)
Solved Paper

Exam Date: 02.05.2025] **[Timing: 09.30AM-12.00 PM**

PART-A : NON-TECHNICAL

1. A fruit seller initially had some apples. He sold 40% of those and still had 300 apples. How many apples did he initially have?
(a) 750 (b) 500 (c) 450 (d) 600

Ans. (b) : Let initial apples are = x
Fruit seller sold 40%
Reaming = 100 – 40 = 60%
The left amount of apple

$$\frac{x \times 60}{100} = 300$$

$$x = \frac{300 \times 100}{60}$$

$$\boxed{x = 500}$$

2. Amit's income in 2019 was ₹27,000. He gets an increment of 10% every year. What was his income (in ₹) in 2021?
(a) 32,670 (b) 32,400
(c) 29,700 (d) 27,000

Ans. (a) : Given that Principal, P = ₹ 27000
Rate, r = 10, Time, t = 2 years

$$A = P\left(1+\frac{r}{100}\right)^t$$

$$A = 27000\left(1+\frac{10}{100}\right)^2$$

$$= 27000\left(\frac{11 \times 11}{100}\right)$$

$$A = 32670$$

3. Which of the following ecosystems has very low temperatures and frozen soil?
(a) Desert (b) Tundra
(c) Grassland (d) Tropical rainforest

Ans. (b) : The Tundra biome is characterized by extremely low temperature and permanently frozen soil known as permafrost. The average temperature is often below freezing for most of the year.

4. Which of the following devices is used to measure temperature?
(a) Hygrometer (b) Voltmeter
(c) Odometer (d) Thermometer

Ans. (d) :

Instrument	Measurement
Hygrometer	Humidity
Voltmeter	Potential difference (voltage)
Odometer	Distance traveled by a vehicle
Thermometer	Temperature

5. The area of a regular polygon with a side of 8 cm is 112 cm^2. If the perpendicular distance from the centre to the side of the polygon is 7 cm, then the number of sides of the polygon is:
(a) 7 (b) 5
(c) 6 (d) 4

Ans. (d) : Area of a regular polygon

$$\mathbf{A} = \frac{1}{2} \times n \times s \times a$$

Where A = Area
s = side length
a = perpendicular distance
n = number of sides
Given A = 112 cm^2 s = 8 cm a = 7 cm

$$112 = \frac{1}{2} \times n \times 56$$

$$28\,n = 112$$

$$\boxed{n = 4}$$

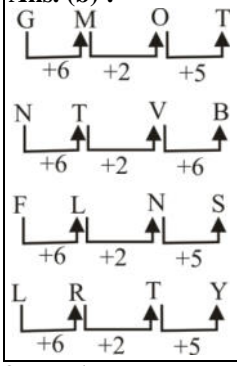
6. Which of the following is the best way to identify workplace hazards?
(a) Conducting regular safety inspections
(b) Relying on employees to report accidents
(c) Ignoring small risks
(d) Waiting for an incident to occur

Ans. (a) : The best way identify workplace hazards.
(i) Collect existing information about workplace hazards.
(ii) Inspect the workplace for safety hazards.
(iii) Identify health hazards.
(iv) Conduct incident investigations
(v) Identify hazards associated with energy and non routine situations.

7. The areas of three adjacent faces of a solid cuboid are 216 cm^2, 114 cm^2 and 19 cm^2 .What is the volume (in cm^3) of the cuboid?
(a) 880 (b) 684
(c) 532 (d) 955

Ans. (b) : Given that
$A_1 = lb = 216\ cm^2$ …….(i)
$A_2 = bh = 114\ cm^2$…….(ii)
$A_3 = hl = 19\ cm^2$ …….(iii)
Multiply the three area equation
$A_1 \times A_2 \times A_3 = 216 \times 114 \times 19$
$(lb \times bh \times hl) = 216 \times 114 \times 19$
$(l^2 \times b^2 \times h^2) = 216 \times 114 \times 19$
$(lbh)^2 = 467856$
$lbh = \sqrt{467856}$
$V = 684\ cm^3$

8. Based on the English alphabetical order, three of the following four letter-clusters area like in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group?
(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)
(a) GMOT (b) NTVB
(c) FLNS (d) LRTY

Ans. (b) :


9. An ammeter has 20 divisions between 0 A and 2 A. The least count of ammeter is_____.
(a) 2 A (b) 0.1 A
(c) 0.2 A (d) 1A

Ans. (b) : If an ammeter has range 0 to 2A and has 20 division between 0 and 2A

$$\text{Least count} = \frac{\text{Maximum value - Minimim value}}{\text{Number of division}}$$

$$\text{Least count} = \frac{2-0}{20} = \frac{1}{10}$$

$$\text{Least count} = 0.1\text{A}$$

10. Which of the following is the work done by the gravitational force on the object of mass 50 kg when the object is moved from one point to another point along a horizontal line ($g = 10\ m/s^2$)?
(a) 50 J (b) 500 J (c) –500 J (d) Zero

Ans. (d) : The work done by a force is defined as the dot product of the force vector and the displacement vector.

$$W = f.d \cos\theta$$

Where θ is the angle between the force and displacement vectors.
$\theta = 90^\circ$ angle between gravitational force and the horizontal displacement
$W = f.d.\ cost\ 90^\circ$
$\boxed{W = 0}$
So the work done by the gravitational force on the object is 0 J.

11. In a hospital, the ratio between the number of doctors and the number of nurses was 1:3. When 12 new doctors joined the hospital and 24 nurses left the hospital, the ratio became 3 : 4. After the resignation of k more nurses from the hospital, the ratio becomes 1 : 1. Find the value of k.
(a) 24 (b) 26 (c) 28 (d) 12

Ans. (d) : Let initial number of doctors = D
Initial number of nurse = N

$$\frac{D}{N} = \frac{1}{3}$$

$$N = 3D$$

After 12 new doctors joined the number of doctors became D + 12 and new number of nurse N – 24

$$\frac{D+12}{N-24} = \frac{3}{4}$$

$$\frac{D+12}{3D-(24)} = \frac{3}{4}$$

$$4(D + 12) = 3\ (3D – 24)$$
$$4D + 48 = 9D – 72$$
$$5D = 120$$
$$\boxed{D = 24}$$

The initial number of nurse $N = 3D$
$N = 3 \times 24$
$= 72$
After K more nurse resigned the number of doctors remained $D + 12 = 24 + 12 = 36$
Then the nurse become
$N – 24 – K$
$= 72 – 24 – K = 48 – K$
Then ratio

$$\frac{48-K}{36} = \frac{1}{1}$$

$$\boxed{K = 12}$$

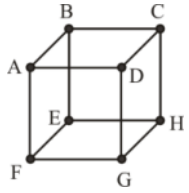
12. On which of the following factors does the resistivity of a conductor depend?
(a) Mass of the conductor
(b) Area of the conductor
(c) Nature of the conductor
(d) Diameter of the conductor

Ans. (c) : Resistivity is defined as the resistance of a unit length with a unit area of cross-section of the material of the conductor.

$$\rho = \frac{RA}{l}$$

The resistivity is independent of the shape and size but depends on the nature and temperature of the material.

13. Which of the following is a geometrical figure with a three-dimensional geometry that has eight vertices and six rectangular faces?
(a) Cylinder (b) Pyramid
(c) Cuboid (d) Parallelogram

Ans. (c) :


The three dimensional geometry cuboid has face = 6 corner or vertices = 8

14. In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Which numbers should replace X and Y so that the pattern followed by the two numbers on the left side of :: is same as that on the right side of ::?
(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into their constituent digits. E.g. 13 – Operations on 13 such as adding / subtracting / multiplying to 13 can be performed. Breaking down 13 into 1 and 3and then performing mathematical operations on 1 and 3 is not allowed.)
X : 85 :: 36 : Y
(a) X = 44, Y = 73 (b) X = 42, Y = 73
(c) X = 42, Y = 71 (d) X = 43, Y = 77

Ans. (b) : X : 85 : : 36 : Y
42 : 85 : : 36 : 73
42 × 2 + 1 : : 36 × 2 + 1
X = 42 and Y = 73

15. The average of 5 results is 51 and that of the first 4 is 50. The 5th result is _____.
(a) 55 (b) 54
(c) 50 (d) 51

Ans. (a) : The average of 5 results is given as 51
Sum of these results = Average × Number of results
= 51 × 5
= 255
The average of 4 results is 50
Sun of first four result = 5 × 4
= 200
5th Result = Sum of 5th result – Sum of 4th result
= 255 – 200
The 5th results = 55

16. The sum of the ages of Yash and his father is 90 years. When Yash is as old as his father's present age, he will be five times as old as his son Suraj's present age. Suraj will be 12 years older than Yash's present age, when Yash is as old as his father at present. How old is Suraj at present?
(a) 16 years (b) 15 years
(c) 12 years (d) 18 years

Ans. (c) : Let-
Present age of Yash is Y
Present age of his father is F
Present age of his son is S
Given condition-
$Y + F = 90$ ...(i)
Let after x year, Yash age will be equal to his father age.
so $y + x = F$
$x = F - y$ ... (ii)
$F = 5S$
$S = \frac{F}{5}$ ... (iii)
$S + x = y + 12$ ... (iv)
Put value of S and x in equation (iv)
$\frac{F}{5} + F - y = y + 12$
$\frac{6F}{5} - 2y = 12$
$6F - 10y = 60$ ...(v)
From equation (i) F = 90 – y putting in equation (v)
$6(90 - y) - 10y = 60$
$\Rightarrow y = 30$
So, F = 90 – y = 90 –30 = 60 and $S = \frac{F}{5} = \frac{60}{5} = 12$ year

17. A, B, C, D, E and F live on six different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it is numbered 2 and so on till the topmost floor is numbered 6. D lives on an odd-numbered floor but not 3. The sum of floors on which D and E live is 7. A lives immediately below C. F lives on the top floor. How many people live between E and F?
(a) 1 (b) 3
(c) 4 (d) 2

Ans. (b) :

Floors	Number
F	6
D	5
C	4
A	3
E	2
B	1

There are three people live between E and F.

18. In the following series, only one letter-cluster is incorrect. Select the INCORRECT letter-cluster.
PCO MEM JGK GIJ DKG AME
(a) AME (b) JGK
(c) GIJ (d) DKG

Ans. (c) : PCO MEM JGK GIJ DKG AME

P	C	O
–3 ↓	+2 ↓	–2 ↓
M	E	M
–3 ↓	+2 ↓	–2 ↓
J	G	K
–3 ↓	+2 ↓	–1 ↓
G	I	J
–3 ↓	+2 ↓	–3 ↓
D	K	G
–3 ↓	+2 ↓	–2 ↓
A	M	E

GIJ is incorrect letter

19. A cistern has two inlets I_1 and I_2 . I_1 alone can fill it in 8 hours and I_2 in 4 hours. If both the inlets are open, what will be the time required to fill the cistern.
(a) $4\frac{2}{3}$ hours (b) $3\frac{2}{3}$ hours
(c) $2\frac{2}{3}$ hours (d) 2 hours

Ans. (c) : Inlet I_1 fill the cistern in 8 hour
Its filling rate = $\frac{1}{8}$

Inlet I_2 inlet fill the cistern in 4 hours its filling = $\frac{1}{4}$

The combined filling rate = $\frac{1}{8} + \frac{1}{4} = \frac{3}{8}$

Then time require for combined filling per hour

$$= \frac{1}{3/8} = \frac{8}{3} = 2\frac{2}{3}$$

20. Which of the following statements is/are true?
Statement 1:
Heat conductors allow heat to pass through them easily.
Statement 2:
All plastics are good conductors of heat.
(a) Only statement 2
(b) Both statements 1 and 2
(c) Only statement 1
(d) Neither statement 1 nor 2

Ans. (c) : Condoctors are those that allow heat pass through them easily. These materials often metals facilitate the transfer of thermal energy through them by conduction. Metals like copper aluminum and iron are good conductor of heat.

- A substance that does not allow the flow of electric current are known as non conductor or insulator. Rubber, plastic glass and wood are bad Conductor of electricity and heat.

21. Refer to the following letter and symbol series and answer the question that follows. Counting to be done from left to right only.
(Left) L R Ω Y A $ K ^ T J # Q & # E % S U * £ B (Right)
How many such symbols are there, each of which is immediately preceded by a vowel and also immediately followed by a letter?
(a) One (b) Two
(c) Four (d) Three

Ans. (b) : L R Ω Y A $ K ^ T J # Q & # E % S U * £ B
There are two symbols ($, %) which is immediately preceded by a vowel and also immediately followed by a latter.

22. From a rectangular cardboard sheet of length 46 m and breadth 8m, three circular plates of radii 3 m, 2 m and 1 m are cut out. If the area of the remaining part of the cardboard sheet is equal to the area of a square, then find the length of each side of the square $\left(\text{use } \pi = \frac{22}{7}\right)$.
(a) 16 m (b) 18 m
(c) 20 m (d) 14 m

Ans. (b) : Given that
$l = 46$ m
b = 8 m
$r_1 = 3$m
$r_2 = 2$m
$r_3 = 1$m
Then area of the rectangular cardboard = $l \times$ b
$= 8 \times 46$
$= 368\ m^2$

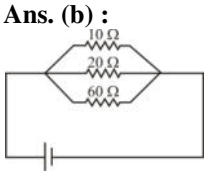
Area of first circle
$A_1 = \pi r_1^2$
$A_1 = \frac{22}{7} \times (3)^2 = \frac{198}{7} m^2$
Area of second circle
$A_2 = \pi r_2^2$
$A_2 = \frac{22}{7} \times (2)^2 = \frac{88}{7} m^2$
Area of third circle
$A_3 = \pi r_3^2$
$A_3 = \frac{22}{7} \times (1)^2 = \frac{22}{7} m^2$
Total area of the circle = $A_1 + A_2 + A_3$
$= \frac{198}{7} + \frac{88}{7} + \frac{22}{7}$
$= \frac{308}{7} m^2 = 44 m^2$
Remaining area = Area of rectangular board – Area of circle
$= 368 - 44$
$= 324\ m^2$
The area of remaining part of the cardboard sheet is equal to the area of a square
$A_{sq} = (\text{Side})^2$
$324 = (\text{Side})^2$
Side = 18 m

23. Which of the following statements regarding the use of a fire extinguisher is/are correct?
Statement 1: It is safe to attempt to extinguish any fire regardless of the presence of toxic smoke.
Statement 2: The P.A.S.S. technique, which stands for Pull, Aim, Squeeze and Sweep, is recommended for the effective use of a fire extinguisher.
(a) Only Statement 2 is correct.
(b) Only Statement 1 is correct.
(c) Neither Statement 1 nor 2 is correct.
(d) Both Statements 1 and 2 are correct.

Ans. (a) : The P.A.S.S stands for pull, aim, squeeze, and sweep. This will allow you to discharge the extinguisher. Aim at the base of the fire.

24. What is the total circuit resistance if it contains resistors 10 Ω, 20 Ω and 60 Ω, connected in parallel?
(a) 90 Ω (b) 6 Ω
(c) 60 Ω (d) 20 Ω

Ans. (b) :



Given,
$R_1 = 10\ \Omega$
$R_2 = 20\ \Omega$
$R_3 = 60\ \Omega$

In parallel combination

$$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$$

$$\frac{1}{R}=\frac{1}{10}+\frac{1}{20}+\frac{1}{60}$$

$$\frac{1}{R}=\frac{6+3+1}{60}$$

$$R=\frac{60}{10}$$

$R = 6\ \Omega$

25. The average of three numbers is 20. If two numbers are 16 and 24, the third number is:

(a) 20 (b) 22
(c) 21 (d) 19

Ans. (a) : Let the three number a_1, a_2, a_3

$a_1 = 16$ $a_2 = 24$

The average of three numbers

$$\frac{a_1+a_2+a_3}{3}=20$$

$$\frac{16+24+a_3}{3}=20$$

$40 + a_3 = 60$

$\boxed{a_3 = 20}$

26. Convert 1 kilowatt hour (kW h) into joule.

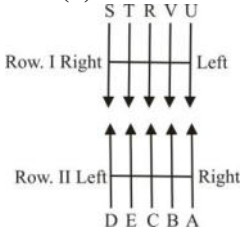
(a) 1 kw h = 3.6×10^7 J
(b) 1 kw h = 3.6×10^5 J
(c) 1 kw h = 3.6×10^3 J
(d) 1 kw h = 3.6×10^6 J

Ans. (d) : 1 kwh = 1 kw × hour
= 1000 w × 3600 second
= 3600000 w.s
= 3.6×10^6 J

27. Ten people are sitting in two parallel rows with five people each in such a way that there is equal distance between adjacent persons.
In row I, A, B, C, D and E are seated and all of them are facing south.
In row II, R, S, T, U and V are seated and all of them are facing north.
Thus each person faces another person from the other row. A sits at the extreme right end of their row and is facing U. R sits at the centre of their row and is facing C. E sits between C and D and is facing T. S sits at the extreme right end of their row.
Who sits exactly opposite B?

(a) T (b) U
(c) R (d) V

Ans. (d) :



V sits exactly opposite B.

28. Which of the following is true?

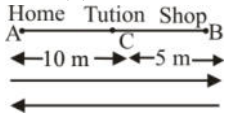
(a) Wood is a good conductor of heat.
(b) Both insulators and conductors allow heat to pass through them easily.
(c) In a kitchen, aluminium vessels are used because aluminium is a good conductor of heat.
(d) Plastic is a good conductor of heat.

Ans. (c) : option c is true statement.
(i) Wood is a poor conductor of heat or good insulator.
(ii) Insulators resist flow while conductor allow it easily.
(iii) In a kitchen, aluminium vessels are used because aluminium is good conductor of heat.
(iv) Plastic is poor conductor of heat, or good insulator.

29. Vijay rides a bicycle 10 m from home to his tuition, then 5 m to a shop. He travels back home the same way, covering the same distance. What is his total path length?

(a) 30 m (b) Zero
(c) 20 m (d) 15 m

Ans. (a) :

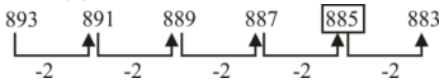


Total path length = Length between start point to destination + length between destination to start point
= 15 + 15 = 30 m

30. What should come in place of the question mark (?) in the given series?
893 891 889 887 ? 883

(a) 885 (b) 986
(c) 886 (d) 985

Ans. (a) :



31. Work done is defined in science as _____.

(a) $\frac{\text{force}}{\text{displacement}}$ (b) force × distance
(c) force × displacement (d) $\frac{\text{force}}{\text{distance}}$

Ans. (c) : Work is the energy transferred to or from an object via the application of force along a displacement.
work done = force × displacement

32. What is the term used to describe organisms that produce their own food in an ecosystem?

(a) Decomposers (b) Consumers
(c) Producers (d) Herbivores

Ans. (c) : Producers- Producers are organism that make their own food in an ecosystem.
Decomposers- Decomposers are essential that break down dead plants and animals, returning vital nutrients to the environment. This process is known as decomposition.

33. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?
(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)
(a) JQ – SY (b) GN – PV
(c) AH – JR (d) HO – QW

Ans. (c) :
J Q — S Y
(10) (17) (19)(25)
+7 +6
G N — P V
(7) (14) (16)(22)
+7 +6
A H — J R
(1) (5) (10)(18)
+7 +6
H O — Q W
(8) (15) (17)(23)
+7 +6
Option c is odd one based on their position.

34. Which of the following statements about geometric figures is/are true?
1. Geometric shapes are enclosed figures made by joining two or more points, lines, or curves.
2. Geometric shapes are always open-ended and made up of only straight lines.
(a) Neither statement 1 nor 2 is true
(b) Only statement 1 is true
(c) Only statement 2 is true
(d) Both statements 1 and 2 are true

Ans. (b) : Geometric shape- Geometric shape is defined as enclosed figures made by joining two or more points, lines or curves.
- Geometric shape are always close ended and made up of only straight line, curve, and circle etc.

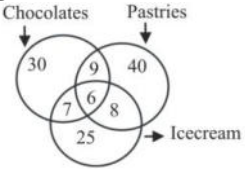
Thus statement I is true.

35. In the following triad, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.
TERM–ERTM–TMRE
(a) USER–RESU–REUS
(b) WHEN–HWEN–WENH
(c) ZERO–EZRO–ZREO
(d) VICE–ICVE–VECI

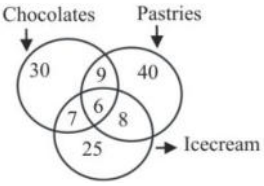
Ans. (d) :
Given T E R M → E R T M → T M R E
1 2 3 4 2 3 1 4 1 4 3 2
Similarly V I C E → I C V E → V E C I
1 2 3 4 2 3 1 4 1 4 3 2

36. Which of the following is a supplementary protocol that allows non-ASCII data to be sent through e-mail?
(a) Mailing Lists
(b) Multipurpose Internet Mail Extensions (MIME)
(c) DNS
(d) HTTPS

Ans. (b) : Multipurpose Internet Mail Extension (MIME) is a supplementary protocol that allows non-ASCII data to be sent through e-mail. It allow the users to exchange different kinds of data files on the internet; audio, video image-application programme.

37. Study the given diagram carefully and answer the question that follows. The numbers in different sections the number of children preferring different desserts.


How many children prefer both pastries and ice creams but NOT chocolates?
(a) 8 (b) 6 (c) 7 (d) 9

Ans. (a) :


Children prefer both pastries and ice-cream = 8

38. What does the symbol given below denote in a circuit diagram?

(a) Variable resistor (b) Voltmeter
(c) Resistor (d) Voltage source

Ans. (a) : Variable resister- A variable resister is a type of electrical component that can change the amount of resistance in a circuit. This means it can control the flow of electricity through a circuit by adjusting the resistance.

39. Which of the following noise levels is considered potentially harmful to human health if experienced over extended periods?
(a) 50 dB (b) 70 dB
(c) 30 dB (d) 90 dB

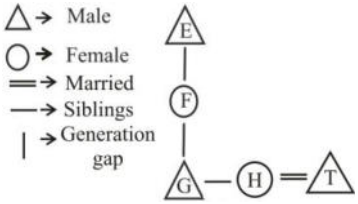
Ans. (d) : Noise level at or above 90 dB are considered potentially harmful to human health if experienced over extended periods.

40. Which of the following statements is/are true about Functional Dimensions (F) in engineering drawing?
Statement 1: Functional Dimensions are essential to the function of the component or space.
Statement 2: Functional Dimensions are typically shown without limits.
Statement 3: Functional Dimensions are only shown for reference purposes.
(a) Only statement 1 is true
(b) Only statements 1 and 2 are true
(c) Only statements 2 and 3 are true
(d) Only statement 3 is true

Ans. (a) : Functional Dimensions- It is dimension which is essential to the function the component or space. They are generally shown with limits.

41. In a certain code language,
'A + B' means 'A is the mother of B',
'A − B' means 'A is the brother of B',
'A × B' means 'A is the wife of B' and
'A & B' means 'A is the father of B'.
How is E related to T if 'E & F + G − H × T'?
(a) Wife's mother's brother (b) Wife's father
(c) Wife's mother's father (d) Wife's brother

Ans. (c) :



E related to T is wife's mother's father.

42. According to the ISO-A size series, what is the designation of a trimmed sheet with dimensions 297 mm × 420 mm?
(a) A1 (b) A3 (c) A2 (d) A4

Ans. (b) :

Paper size	**Dimension (mm × mm)**
A_0	841 × 1189
A_1	594 × 841
A_3	420 × 594
A_4	210 × 297
A_5	148 × 210

43. The weight of an object on Earth is 60 N. What is its weight on the surface of the moon?
(a) 10 N (b) 6 N
(c) 600 N (d) 60 N

Ans. (a) : Weight on earth = 60 N

$$\text{Weight on moon} = \frac{1}{6} \times \text{weight on earth}$$

$$= \frac{1}{6} \times 60 = 10 \text{ N}$$

44. What is the primary source of energy for most of the ecosystems?
(a) Wind (b) Soil
(c) Sunlight (d) Water

Ans. (c) : Sunlight is the primary source of energy for most of the ecosystems.

45. Which of the following relations is NOT correct?
(a) Electric Power = Voltage / Current
(b) Electric Power = $(\text{Current})^2 \times$ Resistance
(c) Electric Power = Voltage × Current
(d) Electric Power = $(\text{Voltage})^2$/ Resistance

Ans. (a) : $\boxed{P = VI}$

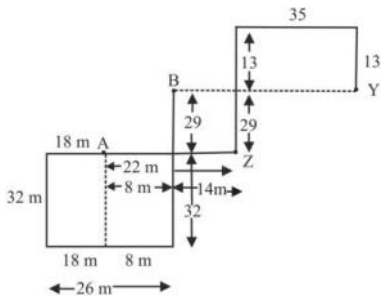
$\boxed{P = I^2R}$

$\boxed{P = V^2/R}$

P – Power, V – Voltage, I – Electric current

46. Ganpat starts from Point A and walks 18 m towards west. He takes a left turn, walks 32m, takes a left turn, walks 26 m, turns left, walks 61 m and stops at Point B. Meena starts from Point Z, which is 22 m towards the east of Point A. She walks 42 m towards north, takes a right turn, walks 35 m, turns right and walks 13 m and stops at Point Y. What is the shortest distance between Point B and Point Y? (All turns are 90-degreeturns only.)
(a) 49 m (b) 43 m
(c) 52 m (d) 57 m

Ans. (a) :



Distance between point B and point Y
= 14 + 35 = 49 m

47. Match the columns.

Engineering Applications	**Type of Engineering Drawings**
(A) Plan, front elevation of homes to be built, foundation drawings	**(P) Mechanical Engineering Drawings**
(B) Circuit diagrams and Electrical installation drawings	**(Q) Electronics Engineering drawings**
(C) PCB tracks drawings	**(R) Electrical Engineering drawings**
(D) Riveted joints and Welded joints	**(S) Civil Engineering drawings**

(a) A-P ; B-R ; C-Q ; D-S
(b) A-S ; B-P ; C-Q ; D-R
(c) A-S ; B-R ; C-Q ; D-P
(d) A-S ; B-R ; C-P ; D-Q

Ans. (c) :

Engineering Applications	**Type of Engineering Drawings**
(A) Plan, front elevation of homes to be built, foundation drawings	(S) Civil Engineering drawings
(B) Circuit diagrams and Electrical installation drawings	(R) Electrical Engineering drawings
(C) PCB tracks drawings	(Q) Electronics Engineering drawings
(D) Riveted joints and Welded joints	(P) Mechanical Engineering Drawings

48. The rate of doing work is known as _____.
(a) potential energy (b) power
(c) kinetic energy (d) force

Ans. (b) : Power- The rate of doing work is known as power.

49. How many base units are used to measure the physical quantities, according to SI units system?
(a) 4 (b) 10
(c) 7 (d) 5

Ans. (c) : 7 unit are used to measure the physical quantities, according to SI unit system.
(i) Kg – Unit of mass
(ii) Meter – Unit of length
(iii) Second – Unit of time
(iv) Ampere – Unit of electric current
(v) Kelvin – Unit of thermodynamic temperature
(vi) Mole – Unit of amount of substance
(vii) Candela – Unit of luminous intensity

50. In hot climate regions, the outer walls of the house are preferred to be white in colour because _____.
(a) white colour reflects sunlight to make the interior of the house cool
(b) white colour absorbs more sunlight to make the house bright
(c) white colour looks good
(d) white colour makes the wall more durable

Ans. (a) : In hot climate region, the outer walls of the house are preferred to be white in colour because white colour reflect sunlight to make the interior of the house cool.
- Black colour absorb more sunlight to make the house dark.

51. A 280 m long train running at a speed of 72 km/hr passes a platform in 30 seconds. Find the length of the platform (in m).
(a) 280 (b) 300
(c) 335 (d) 320

Ans. (d) : Given,
Length of train (l_1) = 280 m
Speed of train (s) = 72 km/hr = 20 m/s
Time taken by train to cross the platform (t) = 30 sec.
Let's assume the length of the platform be l_2.
We know that,

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

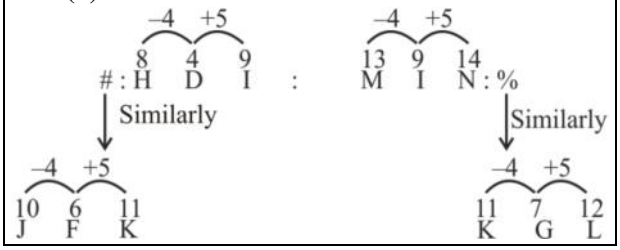
$$30 = \frac{(l_1+l_2)}{\text{Speed}}$$

$$l_1 + l_2 = 600$$

$$l_2 = 600 - l_1 = 600 - 280$$

$$\boxed{l_2 = 320 \text{ m}}$$

52. Which of the following letter-clusters should replace # and % so that the pattern and relationship followed between the letter-cluster pair on the left side of :: is the same as that on the right side of ::?
 # : HDI :: MIN : %
(a) # = JFK, % = KHL (b) # = JFK, % = KGL
(c) # = JFI, % = KGL (d) # = JFK, % = KGM

Ans. (b) :


53. Which of the following statements is correct about negative work done?
(a) Work done is negative when the force is perpendicular to the displacement.
(b) Work done is negative when the force and displacement are in the same direction.
(c) Work done is negative when the force acts opposite to the direction of displacement.
(d) Work done cannot be negative.

Ans. (c) : Negative work done:-
Work done (W) is defined by the formula,

$$W = F.d.\cos\theta \quad \text{---(i)}$$

Where,
F = Force
d = displacement
θ = Angle between the force and displacement vectors
"Work done is negative" when the force acts opposite to the direction of displacement. If the force acts opposite to the direction of displacement, then
θ = 180º and cos(180º) = –1.
Then work done from equation (i) will be,

$$\boxed{W = -Fd}$$

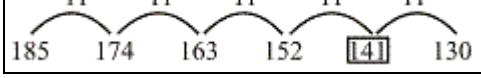
This results in negative work done.

54. Two plumbers, X and Y, are paid a total of ₹770 per day by their employer. If X is paid 140% of the sum paid to Y, then how much is Y paid (in ₹, rounded off to two decimal places) per day?
(a) 270.83 (b) 220.83
(c) 320.83 (d) 370.83

Ans. (c) : Let X is paid by ₹x per day and Y is paid by ₹y per day.
Then total payment paid by owner (employer) to X and Y,
x + y = ₹770
1.4y + y = 770
2.4y = 770

$$y = \frac{770}{2.4} \Rightarrow \boxed{y = ₹320.83}$$

55. What should come in place of the question mark (?) in the given series?
185, 174, 163, 152, ?, 130
(a) 144 (b) 141
(c) 143 (d) 142

Ans. (b) :


56. Which of the following is NOT a benefit of use of mobile governance using ICT?

(a) Increased transparency and accountability in the government
(b) Improved access to government services for citizens
(c) Reduced costs for the government
(d) Increased efficiency in government processes

Ans. (c) : Mobile governance (m-governance) refers to the delivery of government services and information to citizens through mobile devices, ensuring accessibility anytime and anywhere. Mobile governance increases transparency and accountability in the government, improves access to government services for citizens, increases efficiency in government processes. While m-governance offers scalability, it also adds costs, especially during its early stages. Substantial investments are often required to set up infrastructure, integrate systems and strain personnel.

57. What is the average human body temperature?

(a) 40ºC (b) 37ºC
(c) 30ºC (d) 42ºC

Ans. (b) : The average human body temperature is 37ºC (or 98.6ºF).

58. A piece of rod $\frac{8}{9}$ metre long is broken into two pieces. If one piece is $\frac{1}{3}$ metre long then the length (in m) of the other one is-

(a) $\frac{2}{9}$ (b) $\frac{5}{9}$ (c) $\frac{4}{9}$ (d) $\frac{7}{9}$

Ans. (b) : The length of the rod $=\frac{8}{9}$ metre(m)

The length of one piece of rod $=\frac{1}{3}$ metre(m)

The length of another piece of rod = l (let's assume)

Then,

$$\frac{1}{3}+l=\frac{8}{9}$$

$$l=\frac{8}{9}-\frac{1\times3}{3\times3}=\frac{8}{9}-\frac{3}{9}$$

$$\boxed{l=\frac{5}{9}\text{ m}}$$

59. A dozen pairs of jeans quoted at ₹3,520 are available at a discount of 35%. How many pairs of jeans can be bought for ₹572?

(a) 5 (b) 3
(c) 1 (d) 2

Ans. (b) : Given,

Mark price (MP) of 12 pairs of jeans = ₹3520

Discount rate (d) = 35%

Selling price (SP) of 12 (1 dozen) pairs of jeans

$$=\frac{3520\times65}{100}=₹2288$$

Here, selling price (SP) = Cost price (CP)

So, CP of 12 pairs of jeans = ₹2288

$\because$ For ₹2288 there can be bought 12 pairs of jeans.

$\therefore$ ₹1 ---------- $=\frac{12}{2288}$

₹572 ---------- $=\frac{12\times572}{2288}=3$

Hence, for ₹572 there can be bought 3 pairs of jeans.

60. Rinku riding his car covers 136 metres in 17 seconds. What is his speed (in km/hr)?

(a) 11.6 (b) 28.8
(c) 17 (d) 26

Ans. (b) : Given,

Distance covered (d) = 136 meters

Time taken (t) = 17 seconds

$$\text{Speed}(s)=\frac{\text{Distance covered}(d)}{\text{Time takes}(t)}=\frac{136}{17}$$

$$\text{speed}(s)=8\text{m/s}\times\frac{18}{5}=\frac{144}{5}=28.8\text{ km/hr}$$

61. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some bananas are litchis.

All litchis are kiwis.

Some kiwis are strawberries.

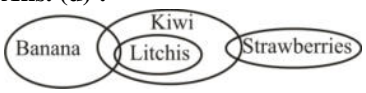
Conclusions:

1. All bananas being kiwis is a possibility.

2. All kiwis are litchis.

(a) Only conclusion 2 follows
(b) Both conclusions 1 and 2 follow
(c) Neither conclusion 1 nor 2 follows
(d) Only conclusion 1 follows

Ans. (d) :



Conclusion:

1. All bananas being kiwis is a possibility. This is true since some bananas are litchis and all litchis are kiwis, it's possible for all bananas to be kiwis as well even though some bananas might not be litchis.

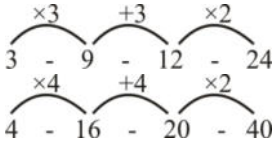
2. All kiwis are litchis. This is false. If all kiwis are litchis, then all litchis would have to be Kiwis (which is true based on the statements) and there would be no strawberries. The statements specify some kiwis are strawberries, so it can't be true that all kiwis are litchis.

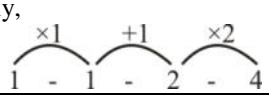
62. A copper spoon is dipped in hot water. What happens to its other end?

(a) It becomes hot by conduction.
(b) It becomes hot by convection.
(c) It becomes cold by convection.
(d) It becomes cold by conduction.

Ans. (a) : When one end of a copper spoon is dipper in hot water, the heat from the water is transferred through the spoon to its other end. This transfer of heat in solids, where particles vibrate and transfer energy to neighboring particles without significant movement of the material itself, is known as conduction. Since the spoon is a solid, conduction is the primary mode of heat transfer.

63. Two sets of numbers are given below. In each set of numbers, certain mathematical operation(s) on the first number result(s) in the second number. Similarly, certain mathematical operation(s) on the second number result(s) in the third number and soon. Which of the given options follows the same set of operations as in the given sets?
(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into their constituent digits. E.g. 13 – Operations on 13 such as adding / subtracting /multiplying to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)
3 - 9 - 12 - 24; 4 - 16 - 20 - 40
(a) 6 - 12 - 18 - 34 (b) 9 - 2 - 11 - 24
(c) 1 - 1 - 2 - 4 (d) 7 - 49 - 56 - 122

Ans. (c) :


Similarly,


64. Potential energy belongs to which of the following categories of energy?
(a) Light energy (b) Mechanical energy
(c) Heat energy (d) Chemical energy

Ans. (b) : Potential Energy:- Potential energy is a form of energy that an object possesses due to its position or state. It is a part of mechanical energy which is the sum of an objects kinetic energy (energy of motion) and potential energy (stored energy).

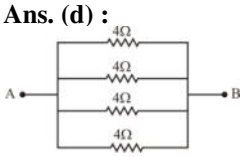
65. Use of energy-efficient machineries in industrial settings primarily helps _____.
(a) extend the lifespan of outdated equipment
(b) reduce industrial energy requirement and improve products' competitiveness.
(c) decrease operational efficiency
(d) increase energy consumption and thereby product cost

Ans. (b) : Use of energy-efficient machineries in industrial setting primarily helps to reduce industrial energy requirement and improve product's competitiveness.
Energy-efficient machinery is designed to consume less energy to perform the same task. This directly leads to a reduction in the overall industrial energy requirement, which in turn lowers operational cost. Lower operational costs can then be passed on in the form of more competitively priced products, thus improving product competitiveness on the market.

66. Which type of thermometer is used for measuring the internal temperature of ice?
(a) Infrared thermometer
(b) Laboratory thermometer
(c) Digital thermometer
(d) Clinical thermometer

Ans. (b) : A laboratory thermometer is used for measuring the internal temperature of ice.
- Laboratory thermometer are designed to measure wide range of temperatures, including freezing and boiling points making then suitable for experiments involving substances like ice.
- Unlike clinical thermometers, which have a limited range and a kink to prevent mercury from falling, laboratory thermometers have a broader range and no kink, allowing for continuous temperature reading during experiments.

67. Four resistors of 4 ohm each are connected in parallel. Four such parallel combinations are then connected in series. The equivalent resistance is _____.
(a) 1 ohm (b) 3 ohm
(c) 2 ohm (d) 4 ohm

Ans. (d) :


For parallel, $\frac{1}{R_{AB}} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{\cancel{4}}{\cancel{4}} = 1$
$R_{AB} = 1\Omega$
Now,
For series,


$R_{CD} = 1 + 1 + 1 + 1 = 4\Omega$

68. If $x^3 + y^3 = 16$ and $x + y = 4$, what is the value of xy?
(a) 0 (b) 3 (c) 2 (d) 4

Ans. (d) : Given,
$x^3 + y^3 = 16$ ... (i)
$x + y = 4$ ... (ii)
$xy = ?$
From equation (ii),
$(x+y)^3 = 43$
$3xy(x+y) = 64 - 16$
$xy = \frac{48}{3\times4} = \frac{48}{12}$
$\boxed{xy = 4}$

69. Which of the following orders of components is primarily responsible for executing instructions, storing permanent firmware, temporarily storing data during program execution and providing a platform for interconnecting hardware components on a computer motherboard?