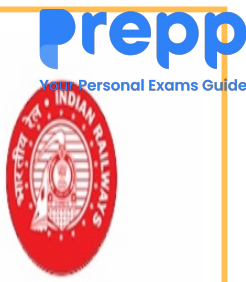




रेल भर्ती बोर्ड / RAILWAY RECRUITMENT BOARDS

सी ई एन - ०१/२०२५ - CEN - 01/2025

सहायक लोको पायलट की भर्ती/ Recruitment of Assistant Loco Pilot



Test Date	28/07/2026
Test Time	2:30 PM - 5:00 PM
Subject	ALP Stage 2 Electronics Mechanic

* Note

Correct Answer will carry 1 mark per Question.

Incorrect Answer will carry 1/3 Negative mark per Question.

1. Options shown in green color with a tick icon are correct.

2. Chosen option on the right of the question indicates the option selected by the candidate.

Section : PART-A

Q.1 Which of the following correctly states the full form of CD and the technology used to store data on it?

- Ans**
- ☒ A. Compact Drive, Optical Storage
 - ☒ B. Compact Drive, Magnetic Storage
 - ☒ C. Compact Disc, Optical Storage
 - ☒ D. Compact Disc, Magnetic Storage

Q.2 In a certain code language, 'SOIL' is coded as '1547' and 'COIL' is coded as '7124'. What is the code for 'C' in the given code language?

- Ans**
- ☒ A. 4
 - ☒ B. 2
 - ☒ C. 7
 - ☒ D. 1

Q.3 P, Q and R are three batsmen. The ratios of runs scored by them in a certain match were as follows:

$P : Q = 5 : 7$ and $Q : R = 2 : 3$.

If they scored a total of 765 runs, then find the number of runs scored by R.

- Ans**
- ☒ A. 378
 - ☒ B. 336
 - ☒ C. 357
 - ☒ D. 350

Q.4 Refer to the following letter series and answer the question that follows. (Counting to be done from left to right only.)

(Left) Q K Q N X K G G V M L A W T W K N G V (Right)

How many such consonants are there each of which is immediately preceded by a vowel and also immediately followed by a consonant?

- Ans**
- ☒ A. Two
 - ☒ B. Three
 - ☒ C. None
 - ☒ D. One

Q.5 The first shopkeeper allows two successive discounts of 3% and 7%, while a second shopkeeper allows two successive discounts of 2% and 8%. A third shopkeeper allows 10% discount on the same item. From which shopkeeper should a customer buy if the marked price is the same at the three shops?

- Ans**
- ☒ A. Buy from the first or the second shopkeeper as both are the same.
 - ☒ B. Buy from the third shopkeeper
 - ☒ C. Buy from the first shopkeeper
 - ☒ D. Buy from the second shopkeeper

Q.6 In a certain code language,
 $A + B$ means 'A is the mother of B',
 $A - B$ means 'A is the brother of B',
 $A \times B$ means 'A is the wife of B' and
 $A \% B$ means 'A is the father of B'.

How is Satish related to Mayank if 'Satish + Deep $\times$ Piyush – Hitesh $\%$ Mayank'?

- Ans**
- ☒ A. Father's brother's wife's sister
 - ☒ B. Father's brother's wife's mother
 - ☒ C. Mother's brother's wife's mother
 - ☒ D. Mother's brother's wife's sister

Q.7 An engineer is updating a schematic for a control panel and needs to indicate a normally closed push button. Which approach best ensures the symbol is universally understood among engineers referring to standard engineering drawings?

- Ans**
- ☒ A. Draw a hand made representation of the push button with a note explaining function
 - ☒ B. Substitute the normally closed push button symbol with a general switch symbol
 - ☒ C. Describe the normally closed push button in words within the schematic diagram clearly
 - ☒ D. Use the standardized symbol for a normally closed push button as per conventions

Q.8 A solid right circular cone is 7 cm high, and the radius of its base is 22.2 cm. It is melted and recast into a right circular cone with radius of its base 3.7 cm. Then the height (in cm) of the cone is _____.

- Ans**
- ☒ A. 159
 - ☒ B. 267
 - ☒ C. 252
 - ☒ D. 185

Q.9 Let C be a circle, and AB and DE be two chords on C such that $AB = BE$. In the quadrilateral ABED, let AE and BD intersect at F, $\angle DBE = 55^\circ$ and $\angle BAE = 40^\circ$. Find $\angle FED$.

- Ans**
- ☒ A. 55°
 - ☒ B. 60°
 - ☒ C. 45°
 - ☒ D. 110°

Q.10 What does the term 'HAZOP' stand for in occupational safety?

- Ans**
- ☒ A. Hazardous Operation Standard
 - ☒ B. Handling and Organizing Safety
 - ☒ C. Hazard and Operability Study
 - ☒ D. Hazardous Operations Safety

Q.11 Which type of personal protective equipment is most suitable for tasks involving airborne chemical particles in confined spaces?

- Ans**
- ☐ A. Body protection with flame-retardant suits
 - ☐ B. Hand protection using chemical-resistant gloves
 - ☐ C. Head protection with industrial-grade hard hats
 - ☒ D. Respiratory protection devices such as half-face masks

Q.12 12 is related to 1730 following a certain logic. Following the same logic, 13 is related to 2199. To which of the given options is 11 related, following the same logic? (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 etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

- Ans**
- ☐ A. 1443
 - ☐ B. 1543
 - ☒ C. 1333
 - ☐ D. 1433

Q.13 A, B, C, D, X, Y and Z are sitting around a circular table facing the centre of the table. Only two people sit between Y and C when counted from the left of C. D sits third to the left of B. A sits to the immediate right of B. A sits second to the left of Y. Z is not an immediate neighbor of D. Who sits third to the right of X?

- Ans**
- ☐ A. C
 - ☐ B. Y
 - ☐ C. D
 - ☒ D. A

Q.14 Which tool safety measure best prevents injuries when cleaning a workshop lathe after use?

- Ans**
- ☐ A. Blowing chips away with compressed air around the lathe
 - ☐ B. Wiping metal chips using bare hands directly
 - ☒ C. Using a brush to remove metal chips from the lathe
 - ☐ D. Using a rag to remove metal dust from the lathe

Q.15 Which intervention most effectively reduces ground-level pollutant concentrations during a winter temperature inversion?

- Ans**
- ☐ A. Increasing surface temperatures near emission sources
 - ☐ B. Reducing local wind speed to minimize horizontal dispersion
 - ☒ C. Enhancing vertical air mixing through artificial turbulence
 - ☐ D. Elevating emission sources above inversion layers

Q.16 Why is a room thermometer generally mounted vertically on a wall?

- Ans**
- ☒ A. It ensures accurate reading by keeping the bulb exposed to room air.
 - ☐ B. It helps the thermometer measure body temperature faster.
 - ☐ C. It protects the thermometer from breaking easily.
 - ☐ D. It prevents the liquid from freezing inside the thermometer.

Q.17 The mean of 11 numbers is 10.9. If the mean of the first 6 numbers is 10.5 and the mean of the last 6 numbers is 11.4, then find the 6th number.

- Ans**
- ☐ A. 11
 - ☒ B. 11.5
 - ☐ C. 10.5
 - ☐ D. 10

Q.18 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.)

- Ans**
- ☒ A. RL-SN
 - ☐ B. PJ-QK
 - ☐ C. HB-IC
 - ☐ D. FZ-GA

Q.19 What is the primary role of the Central Processing Unit (CPU) in a computer system?

- Ans**
- ☐ A. To manage network connections
 - ☐ B. To display output on the screen
 - ☒ C. To execute program instructions
 - ☐ D. To store long-term data

Q.20 If the mean of the following data is 45, then what is the value of x?

Class	10-20	20-30	30-40	40-50	50-60
Frequency	23	30	31	45	X

- Ans**
- ☐ A. 180
 - ☐ B. 188
 - ☐ C. 162
 - ☒ D. 160

Q.21 Refer to the given letter series and answer the question that follows. Counting to be done from left to right only.

(Left) H S A N D D I A D F P A J O S K I O Z O T X (Right)

How many such consonants are there, each of which is immediately preceded by a consonant and also immediately followed by a vowel?

- Ans**
- ☒ A. Four
 - ☐ B. Five
 - ☐ C. Six
 - ☐ D. Three

Q.22 Which of the following statements best describes a triangle as used in engineering drawing?

- Ans**
- ☐ A. A triangle is a polygon with four straight sides and four angles.
 - ☒ B. A triangle is a polygon with three straight sides and three angles.
 - ☐ C. A triangle is a polygon having three curved sides.
 - ☐ D. A triangle must always have all sides of equal length.

Q.23 Refer to the given letter series and answer the question that follows.

(Left) A X T N K R Q K C P S I D F J U D O R G Z M B E L (Right)

How many letters are there in the English alphabetical series between the letter that is fourth from the right end and the letter that is third from the left end of the series?

- Ans**
- ☐ A. 5
 - ☐ B. 3
 - ☒ C. 6
 - ☐ D. 4

Q.24 Pipes A and B can fill an entire tank in 8 hours and 12 hours, respectively. The water tank is one-fourth full. If both the pipes are opened together, then how long will it take to fill the remaining part of the tank?

- Ans**
- ☐ A. 3 hours 6 minutes
 - ☐ B. 3 hours 26 minutes
 - ☐ C. 3 hours 16 minutes
 - ☒ D. 3 hours 36 minutes

Q.25 An astronaut weighs 600 N on Earth. During a moon mission, she performs an experiment to measure her weight on the moon. Which value is closest to her expected weight on the moon, and why?

- Ans**
- ☒ A. 100 N, because the Moon's gravity is about one-sixth of Earth's.
 - ☐ B. 200 N, because the Moon's gravity is about one-third of Earth's.
 - ☐ C. 600 N, because a person's weight remains unchanged on the Moon.
 - ☐ D. 300 N, because the Moon's gravity is about one-half of Earth's.

Q.26 Why does restricting certain chemical refrigerants effectively reduce damage to the ozone layer?

- Ans**
- ☒ A. Refrigerants release substances that catalyze ozone breakdown.
 - ☐ B. Refrigerants increase oxygen production, supporting ozone recovery.
 - ☐ C. Refrigerants contain particles that absorb harmful UV light.
 - ☐ D. Refrigerants emit greenhouse gases that warm the stratosphere.

Q.27 Simplify the following expression.

$$11 \text{ of } 7 + 125 \div 5 + 99 \div 11 \times 7 - 17 \text{ of } 7 + 7 \times 6 - (91 \div 7 + 7 \times 5)$$

- Ans**
- ☐ A. 36
 - ☐ B. 48
 - ☐ C. 44
 - ☒ D. 40

Q.28 What should come in place of the question mark (?) in the given series based on the English alphabetical order?

MDB PHE SLH VPK ?

- Ans**
- ☒ A. YTN
 - ☐ B. ZUO
 - ☐ C. XSM
 - ☐ D. ZTM

Q.29 Which one of the following statements correctly describes a characteristic of WANs?

- Ans**
- ☐ A. WANs are always public networks managed solely by Internet Service Providers (ISPs).
 - ☐ B. WANs typically use only wireless media to connect distant LANs.
 - ☐ C. WANs are limited to connecting devices within a radius of 1 to 2 km.
 - ☒ D. WANs can be built by connecting multiple LANs via wired or wireless links.

Q.30 What information does a kilometer stone provide to travelers on a road?

- Ans**
- ☒ A. Distance from a reference point
 - ☐ B. Direction of travel
 - ☐ C. Speed of the vehicle
 - ☐ D. Time taken to reach destination

Q.31 Select the pair which follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

ZOT - TLP
NIL - HFH

- Ans**
- ☐ A. ABD - VZZ
 - ☐ B. VZZ - BCD
 - ☐ C. BOC - VZT
 - ☒ D. BCD - VZZ

Q.32 If the height of an object is doubled while its mass remains constant, its gravitational potential energy will be:

- Ans**
- ☐ A. halved
 - ☐ B. decreased to one-fourth
 - ☐ C. unchanged
 - ☒ D. doubled

Q.33 Which statement best describes how the mass and speed of an object affect its kinetic energy?

- Ans**
- ☐ A. An object with less mass and lower speed will have more kinetic energy.
 - ☐ B. An object with greater mass but lower speed will have more kinetic energy.
 - ☐ C. An object with same mass but higher speed will have less kinetic energy.
 - ☒ D. An object with greater mass and higher speed will have more kinetic energy.

Q.34 Which factor increases the amount of heat produced in a wire when an electric current flows through it for a fixed time?

- Ans**
- ☐ A. Decreasing the length of the wire
 - ☐ B. Reducing the current in the wire
 - ☐ C. Making the wire thicker
 - ☒ D. Increasing the resistance of the wire

Q.35 Which of the following best describes the function of a speedometer in a vehicle?

- Ans**
- ☒ A. It displays the current speed at which the vehicle is moving.
 - ☐ B. It measures the total distance the vehicle has traveled.
 - ☐ C. It calculates the average speed over a journey.
 - ☐ D. It shows the rate at which the vehicle's speed changes.

Q.36 The salary of a person is increased by 10%, 20% and 25% successively in three consecutive years. Find the overall percentage increase in the salary at the end of the third year.

- Ans**
- ☒ A. 65%
 - ☐ B. 60%
 - ☐ C. 30%
 - ☐ D. 50%

Q.37 If 2 is subtracted from each odd digit and 2 is added to each even digit in the number 235234796423, what will be the sum of the digits that are third from the left and third from the right?

- Ans**
- ☐ A. 6
 - ☐ B. 7
 - ☒ C. 9
 - ☐ D. 8

Q.38 A plane parallel to the base divides a cone of height 40 cm into two parts. If the volume of the upper smaller cone formed is $\frac{1}{64}$ of the volume of the original cone, calculate the height of the plane from the base of the cone.

- Ans**
- ☐ A. 20 cm
 - ☐ B. 10 cm
 - ☐ C. 40 cm
 - ☒ D. 30 cm

Q.39 A pump can fill a tank in 3 hours. Due to a leak in the tank, it takes 4.5 hours to fill the tank. In how much time can the leak empty the full tank if no other entry or exit routes are open?

- Ans**
- ☐ A. 7 hours
 - ☒ B. 9 hours
 - ☐ C. 8 hours
 - ☐ D. 6 hours

Q.40 Srinu starts from his home and drives 2 km towards the south, then takes a right turn and drives 5 km. He then takes a right turn and drives 6 km before taking a right turn again and driving 4 km further. Srinu finally takes a right turn and drives 4 km before stopping at his office. In which direction should Srinu drive to reach his home again? (All turns are 90-degree turns only unless specified.)

- Ans**
- ☐ A. South
 - ☒ B. East
 - ☐ C. North
 - ☐ D. West

Q.41 SANZ is related to YUTT in a certain way based on the English alphabetical order. In the same way, MTHM is related to SNNG. To which of the following is LJRE related to following the same logic?

- Ans**
- ☐ A. REXZ
 - ☒ B. RDXV
 - ☐ C. QDYY
 - ☐ D. QEYZ

Q.42 What should come in place of the question mark (?) in the given series?

1 2 7 20 61 ?

- Ans**
- ☒ A. 182
 - ☐ B. 185
 - ☐ C. 181
 - ☐ D. 183

Q.43 A laboratory thermometer has a range from -10 degrees Celsius to 110 degrees Celsius and 120 equal divisions. What is the smallest value that this thermometer can read?

- Ans**
- ☐ A. 10 degrees Celsius
 - ☐ B. 2 degrees Celsius
 - ☐ C. 0.5 degrees Celsius
 - ☒ D. 1 degree Celsius

Q.44 A cyclist travels 120 km in 3 hours, rests for 1 hour, and then travels another 80 km in 2 hours. To determine the cyclist's average speed for the entire journey, which of the following quantities should be used?

- Ans**
- ☐ A. Distance travelled in a particular direction divided by time
 - ☐ B. Change in velocity divided by total time taken
 - ☐ C. Total displacement divided by total time taken
 - ☒ D. Total distance travelled divided by the total time taken

Q.45 The cost of a diamond varies directly with the square of its weight. A diamond broke into four pieces with weights in the ratio 2:4:1:3. If it had been broken into four equal pieces, the loss would have been ₹60,000. What was the original cost of the diamond?

- Ans**
- ☐ A. ₹78,000
 - ☐ B. ₹75,000
 - ☒ C. ₹80,000
 - ☐ D. ₹82,000

Q.46 Which statement best describes the front view in an engineering drawing?

- Ans**
- ☐ A. It shows the object's depth and height as seen from the side
 - ☐ B. It shows only the object's bottom or right side
 - ☐ C. It shows only one dimension of the object
 - ☒ D. It shows the object's height and width as seen from the front

Q.47 When a cutting plane line passes through a hole and a rib, which feature should be sectioned in the resulting view according to standard conventions?

- Ans**
- ☐ A. Both the hole and the rib are shown unsectioned
 - ☒ B. The hole is sectioned but the rib is shown unsectioned
 - ☐ C. Both the hole and the rib are shown sectioned
 - ☐ D. The rib is sectioned but the hole is left unsectioned

Q.48 If $x + \frac{1}{x} = 5$, then $\frac{x^3 - 5x^2 + 5x}{x^2 + 1}$ is equal to:

- Ans**
- ☐ A. $\frac{3}{5}$
 - ☐ B. $\frac{2}{5}$
 - ☒ C. $\frac{4}{5}$
 - ☐ D. $\frac{1}{5}$

Q.49 G is the mother of Y. Y is the sister of V. S is the father of L. L is the son of V. How is G related to L?

- Ans**
- ☐ A. Mother's sister
 - ☐ B. Sister
 - ☒ C. Mother's mother
 - ☐ D. Mother

Q.50 The average of five numbers is 30. If four of the numbers are 25, 35, 28 and 32, then what is the fifth number?

- Ans**
- ☒ A. 30
 - ☐ B. 32
 - ☐ C. 28
 - ☐ D. 35

Q.51 Find the compound interest on ₹5,70,000 for 1.5 years at 10% per annum compounded half-yearly.

- Ans**
- ☒ A. ₹89,846.25
 - ☐ B. ₹89,946.25
 - ☐ C. ₹92,846.25
 - ☐ D. ₹88,846.25

- Q.52** If $3x - 2y + 3z = 8$, $4x - 3y + 2z = 4$ and $2x + y - z = 1$, then find x, y and z, respectively.
- Ans** ☒ A. 2, 1 and 3
☒ B. 1, 2 and 3
☒ C. 3, 1 and 2
☒ D. 2, 3 and 1

- Q.53** A cyclist rides 60 meters north, then 80 meters south, and finally 70 meters north. What is the total distance the cyclist has traveled?
- Ans** ☒ A. 150 meters
☒ B. 60 meters
☒ C. 210 meters
☒ D. 10 meters

- Q.54** 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.)
- Ans** ☒ A. DG – EH
☒ B. SJ – TK
☒ C. KE – LF
☒ D. IT – KV

- Q.55** Read the given statement(s) 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 statement(s).
- Statements:**
 Some rugs are fans.
 No fan is a car.
- Conclusion (I) : Some rugs are cars.**
Conclusion (II) : Some fans are rugs.
- Ans** ☒ A. Both conclusions (I) and (II) follow
☒ B. Only conclusion (II) follows
☒ C. Only conclusion (I) follows
☒ D. Neither conclusion (I) nor (II) follows

- Q.56** A crane lifts a 200 kg load to a height of 15 meters in 10 seconds. Assuming acceleration due to gravity is 10 m/s^2 and energy loss is negligible, what is the power output of the crane during this operation?
- Ans** ☒ A. 1500 W
☒ B. 1000 W
☒ C. 3000 W
☒ D. 2000 W

- Q.57** An engineering firm is tasked with creating a set of technical drawings for a large-scale project. The client specifies that all components must fit on a single sheet without reducing the drawing scale, and the total drawing area required is approximately 1 square meter. Based on standard drawing sheet sizes, which sheet should the firm select to best meet these requirements?
- Ans** ☒ A. A0 size sheet
☒ B. A1 size sheet
☒ C. A2 size sheet
☒ D. A3 size sheet

Q.58 A boy uses a wheelbarrow to carry sand. The wheel acts as the pivot, the sand is placed in the tray, and the boy lifts the handles. In this arrangement, the sand represents _____.

- Ans**
- ☒ A. Arm
 - ☒ B. Load
 - ☒ C. Fulcrum
 - ☒ D. Effort

Q.59 Two trains are moving in opposite directions. The first train is 120 m long and runs at 54 km/h. The second train is 180 m long and runs at 72 km/h. How much time will they take to cross each other completely?
(Rounded up to two decimal places)

- Ans**
- ☒ A. 8.43 seconds
 - ☒ B. 8.57 seconds
 - ☒ C. 7.57 seconds
 - ☒ D. 9.25 seconds

Q.60 Which of the following pairs of numbers is co-prime?

- Ans**
- ☒ A. (14, 28)
 - ☒ B. (17, 54)
 - ☒ C. (21, 33)
 - ☒ D. (28, 49)

Q.61 A ladder is leaning against a wall and makes an angle of 60° with the ground. If the length of the ladder is 24 m, find the distance of the foot of the ladder from the wall.

- Ans**
- ☒ A. 9 m
 - ☒ B. 12 m
 - ☒ C. 18 m
 - ☒ D. 15 m

Q.62 When drawing repeated 67° angles on an engineering sheet, which practice best helps minimize cumulative alignment errors?

- Ans**
- ☒ A. Drawing all angles continuously without intermediate verification
 - ☒ B. Marking all angles lightly with a pencil before finalizing
 - ☒ C. Relying solely on the initial protractor alignment for all angles
 - ☒ D. Using the same reference line for all repeated angles

Q.63 What should come in place of '?' in the given series?
11, 22, 44, 88, 176, ?

- Ans**
- ☒ A. 342
 - ☒ B. 358
 - ☒ C. 356
 - ☒ D. 352

Q.64 A cyclist travels from the kilometer stone marked 52 to the stone marked 79. How far has the cyclist traveled?

- Ans**
- ☒ A. 27 kilometers
 - ☒ B. 31 kilometers
 - ☒ C. 131 kilometers
 - ☒ D. 52 kilometers

Q.65 What does CPU stand for in computing?

- Ans**
- ☐ A. Computer Processing Unit
 - ☐ B. Core Processing Unit
 - ☒ C. Central Processing Unit
 - ☐ D. Control Processing Unit

Q.66 A technician needs to select a fuse wire for a room heater. Which property should be considered most important for safety based on the heating effect of electric current?

- Ans**
- ☒ A. The fuse wire must have a low melting point to break the circuit during excess current.
 - ☐ B. The fuse wire must have a high melting point for durability.
 - ☐ C. The fuse wire must have high resistance and be thick to prevent melting.
 - ☐ D. The fuse wire must have a shiny surface for efficient cooling.

Q.67 A ramp is used to lift a box to a platform 2 m high. To reduce the effort required, the ramp length is increased from 4 m to 8 m. Assuming negligible friction, what remains unchanged?

- Ans**
- ☐ A. The distance moved along the ramp
 - ☒ B. The work done in raising the box
 - ☐ C. The force required
 - ☐ D. The mechanical advantage

Q.68 Read the given statement(s) and conclusions carefully. Assuming that the information given in the statement(s) 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 statement(s).

Statements:

All chocolates are paneers.
No paneer is a milk.

Conclusions:

- (I) No chocolate is a milk.
(II) Some milks are paneers.

- Ans**
- ☐ A. Neither conclusion (I) nor (II) follows.
 - ☐ B. Only conclusion (II) follows.
 - ☒ C. Only conclusion (I) follows.
 - ☐ D. Both conclusions (I) and (II) follow.

Q.69 Which color is universally associated with emergency exit signs in industrial workplaces under international standards?

- Ans**
- ☐ A. Yellow background with black text or symbols
 - ☒ B. Green background with white text or symbols
 - ☐ C. Blue background with white text or symbols
 - ☐ D. Red background with white text or symbols

Q.70 What is a key feature of single stroke lettering in technical drawings?

- Ans**
- ☐ A. Each character is outlined and then filled.
 - ☒ B. Each character is made with one continuous stroke.
 - ☐ C. Each character is made with several parallel lines.
 - ☐ D. Each character is shaded after drawing.

Q.71 If a rectangular field is measured to be 120 meters long and 75 meters wide, what is its area in SI units?

- Ans**
- ✓ A. 9000 square meters
 - ✗ B. 1800 square meters
 - ✗ C. 15000 square meters
 - ✗ D. 19500 square meters

Q.72 A, B, C, D and E have different heights. E is taller than C but shorter than A. Only one person is taller than A. D is shorter than C. Who amongst them is the third tallest?

- Ans**
- ✗ A. A
 - ✓ B. E
 - ✗ C. C
 - ✗ D. B

Q.73 Which of the following is the best example of municipal solid waste?

- Ans**
- ✗ A. Mining tailings
 - ✗ B. Hospital biomedical waste
 - ✓ C. Household kitchen garbage
 - ✗ D. Industrial process waste

Q.74 Five students, N, O, R, S and T, have different heights. T is taller than N. R is taller than S but shorter than O. S is taller than N. More than two people are taller than T. How many people are shorter than R?

- Ans**
- ✓ A. Three
 - ✗ B. One
 - ✗ C. Two
 - ✗ D. None

Q.75 A car travels from point A to point B in a zigzag path, covering a total distance of 200 meters. If the shortest straight-line distance between A and B is 120 meters, which statement best describes the car's distance and displacement?

- Ans**
- ✗ A. The distance is 200 meters; the displacement is 200 meters
 - ✗ B. The distance is 120 meters; the displacement is 120 meters
 - ✗ C. The distance is 120 meters; the displacement is 200 meters
 - ✓ D. The distance is 200 meters; the displacement is 120 meters

Q.76 An article is bought for ₹300 and its price is increased by 5.5%. The resulting price is then reduced by 8%. Find the final selling price.

- Ans**
- ✗ A. ₹288.24
 - ✗ B. ₹284.45
 - ✗ C. ₹296.46
 - ✓ D. ₹291.18

Q.77 A question is followed by two statements numbered (I) and (II). You have to decide whether the data provided in the statements are sufficient to answer the question. Read both the statements and decide the appropriate answer.

Among 5 sticks, B, U, N, M and D, each having a different height, which stick is the shortest?

(I) D is shorter than U. M is shorter than B.

(II) M is taller than D.

- Ans**
- ✗ A. Both statements I and II together (and not statement I alone or statement II alone) are sufficient to answer the question
 - ✗ B. Data in statement I alone is sufficient to answer the question while data in statement II is not
 - ✓ C. Both statements I and II together are NOT sufficient to answer the question
 - ✗ D. Data in statement II alone is sufficient to answer the question while data in statement I is not

Q.78 Which statement best describes the side view in engineering drawing?

- Ans**
- ☒ A. It shows the object as seen from above or below
 - ☒ B. It shows the object as seen from left or right side
 - ☒ C. It shows a combination of all views of the object
 - ☒ D. It shows the object as seen clearly from the front

Q.79 What is the primary color used in warning signs to alert workers of potential hazards?

- Ans**
- ☒ A. Yellow with black symbol or text
 - ☒ B. Blue with white symbol or text
 - ☒ C. Green with white symbol or text
 - ☒ D. Red with white symbol or text

Q.80 A question is followed by two statements numbered (I) and (II). You have to decide whether the data provided in the statements are sufficient to answer the question. Read both the statements and select the most appropriate answer.

Question:

Among five trees N, O, R, S, and T, each having a different height, which tree is the tallest?

Statements:

(I) T is taller than R. N is taller than T.

(II) R is shorter than O but taller than S.

- Ans**
- ☒ A. Both statements I and II together are NOT sufficient to answer the question
 - ☒ B. Both statements I and II together (and not statement I alone or statement II alone) are sufficient to answer the question
 - ☒ C. Data in Statement II alone is sufficient to answer the question while data in statement I is not
 - ☒ D. Data in Statement I alone is sufficient to answer the question while data in statement II is not

Q.81 Sohan covers a total distance of 760 km to reach his home, traveling partly by train and partly by car. He takes 8 hours when he travels 160 km by train and the rest by car. If he travels 240 km by train and the remaining distance by car, his journey takes 12 minutes longer. Find the difference between the speeds of the train and the car.

- Ans**
- ☒ A. 20 km/h
 - ☒ B. 23 km/h
 - ☒ C. 27 km/h
 - ☒ D. 21 km/h

Q.82 A 42-litre solution has sugar and water in the ratio 2 : 5. If, due to evaporation, the volume is reduced by 35%, and only water evaporates, what is the new ratio of sugar to water?

- Ans**
- ☒ A. 31 : 50
 - ☒ B. 40 : 41
 - ☒ C. 51 : 42
 - ☒ D. 40 : 51

Q.83 Which symbol best represents a battery in an electric circuit diagram according to standard conventions?

- Ans**
- ☒ A. A single long line only
 - ☒ B. Two short lines placed together
 - ☒ C. A pair of long and short parallel lines placed alternately
 - ☒ D. Two circles connected in series

Q.84 A sum of money invested at simple interest amounts to ₹21,500 in 5 years and ₹26,000 in 8 years. Find the principal amount (in ₹).

- Ans**
- ☒ A. 7,500
 - ☒ B. 14,000
 - ☒ C. 15,500
 - ☒ D. 12,000

Q.85 Which of the following statements best describes a cuboid as used in engineering drawing?

- Ans**
- ☒ A. A cuboid has all sides and angles equal, making it similar to a cube.
 - ☒ B. A cuboid is a solid with six rectangular faces, and opposite faces are equal.
 - ☒ C. A cuboid is a solid where all faces are parallelograms but not necessarily rectangles.
 - ☒ D. A cuboid has all faces as squares of equal size.

Q.86 Which scenario best demonstrates proactive workplace safety behavior?

- Ans**
- ☒ A. Waiting for a supervisor to notice hazards
 - ☒ B. Reporting hazards after incidents happen
 - ☒ C. Identifying and correcting hazards before accidents occur
 - ☒ D. Discussing only past safety problems in meetings

Q.87 Which combination best describes the main environmental challenges associated with plastic waste management?

- Ans**
- ☒ A. Neutralization and easy recycling
 - ☒ B. Thermal pollution and effective composting
 - ☒ C. Persistence in the environment and microplastic formation
 - ☒ D. Rapid biodegradation and chemical leaching

Q.88 What will come in the place of '?' in the following equation, if '+' and '-' are interchanged and 'x' and '÷' are interchanged?
 $5 \div 3 + 15 \times 5 - 3 = ?$

- Ans**
- ☒ A. 18
 - ☒ B. 9
 - ☒ C. 15
 - ☒ D. 12

Q.89 A group of numbers/symbols is coded using letter codes as per the codes given below and the conditions that follow. The correct combination of codes following the conditions is your answer.

Note: If none of the conditions follow, then the codes for the respective number/symbol are to be followed directly as given in the table.

Number/symbol	3	@	8	4	\$	&	2	%	#	1	+	9	7	5
Code	U	G	B	K	M	F	X	R	E	Q	S	C	V	T

Conditions –

- (i) If the first element is a symbol and the last element an odd number, the codes for these two (the first and the last elements) are to be interchanged.
- (ii) If the first element is an odd number and the last an even number, the first and the last elements are to be coded as ©
- (iii) If both second and third elements are perfect squares, the third element is to be coded as the code for the second element.

What will be the code for the following group?
& 8 \$ 9 5

- Ans**
- ☒ A. TCMBF
 - ☒ B. FBMCT
 - ☒ C. TBMCF
 - ☒ D. FCBMT

Q.90 A dealer buys a table for ₹2,750. He first marks it up by 28%, then allows a 12% discount to a customer. If the customer also pays 5% GST on the selling price, find the profit percentage (excluding GST) made by the dealer.

- Ans**
- ☒ A. 13.81%
 - ☒ B. 12.64%
 - ☒ C. 15.12%
 - ☒ D. 10.36%

Q.91 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 so on. 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 to/subtracting from/multiplying with 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

$$6 - 16 - 23 - 32; 7 - 19 - 26 - 35$$

- Ans**
- ☒ A. $12 - 34 - 41 - 50$
 - ☒ B. $11 - 31 - 38 - 29$
 - ☒ C. $4 - 14 - 21 - 30$
 - ☒ D. $8 - 22 - 15 - 24$

Q.92 What will come in place of the question mark (?) in the following equation if '+' and '-' are interchanged and 'x' and '÷' are interchanged?
 $42 \times 6 \div 7 - 35 + 19 = ?$

- Ans**
- ☒ A. 65
 - ☒ B. 69
 - ☒ C. 67
 - ☒ D. 63

Q.93 A hiker lifts a backpack from the ground to a ledge 2 meters above the ground. Which situation would result in the greatest increase in the backpack's gravitational potential energy?

- Ans**
- ☒ A. Lifting a heavier backpack to the same 2-meter ledge
 - ☒ B. Lifting a lighter backpack to the same 2-meter ledge
 - ☒ C. Lifting the same backpack to a 1-meter ledge
 - ☒ D. Carrying the same backpack horizontally for 2 meters

Q.94 Why are electric wires in household appliances usually covered with plastic or rubber coating?

- Ans**
- ☒ A. To make the wires heavier
 - ☒ B. To prevent electric shocks by insulation
 - ☒ C. To produce more heat
 - ☒ D. To increase the flow of current

Q.95 Seven boxes, P, Q, S, T, U, V, and W, are kept one over the other, but not necessarily in the same order. There are exactly two boxes between T and P. Only Q is kept above U. No box is kept below P. S is kept somewhere below W but above V. Based on the given information, which box is kept third above V?

- Ans**
- ☒ A. W
 - ☒ B. S
 - ☒ C. P
 - ☒ D. T

Q.96 Seven boxes S, T, U, V, W, X, and Y are kept one over the other but not necessarily in the same order. U is kept exactly third from the top. Only one box is kept between U and T. W is kept immediately above T. Only three boxes are kept between X and S. V is kept on one of the positions below Y. Only two boxes are kept between U and S. Which box is kept second from the top?

- Ans**
- ☐ A. U
 - ☐ B. V
 - ☐ C. T
 - ☒ D. X

Q.97 Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

GXM 5, JVN 11, MTO 24, PRP 51, ?

- Ans**
- ☐ A. TPQ 107
 - ☐ B. TPQ 106
 - ☒ C. SPQ 106
 - ☐ D. SPQ 107

Q.98 What is the primary purpose of a Local Area Network (LAN)?

- Ans**
- ☐ A. To link wireless devices only
 - ☐ B. To connect social media accounts
 - ☒ C. To connect computers within a small geographical area
 - ☐ D. To connect global networks

Q.99 The price of sugar is increased by 20%. Manoj can increase his expenditure on sugar by only 15% from his income. In order to balance his expenditure, by what percentage should he reduce the quantity of sugar consumed?

- Ans**
- ☐ A. 5%
 - ☐ B. $5\frac{1}{3}\%$
 - ☒ C. $4\frac{1}{6}\%$
 - ☐ D. 6.5%

Q.100 Why does biomedical waste require special handling compared to general municipal waste?

- Ans**
- ☐ A. It is more likely to be recycled than other types of waste.
 - ☐ B. It has higher chemical content and is always toxic.
 - ☒ C. It may contain infectious agents that pose health risks.
 - ☐ D. It is always radioactive and requires heavy shielding.

Section : PART-B

Q.1 A resistor is marked with the bands Yellow, Violet, Orange, and Silver. Which statement is correct regarding the resistance value of the resistor?

- Ans**
- ☐ A. Its value is 47 Ω with $\pm 10\%$ tolerance
 - ☐ B. Its value is 4.7 k Ω with $\pm 5\%$ tolerance
 - ☒ C. Its value is 47 k Ω with $\pm 10\%$ tolerance
 - ☐ D. Its value is 470 k Ω with $\pm 20\%$ tolerance

Q.2 What is the main purpose of a limiter circuit in a Frequency Modulation receiver?

- Ans**
- ☐ A. To filter out all noise components
 - ☐ B. To demodulate the signal
 - ☒ C. To remove amplitude variations
 - ☐ D. To change the carrier frequency

Q.3 What is the working principle of an LVDT?

- Ans**
- ☐ A. It relies on the Hall effect for sensing
 - ☒ B. It operates on the principle of mutual induction
 - ☐ C. It uses the piezoelectric effect for measurement
 - ☐ D. It works by changing resistance with position

Q.4 According to engineering drawing, how is a plane surface defined?

- Ans**
- ☐ A. A surface kept parallel to one principal reference plane
 - ☒ B. A surface in which the line joining any two points lies entirely within it
 - ☐ C. A surface formed by rotating a straight line about a fixed axis
 - ☐ D. A surface having the shortest path between any two points

Q.5 While servicing an inverter-based stabilizer, you notice the relay contacts are heavily pitted. What is the best preventive measure when replacing the relay?

- Ans**
- ☐ A. Lower the relay switching voltage
 - ☐ B. Use a relay with smaller contacts
 - ☒ C. Choose a relay rated for higher contact current
 - ☐ D. Select a relay with lower coil resistance

Q.6 In a full adder circuit, under which input condition will the sum output be LOW (0)?

- Ans**
- ☐ A. When only one input is HIGH
 - ☐ B. When all inputs are HIGH
 - ☒ C. When an even number of inputs is HIGH
 - ☐ D. When an odd number of inputs is HIGH

Q.7 In a lab test, three resistors of 2 Ω , 3 Ω , and 6 Ω are connected in series across a 22V DC source. What is the current through the 3 Ω resistor in the circuit?

- Ans**
- ☐ A. 11 A
 - ☐ B. 3 A
 - ☐ C. 1 A
 - ☒ D. 2 A

Q.8 For a circuit to function as an oscillator and produce sustained sinusoidal output, the feedback applied must be:

- Ans**
- ☐ A. Zero feedback to avoid distortion
 - ☐ B. Random feedback depending on input signal
 - ☐ C. Negative feedback to stabilize gain
 - ☒ D. Positive feedback with proper phase

Q.9 An ITI workshop implements 5S but notices recurring safety hazards because tools are often left in different locations and workers cannot find them quickly. Which 5S step should be strengthened most effectively?

- Ans**
- ☐ A. Sustain
 - ☒ B. Set in Order
 - ☐ C. Shine
 - ☐ D. Sort

Q.10 To convert an op-amp integrator into a practical integrator (avoiding low-frequency saturation), which component is typically added in parallel with the feedback capacitor?

- Ans**
- ☒ A. A resistor
 - ☐ B. An inductor
 - ☐ C. A diode
 - ☐ D. A second capacitor

Q.11 When using a PMMC multimeter to measure current, how should the instrument be connected in the circuit?

- Ans**
- ☐ A. Across the resistor only
 - ☒ B. In series with the circuit
 - ☐ C. In parallel with the load
 - ☐ D. Across the voltage source

Q.12 What is the function of the heat sink on the motherboard in a computer system?

- Ans**
- ☐ A. Store BIOS settings in ROM
 - ☒ B. Absorb heat from the processor
 - ☐ C. Run the BIOS during booting process
 - ☐ D. Provide power to RAM

Q.13 Which of the following best describes the Internet of Things?

- Ans**
- ☐ A. A type of programming language
 - ☒ B. A network of connected devices sharing data
 - ☐ C. A single device connected to the internet
 - ☐ D. Only computers communicating online

Q.14 What is the purpose of the I/O shield supplied with a motherboard?

- Ans**
- ☐ A. Maintain the cooling of the cabinet
 - ☐ B. Improve processor speed
 - ☒ C. Align and protect rear motherboard ports
 - ☐ D. Cover and protect unused RAM slots

Q.15 Which illustrates the application of a voltage amplifier?

- Ans**
- ☐ A. Converting digital signals into analog
 - ☐ B. Measuring resistance directly
 - ☒ C. Enhancing the voltage of a sensor output before sending it to a microcontroller
 - ☐ D. Filtering unwanted frequencies

Q.16 What is the primary purpose of using the Pulse Amplitude Modulation (PAM) technique in communication systems?

- Ans**
- ☒ A. To represent analog information by varying the amplitude of high frequency discrete pulses
 - ☐ B. To reduce the bandwidth requirements of signals
 - ☐ C. To increase the frequency of pulses for transmission
 - ☐ D. To encode information using phase shifts in pulses

Q.17 An electrician is required to test a live electrical panel. Which PPE should be worn to protect the hands from electrical hazards?

- Ans**
- ☐ A. Safety helmet
 - ☐ B. Safety goggles
 - ☒ C. Insulated gloves
 - ☐ D. Ear plugs

Q.18 A technician opens a computer cabinet and notices a round coin-shaped battery on the motherboard. What is its purpose?

- Ans**
- ☒ A. Store BIOS/CMOS settings
 - ☐ B. Power the monitor
 - ☐ C. Control USB ports
 - ☐ D. Increase RAM speed

Q.19 Which sequence best ensures both picture quality and device safety while setting up a new LED or LCD TV with a set-top box?

- Ans**
- ☐ A. Connect the set-top box to the TV with AV cables, plug in while both devices are switched on.
 - ☐ B. Connect the set-top box to the TV with AV cables, power on both devices, then switch inputs.
 - ☒ C. Connect the set-top box to the TV with HDMI, power off both devices before plugging, then switch on after connections are secure.
 - ☐ D. Connect the set-top box to the TV with HDMI after turning on the TV first, then the set-top box.

Q.20 In a Pulse Position Modulation (PPM) signal, which of the following pulse parameters remain constant?

- Ans**
- ☐ A. Pulse width only
 - ☒ B. Pulse width and amplitude both
 - ☐ C. Pulse position
 - ☐ D. Pulse amplitude only

Q.21 While fixing a circuit board, which method is best for removing a surface-mount component without ripping or damaging the metal copper tracks?

- Ans**
- ☐ A. Using chemical solvent to dissolve solder and remove the component
 - ☒ B. Using a temperature-controlled soldering station with proper desoldering tools
 - ☐ C. Applying high heat quickly with a basic soldering iron and prying tool
 - ☐ D. Applying force with a heated tweezer to pull off the component

Q.22 Which memory technology is used in USB pen drives?

- Ans**
- ☐ A. Cache Memory
 - ☐ B. DRAM
 - ☒ C. Flash Memory
 - ☐ D. SRAM

Q.23 Which pin on the IC-555 Timer is used to discharge the timing capacitor when it is operated as an astable multivibrator?

- Ans**
- ☐ A. Pin 4
 - ☐ B. Pin 6
 - ☐ C. Pin 2
 - ☒ D. Pin 7

Q.24 An industrial environment with significant power line interference is causing issues in analog communication. Why would phase modulation be selected over amplitude modulation for the analog signaling in such an environment?

- Ans**
- ☐ A. Phase modulation requires less complex receivers than amplitude modulation
 - ☐ B. Phase modulation uses less power than amplitude modulation in all cases
 - ☐ C. Phase modulation guarantees maximum error in noisy environments
 - ☒ D. Phase modulation is less affected by amplitude variations caused by noise

Q.25 Which of the following materials has the lowest electrical conductivity and should be avoided for connecting sensitive measurement instruments?

- Ans
- ☐ A. Copper
 - ☐ B. Silver
 - ☐ C. Aluminum
 - ☒ D. Iron

Q.26 A black rectangular SMD component near an LED driver circuit's input has a white stripe on one edge, and the board is marked with a D. What is this component and its polarity?

- Ans
- ☐ A. Diode; stripe is the Anode (+)
 - ☒ B. Diode; stripe is the Cathode (-)
 - ☐ C. Capacitor; stripe is ground
 - ☐ D. Inductor; stripe is positive input

Q.27 During the troubleshooting workflow of an LED TV that has a No Video, But Has Audio fault condition, which of the following diagnostic steps should a technician perform immediately after confirming the power supply voltages are normal?

- Ans
- ☐ A. Replace the primary microprocessing main board assembly.
 - ☒ B. Perform a flashlight test on the screen to check for a faint image.
 - ☐ C. Replace the liquid crystal display panel assembly immediately.
 - ☐ D. Increase the main AC input voltage using a variable autotransformer.

Q.28 What is the function of RAM in a desktop computer?

- Ans
- ☒ A. Temporary data storage for running applications
 - ☐ B. Permanent storage of files and folders
 - ☐ C. Storing system backup
 - ☐ D. Processing data and performing calculations

Q.29 Which technology is used by a CD-ROM drive to read data in computer systems?

- Ans
- ☒ A. Laser technology
 - ☐ B. Ultraviolet light technology
 - ☐ C. Electrical contacts
 - ☐ D. Magnetic head

Q.30 What is the main benefit of increasing (extending) RAM in a desktop computer?

- Ans
- ☐ A. Faster processor speed
 - ☒ B. Improved multitasking performance
 - ☐ C. Higher disk permanent storage
 - ☐ D. Better display resolution

Q.31 Which type of charge carriers mainly control current in a Field Effect Transistor (FET)?

- Ans
- ☐ A. Electrons and holes together
 - ☐ B. Minority carriers only
 - ☐ C. Both minority and majority carriers
 - ☒ D. Majority carriers only

Q.32 In the procedure of measuring resistance with a shunt type ohmmeter, what will the pointer indicate if the test terminals remain open during testing?

- Ans
- ☐ A. Mid-scale reading
 - ☐ B. Zero resistance
 - ☒ C. Infinite resistance
 - ☐ D. Negative reading

Q.33 What is the function of a half wave rectifier?

- Ans**
- ☒ A. It converts AC to DC
 - ☐ B. It converts DC to AC
 - ☐ C. It amplifies signals
 - ☐ D. It stores electrical energy

Q.34 What does the term booting mean in a computer system?

- Ans**
- ☐ A. Defragmenting a hard disk to fix bad sectors
 - ☐ B. Installing open source software tools
 - ☐ C. Scanning for virus and deleting the infected files
 - ☒ D. Starting a computer and loading the operating system

Q.35 A silicon sample is doped with boron in a lab. Identify the semiconductor type.

- Ans**
- ☒ A. P-type semiconductor
 - ☐ B. Insulator
 - ☐ C. Intrinsic semiconductor
 - ☐ D. N-type semiconductor

Q.36 During an 8051 microcontroller experiment, switches are connected to Port 1. Before reading the switch status, the program writes logic '1' to the port pins. What is the purpose of this operation?

- Ans**
- ☐ A. To clear the data stored in the port register
 - ☐ B. To configure the port pins as output
 - ☒ C. To configure the port pins as input
 - ☐ D. To enable serial communication

Q.37 Why is a Double-Pole (DP) Miniature Circuit Breaker (MCB) generally preferred over a Single-Pole (SP) MCB in a single-phase distribution system?

- Ans**
- ☐ A. It increases the fault current carrying capacity of the circuit.
 - ☐ B. It eliminates the requirement for earthing in the installation.
 - ☐ C. It reduces the power consumption of the connected load.
 - ☒ D. It simultaneously disconnects both the phase and neutral conductors during switching or fault conditions.

Q.38 What is the purpose of the base region in an NPN transistor?

- Ans**
- ☐ A. To generate electrons for the collector
 - ☐ B. To act as the main current path
 - ☒ C. To control the number of electrons passing from emitter to collector
 - ☐ D. To dissipate heat

Q.39 Why are transistors preferred over mechanical switches for rapid switching operations?

- Ans**
- ☐ A. Transistors require manual operation
 - ☒ B. Transistors switch faster and have long life span
 - ☐ C. Transistors are larger in size
 - ☐ D. Transistors consume more power

Q.40 Which type of amplifier is used at the final stage to drive a loudspeaker?

- Ans**
- ☐ A. Pre-amplifier
 - ☐ B. Voltage amplifier
 - ☐ C. Buffer amplifier
 - ☒ D. Power amplifier

Q.41 An Earth Leakage Circuit Breaker (ELCB) is designed to disconnect the electrical supply under which of the following conditions?

- Ans**
- ☒ A. When the earth leakage current exceeds the preset sensitivity (trip) value
 - ☐ B. When the supply frequency deviates from its rated value
 - ☐ C. When the earth leakage current falls below the rated value
 - ☐ D. When the load current exceeds the rated current of the circuit

Q.42 Which of the following inputs is applied to a base terminal in a transistor amplifier during lab testing?

- Ans**
- ☐ A. Random noise signal
 - ☒ B. Small AC signal input
 - ☐ C. High DC voltage input
 - ☐ D. Zero signal input

Q.43 Two wires are made of the same material and have the same length. Wire A has a cross-sectional area of 2 mm^2 , and Wire B has a cross-sectional area of 5 mm^2 . Which wire has the greater resistance?

- Ans**
- ☒ A. Wire A, because smaller area gives higher resistance
 - ☐ B. Both have equal resistance because length is the same
 - ☐ C. Resistance cannot be compared without knowing voltage
 - ☐ D. Wire B, because larger area gives higher resistance

Q.44 What could happen if the desoldering pump is not used promptly after the solder melts during switch removal from a PCB?

- Ans**
- ☒ A. The solder may solidify before being removed
 - ☐ B. The switch will detach automatically
 - ☐ C. The PCB will break instantly
 - ☐ D. The desoldering pump may overheat

Q.45 When building a basic 6 by 4 LED matrix display, what is the total number of individual LEDs required to complete the grid?

- Ans**
- ☐ A. 10 LEDs
 - ☐ B. 2 LEDs
 - ☐ C. 64 LEDs
 - ☒ D. 24 LEDs

Q.46 In the output characteristics of a common-emitter configuration, a family of curves is obtained by varying V_{CE} while keeping which quantity fixed? (Symbols have their usual meaning.)

- Ans**
- ☐ A. I_C
 - ☐ B. V_{CE}
 - ☐ C. V_{CC}
 - ☒ D. I_B

Q.47 In an FM system, if the modulating signal frequency is doubled and the peak frequency deviation is kept constant, the modulation index will:

- Ans**
- ☐ A. Become zero
 - ☐ B. Double
 - ☐ C. Remain the same
 - ☒ D. Halve

Q.48 In quantization process for a Pulse code modulation system, a sampled version of a continuous analog signal are mapped to what type of values?

- Ans**
- ☒ A. A finite set of discrete Binary levels
 - ☐ B. An infinite set of discrete Binary levels
 - ☐ C. Random values
 - ☐ D. Analog values only

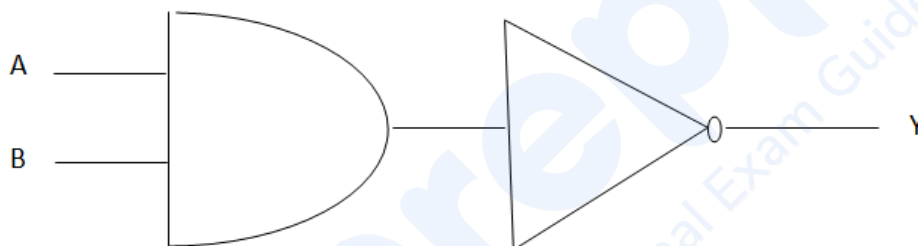
Q.49 When selecting a sensor for an industrial application that requires detecting very small temperature changes, which sensor characteristic should be prioritized to ensure the sensor can detect the smallest variation in temperature?

- Ans**
- ☐ A. Accuracy
 - ☐ B. Range
 - ☒ C. Resolution
 - ☐ D. Sensitivity

Q.50 If an intrinsic semiconductor has equal electrons and holes, and 20 electrons are added, what is the majority carrier?

- Ans**
- ☐ A. None present
 - ☐ B. Both electrons and holes are majority carriers
 - ☐ C. Holes only
 - ☒ D. Electrons only

Q.51 Consider the logic circuit shown in the given diagram. Which pair of the inputs A and B will produce output $Y = 0$?



- Ans**
- ☐ A. $A=0, B=0$
 - ☒ B. $A=1, B=1$
 - ☐ C. $A=1, B=0$
 - ☐ D. $A=0, B=1$

Q.52 A machinist is required to mark the axis of a drilled hole on an engineering drawing. Which line type according to BIS SP 46-2003 should be used for the axis?

- Ans**
- ☐ A. Thick zig-zag line
 - ☐ B. Continuous thick line
 - ☒ C. Chain thin line
 - ☐ D. Dashed thin line

Q.53 In an N-type semiconductor, what is the role of donor atoms?

- Ans**
- ☐ A. They absorb thermal energy
 - ☐ B. They create holes for conduction
 - ☐ C. They increase the energy gap
 - ☒ D. They provide extra electrons for conduction

Q.54 When analyzing a closed-loop circuit containing an **ideal operational amplifier**, what assumption must be applied regarding the currents entering the inverting and non-inverting input pins?

- Ans**
- ☒ A. No current flows into either input terminal
 - ☐ B. A small bias current flows into each terminal
 - ☐ C. Current flows only into the non-inverting terminal
 - ☐ D. Equal and opposite currents flow into both terminals

Q.55 In a moderately doped p-type semiconductor at $T = 300\text{ K}$, where is the Fermi level E_F located relative to the intrinsic Fermi level E_i ?

- Ans**
- ☐ A. Near conduction band and above the intrinsic Fermi Level
 - ☐ B. At the center of band gap
 - ☐ C. Outside band gap
 - ☒ D. Near valence band and below the intrinsic Fermi level

Q.56 Which scenario best demonstrates the use of IGBT in a real-world application?

- Ans**
- ☐ A. Amplifying small signals in a radio circuit
 - ☒ B. Controlling the speed of an industrial motor
 - ☐ C. Protecting a circuit from voltage surges
 - ☐ D. Providing voltage regulation in a small device

Q.57 The SI unit of magnetic flux density is:

- Ans**
- ☐ A. Ampere-turn
 - ☒ B. Tesla
 - ☐ C. Weber
 - ☐ D. Henry

Q.58 Which port is typically used to connect a monitor to the motherboard in computer system?

- Ans**
- ☒ A. VGA port
 - ☐ B. SATA port
 - ☐ C. Ethernet port
 - ☐ D. PATA port

Q.59 An apprentice needs to make a rectangular opening in a metal plate with accurate edges and sharp corners. Which combination of fitting tools is most suitable?

- Ans**
- ☒ A. Hacksaw and flat file for cutting and edge finishing
 - ☐ B. Round file and center punch for corner shaping work
 - ☐ C. Surface plate and scriber for cutting and finishing edges
 - ☐ D. Try square and flat file for layout and edge shaping

Q.60 As per BIS SP 46:2003 engineering drawing conventions, which arrowhead type is used for dimension lines?

- Ans**
- ☐ A. Dot arrowhead
 - ☐ B. Slashed arrowhead
 - ☒ C. Closed filled arrowhead
 - ☐ D. Open arrowhead

Q.61 A lamp circuit carries a charge of 24 coulombs in 8 seconds. What is the current in the circuit?

- Ans**
- ☒ A. 3 A
 - ☐ B. 1/3 A
 - ☐ C. 8 A
 - ☐ D. 2 A

Q.62 A magnetic path carries a flux density of 0.8 Tesla (T) through an area of 15 cm². What is the magnetic flux (in weber)?

- Ans**
- ☒ A. 0.0012 Wb
 - ☐ B. 1.2 Wb
 - ☐ C. 0.12 Wb
 - ☐ D. 0.012 Wb

Q.63 Which terminal is unique to an IGBT but not found in a BJT?

- Ans**
- ☐ A. Collector
 - ☐ B. Emitter
 - ☐ C. Base
 - ☒ D. Gate

Q.64 Which type of resistance is best measured using a Series type Ohm meter?

- Ans**
- ☐ A. Low resistance in less than 1 Ohm range
 - ☐ B. Capacitance value of a circuit
 - ☐ C. Very high resistance Greater than 100 Mega-ohm range
 - ☒ D. Medium resistance ranging from few ohms to kilo-ohms

Q.65 The surface-mount soldering defect where unequal surface tension causes a chip component to lift vertically off one pad is known as _____, which can be mitigated during manual rework by using _____.

- Ans**
- ☐ A. de-wetting; a higher-wattage chisel tip
 - ☐ B. cold joint; a lower melting-point solder paste
 - ☒ C. tombstoning; split-tip soldering iron
 - ☐ D. bridging; an unfluxed copper braid

Q.66 What happens to the gain of a non-inverting amplifier using OP-AMP if the feedback resistor value is increased by 5 % while keeping the input resistor constant? (Assuming the OP-AMP remains in linear range for operation.)

- Ans**
- ☐ A. The gain remains constant
 - ☐ B. The gain changes unpredictably
 - ☐ C. The gain decreases
 - ☒ D. The gain increases

Q.67 Why is rubber suitable for making seals and gaskets?

- Ans**
- ☐ A. It readily absorbs water
 - ☐ B. It reacts with most chemicals
 - ☒ C. It can form tight, flexible closures
 - ☐ D. It easily conducts electricity

Q.68 During hardware interfacing using the 8051 microcontroller, why are I/O ports essential?

- Ans**
- ☐ A. To perform calculations
 - ☐ B. To store information for processing
 - ☐ C. To increase the clock frequency of the microcontroller
 - ☒ D. To interface with external devices

Q.69 During lab practice, if you connect the input of a NOT gate to a logic low (0), what practical output should you observe?

- Ans**
- ☐ A. Logic low (0)
 - ☐ B. No change
 - ☐ C. Undefined
 - ☒ D. Logic high (1)

Q.70 Two oscillators use the same inductor (L) and the same capacitor (C) values. One is Colpitts with $C_1 = C_2$ and the other is Hartley with $L_1 = L_2$ with negligible mutual inductance (M). Which of the following is true about their resonant frequencies?

- Ans**
- ☐ A. Both have the same frequency
 - ☐ B. Hartley frequency is higher
 - ☐ C. Frequency depends on transistor beta
 - ☒ D. Colpitts frequency is higher

Q.71 In premium solid-state architectures requiring high color rendering indices, what unique structural method is used to construct a standard commercial white LED light bulb?

- Ans**
- ☐ A. Wiring three separate red, green, and blue monochromatic diodes in an absolute series loop fed by an unrectified AC power supply
 - ☐ B. Packing an isolated high-pressure low-temperature mercury vapor gas cell directly inside a silicon diode block
 - ☒ C. Depositing a yellow cerium-doped yttrium aluminum garnet phosphor coating directly over a blue indium gallium nitride semiconductor die
 - ☐ D. Forcing a direct current stream backward through an ultra-thin tungsten filament mounted between a pair of direct bandgap substrates

Q.72 On which principle does a Resistance Temperature Detector (RTD) work?

- Ans**
- ☒ A. Resistance increases with increase in temperature
 - ☐ B. Resistance remains constant with temperature
 - ☐ C. Resistance decreases with increase in temperature
 - ☐ D. Voltage decreases with increase in temperature

Q.73 The common-emitter (CE) configuration of a transistor is most widely used as a/an:

- Ans**
- ☐ A. Impedance matcher
 - ☐ B. Passive Filter
 - ☐ C. Rectifier
 - ☒ D. Voltage Amplifier

Q.74 Which single logic gate can be used to implement the Boolean equation $Y = A + B$ in a digital circuit?

- Ans**
- ☒ A. OR gate
 - ☐ B. AND gate
 - ☐ C. NAND gate
 - ☐ D. NOT gate

Q.75 Why is an online UPS preferred for critical computer equipment over other types of UPS?

- Ans**
- ☐ A. It is less expensive than all other UPS types
 - ☐ B. It is physically smaller than offline UPS systems
 - ☐ C. It uses fewer electronic components
 - ☒ D. It eliminates transfer time, preventing even brief power interruptions