GATE

# Solved Papers 2025

#### **COMPUTER SCIENCE & IT (CS-1)**

**Reasoning &** 

OA

- 1. The average marks obtained by a class in an examination were calculated as 30.8. However, while checking the marks entered, the teacher found that the marks of one student were entered incorrectly as 24 instead of 42. After correcting the marks, the average becomes 31.4. How many students does the class have?
  - (a) 25 (b) 28 (c) 30 (d) 32
- **2.** According to the map shown in the figure, which one of the following statements is correct?

Note: The figure shown is representative.



- (a) The library is located to the northwest of the canteen.
- (b) The hospital is located to the east of the chemistry lab.
- (c) The chemistry lab is to the southeast of physics lab.
- (d) The classrooms and canteen are next to each other.
- **3.** In the diagram, the lines QR and ST are parallel to each other. The shortest distance between these two lines is half the shortest distance between the point P and line QR. What is the ratio of the area of the triangle PST to the area of the trapezium SQRT?

Note: The figure shown is representative.



**4.** A fair six-faced dice, with the faces labelled '1', '2', '3', '4', '5', and '6', is rolled thrice. What is the probability of rolling '6' exactly once?

(a) 
$$\frac{75}{216}$$
 (b)  $\frac{1}{6}$  (c)  $\frac{1}{18}$  (d)  $\frac{25}{216}$ 

5. A square paper, shown in figure (I), is folded along the dotted lines, as shown in the figures (II) and (II). Then a few cuts are made as shown in figure (IV). Which one of the following patterns will be obtained when the paper is unfolded?

Note: The figure shown are representative.



A shop has four distinct flavours of ice-cream. One can purchase any number of scoops of any flavour. The order in which the scoops are purchased is inconsequential. If one wants to purchase 3 scoops of ice-cream, in how many ways can one make that purchase?

## **COMPUTER SCIENCE & IT (CS-2)**

7. If  $Pe^x = Qe^{-x}$  for all real values of *x*, which one of the following statements is true?

(a) 
$$P = Q = 0$$
  
(b)  $P = Q = 1$   
(c)  $P = 1; Q = -1$   
(d)  $\frac{P}{Q} = 0$ 

8. The paper as shown in the figure is folded to make a cube where each square corresponds to a particular face of the cube. Which one of the following options correctly represents the cube? Note: The figures shown are representative.





- **9.** Let *p*<sub>1</sub> and *p*<sub>2</sub> denote two arbitrary prime numbers. Which one of the following statements is correct for all values of *p*<sub>1</sub> and *p*<sub>2</sub>?
  - (a)  $p_1 + p_1$  is not a prime number
  - **(b)**  $p_1p_2$  is not a prime number
  - (c)  $p_1 + p_2 + 1$  is a prime number
  - (d)  $p_1p_2 + 1$  is a prime number
- **10.** If IMAGE and FIELD are coded as FHBNJ and EMFJG, respectively then, which one among the given options is the most appropriate code for BEACH?

(a)	CEADP	(b)	IDBFC
(c)	JGIBC	(d)	IBCEC

**11.** Which one of the following options is correct for the given data in the table?

Iteration (i)	0	1	2	3
Input (I)	20	-4	10	15
Output (X)	20	16	26	41
Output (Y)	20	-80	-800	-12000

(a) 
$$X(i) = X(i-1) + I(i); Y(i) = Y(i-1) I(i); i > 0$$

- **(b)** X(i) = X(i-1) I(i); Y(i) = (i-1) + I(i); i > 0
- (c) X(i) = X(i-1) I(i); Y(i) = Y(i-1) I(i); i > 0

(d) 
$$X(i) = X(i-1) + I(i); Y(i) = Y(i-1)I(i-1); i > 0$$

**12.** In the given figure, PQRS is a square of side 2 cm and PLMN is a rectangle. The corner L of the rectangle is on the side QR. Side MN of the rectangle passes through the corner of the square. What is the area (in cm<sup>2</sup>) of the rectangle PLMN? **Note:** The figure shown is representative.



**13.** The diagram below shows a river system consisting of 7 segments, marked P, Q, R, S, T, U and V. It splits the land into 5 zones, marked Z1, Z2, Z3, Z4 and Z5. We need to connect these zones using the least number of bridges. Out of the following options, which one is correct?

Note: The figure shown is representative.



- (a) Bridges on P, Q and T
- (b) Bridges on P, Q, S and T
- (c) Bridges on Q, R, T and V
- (d) Bridges on P, Q, S, U and V

#### **MECHANICAL ENGINEERING**

- 14. Two cars, P and Q, start from a point X in India at 10 a.m.. Car P travels North with a speed of 25 km/h and car Q travels East with a speed of 30 km/h. Car P travels continuously but car Q stops for some time after travelling for one hour. If both the cars are at the same distance from X at 11:30 a.m., for how long (in minutes) did car Q top?
  (a) 10 are (b) 12 are (c) 15 are (d) 18
  - (a) 10 (b) 12 (c) 15 (d) 18
- **15.** The ceiling function of a real number x, denoted by ce(x), is defined as the smallest integer that is greater than or equal to x. Similarly, the floor function, denoted by fl(x), is defined as the largest integer that is smaller than or equal to x. Which one of the following statements is NOT correct for all possible values of x?

(a) 
$$ce(x) \ge x$$
 (b)  $fl(x) \le x$ 

- (c)  $ce(x) \ge fl(x)$  (d) fl(x) < ce(x)
- **16.** P and Q play chess frequently against each other. Of these matches, P has won 80% of the matches, drawn 15% of the matches and lost 5% of the matches.

If they play 3 more matches, what is the probability of P winning exactly 2 of these 3 matches?

(a) 
$$\frac{48}{125}$$
 (b)  $\frac{16}{125}$  (c)  $\frac{16}{25}$  (d)  $\frac{16}{48}$ 

- 17. If HIDE and CAGE are coded as 19-23-7-11 and 5-2-17-11, respectively, then what is the code for HIGH?
  (a) 5-17-1-2
  (b) 17-19-13-17
  - (c) 13-3-1-2 (d) 19-23-17-19
- **18.** The given figure is reflected about the horizontal dashed line and then rotated clockwise by 90° about an axis perpendicular to the plane of the figure.

Which one of the following options correctly shows the resultant figure?

Note: The figures shown are representative.



- **19.** Which one of the following options has the correct sequence of objects arranged in the increasing number of mirror lines (lines of symmetry)?
  - (a) Circle; Square; Equilateral triangle; Isosceles triangle
  - (b) Isosceles triangle; Equilateral triangle; Square; Circle
  - (c) Equilateral triangle; Isosceles triangle; Square; Circle
  - (d) Isosceles triangle; Square; Equilateral triangle; Circle
- 20. A final year student appears for placement interview in two companies, S and T. Based on her interview performance, she estimates the probability of receiving job offers from companies S and T to be 0.8 and 0.6, respectively. Let *p* be the probability that she receives job offers from both the companies. Select the most appropriate option.

(a) 
$$0 \le p \le 0.2$$
(b)  $0.4 \le p \le 0.6$ (c)  $0.4 \le p \le 0.4$ (d)  $0.6 \le p \le 1.0$ 

#### ELECTRICAL ENGINEERING

**21.** The relationship between two variables *x* and *y* is given by x + p + q = 0 and is shown in the figure. Find the values of *p* and *q*.

Note: The figure shown is representative.



(a) 
$$p = -\frac{1}{2}; q = 2$$
  
(b)  $p = 2; q = -2$   
(c)  $p = \frac{1}{2}; q = 4$   
(d)  $p = 2; q = 4$   
22. What is the value of  $\left(\frac{3^{81}}{27^4}\right)^{1/3}$ ?  
(a)  $3^{13}$  (b)  $3^{96}$  (c)  $3^{23}$  (d)  $3^{69}$ 

23. In the given figure, EF and HJ are coded as 30 and 80, respectively. Which one among the given options is most appropriate for the entries marked (i) and (ii)?



- (d) (i) PS; (ii) 14
- **24.** Scores obtained by two students P and Q in seven course are given in the table below. Based on the information given in the table, which one of the following statement is INCORRECT?

Р	22	89	50	45	78	60	39
Q	35	65	60	56	81	45	50

- (a) Average score of P is less than the average score of Q.
- (b) Median score of P is same as the median score of O.
- (c) Difference between the maximum and minimum scores of P is greater than the difference between the maximum and minimum scores of Q.
- (d) Median score and the average score of Q are same.
- **25.** Spheres of unit diameter are centred at (*l*, *m*, *n*) where *l*, *m* and *n* take every possible integer values. The distance between two spheres is computed from the centre of one sphere to the centre of the other sphere. For a given sphere, x is the distance to its nearest sphere and *y* is the distance to its next

nearest sphere. The value of  $\frac{y}{r}$  is:

(a) 
$$2\sqrt{2}$$
 (b)  $\frac{1}{\sqrt{2}}$  (c)  $\sqrt{2}$  (d) 2

26. In the triangle PQR, the lengths of PT and TR are in the ratio of 3 : 2.

ST is parallel to QR. Two semi-circles are drawn with PS and PQ as diameters, as shown in the figure.

Which one of the following statements is true about the shaded area PQS?

Note: The figure shown is representative.



semi-circle with the diameter PS.

- (c) The shaded area is  $\frac{14}{9}$  times the area of the semi-circle with the diameter PS.
- (d) The shaded area is  $\frac{14}{25}$  times the area of the semi-circle with the diameter PQ.

## **ELECTRONICS ENGINEERING**

- **27.** The 12 musical notes are given as C, C<sup>#</sup>, D, D<sup>#</sup>, E, E<sup>#</sup>, F, F<sup>#</sup>, G, G<sup>#</sup>, A, A<sup>#</sup>. Frequency of each note is  $\sqrt[12]{2}$  times the frequency of the previous note. If the frequency of the note C is 130.8 Hz, then the ratio of frequencies of notes F<sup>#</sup> and C.
- (a) The shaded area is  $\frac{16}{9}$  times the area of the semi-circle with the diameter PS.
- (b) The shaded area is equal to the area of the
- (a)  $\sqrt[6]{2}$  (b)  $\sqrt{2}$  (c)  $\sqrt[4]{2}$  (d) 2
- **28.** The following figures show three curves generated using an iterative algorithm. The total length of the curve generated after 'Iteration *n*' is:

Note: The figures shown are representative.





**30.** A stick of length one metre is broken at two locations at distances of  $b_1$  and  $b_2$  from the origin (0), as shown in the figure. Note that  $0 < b_1 < b_2 < 1$ . Which one of the following is NOT a necessary condition to form a triangle using the three pieces? **Note:** All lengths are in metre. The figure shown is representative.

(a) 
$$b_1 < 0.5$$
 (b)  $b_2 > 0.5$   
(c)  $b_2 < b_1 + 0.5$  (d)  $b_1 + b_2 < 1$ 

**31.** Eight students (P, Q, R, S, T, U, V, and W) are playing musical chairs. The figure indicates their order of position at the start of the game. The play the game by moving forward in a circle in the clockwise direction.

After the 1<sup>st</sup> round, 4<sup>th</sup> student behind P leaves the game. After 2<sup>nd</sup> round, 5<sup>th</sup> student behind Q leaves the game. After 3<sup>rd</sup> round, 3<sup>rd</sup> student behind V leaves the game. After 4<sup>th</sup> round, 4<sup>th</sup> student behind U leaves the game. Who all are left in the game after the 4<sup>th</sup> round?





- (a) P; T; Q; S
  (b) V; P; T; Q
  (c) W; R; Q; V
  (d) Q; T; V; W
- **32.** The table lists the top 5 nations according to the number of gold medals won in a tournament; also included are the number of silver and the bronze medals won by them. Based only on the data provided in the table, which one of the following statements is INCORRECT?

Nation	Gold	Silver	Bronze
USA	40	44	41
Canada	39	27	24
Japan	20	12	13
Australia	17	19	16
France	16	26	22

(a) France will occupy the third place if the list were made on the basis of the total number of medals won.

- (b) The order of the top two nations will not change even if the list is made on the basis of the total number of medals won.
- (c) USA and Canada together have less than 50% of the medals awarded to the nations in the above table.
- (d) Canada has won twice as many total medals as Japan.
- **33.** An organisation allows its employees to work independently on consultancy projects but charges an overhead on the consulting fee. The overhead is 20% of the consulting fee, if the fee is up to 5,00,000. For higher fees, the overhead is 1,00,000 plus 10% of the amount by which the fee exceeds 5,00,000. The government charges a Goods and Services Tax of 18% on the total amount (the consulting fee plus the overhead). An employee of the organisation charges this entire amount, i.e., the consulting fee, overhead, and tax, to the client. If the client cannot pay more than 10,00,000, what is the maximum consulting fee that the employee can charge?

## **CIVIL ENGINEERING (CE-1)**

**34.** The sum of the following infinite series is:

$$\frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \frac{1}{5!} + \dots$$
  
(b)  $1 + e$  (c)  $e - 1$  (d)  $e$ 

**35.** A thin wire is used to construct all the edges of a cube of 1 m side by bending, cutting and soldering the wire. If the wire is 12 m long, what is the minimum number of cuts required to construct the wire frame to form the cube?

(c) 6

(d) 12

(a)

(a

**36.** The figures, I, II and III are parts of a sequence. Which one of the following options comes next in the sequence is IV?



**37.** Rohit goes to a restaurant for lunch at about 1 p.m. When he enters the restaurant, he notices that the hour and minute hands on the wall clock are exactly coinciding. After about an hour, when he leave the restaurant, he notices that the clock hand are again exactly coinciding. How much time (in minutes) did Rohit spend at the restaurant?

(a) 
$$64\frac{6}{11}$$
 (b)  $66\frac{5}{13}$  (c)  $65\frac{5}{11}$  (d)  $66\frac{6}{13}$ 

## OSWAAL GATE Year-wise Solved Papers GENERAL APTITUDE

38. A colour model is shown in the figure with colour codes: Yellow (Y), Magenta (M), Cyan (C), Red (R), Blue (Bl), Green (G), and Black (K). Which one of the following options displays the colour codes that are consistent with the colour model?



**39.** A circle with centre at (x, y) = (0.5, 0) and radius = 0.5 intersects with another circle with centre at (x, y) = (1, 1) and radius = 1 at two point. One of the points of intersection (x, y) is:

(a)	(0, 0)	<b>(b)</b> (0.2, 0	).4)

(c) (0.5, 0.5) (d) (1, 2)

**40.** An object is said to have an n-fold rotational symmetry if the object, rotated by an angle of  $\frac{2\pi}{n}$ ,

is identical to the original.

Which one of the following objects exhibits four-fold rotational symmetry about an axis perpendicular to the plane of the screen?

Note: The figures shown are representative.



## **CIVIL ENGINEERING (CE-2)**

41. An electricity utility company charges ₹7 per kWh (kilo watt-hour). If a 40-watt desk light is left on for 10 hours each night for 180 days, what would be the cost of energy consumption? If the desk light is on for 2 more hours each night for the 180 days, what would be the percentage-increase in the cost of energy consumption?

(a) ₹604.8; 10%
(c) ₹604.8; 12%

(b) ₹504; 20%
(d) ₹720; 15%

**42.** In the context of the given figure, which one of the following options correctly represents the entries in the blocks labelled (i), (ii), (iii) and (iv), respectively.

Ν	U	F	(i)
21	14	9	6
Η	L	(ii)	0
12	(iv)	15	(iii)

- (a) Q, M, 12 and 8 (b) K, L, 10 and 14
- (c) I, J, 10 and 8 (d) L, K, 12 and 8
- **43.** A bag contains Violet (V), Yellow (Y), Red (R), and Green (G) balls. On counting them, the following results are obtained:
  - (i) The sum of Yellow balls and twice the number of Violet balls is 50.
  - (ii) The sum of Violet and Green balls is 50.
  - (iii) The sum of Yellow and Red balls is 50.
  - (iv) The sum of Violet and twice the number of Red balls is 50.





**44.** For the clock shown in the figure, if  $O^* = O Q S Z P R T$ , and  $X^* = X Z P W Y O Q$ then which one among the given options is most

appropriate for P\*?



- (a) PUWRTVX(c) PTVQSUW
- (b) PRTOQSU(d) PSUPRTV
- **45.** Consider a five-digit number PQRST that has distinct digits P, Q, R, S and T, and satisfies the following conditions:
  - P < QS > P > T

If integers 1 through 5 are used to construct such a number, the value of P is:

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

**46.** A business person buys potatoes of two different varieties P and Q, mixes them in a certain ratio and sells them at ₹192 per kg.

The cost of the variety P is ₹800 for 5 kg.

The cost of the variety Q is ₹800 for 4 kg.

If the person gets 8% profit, what is the P : Q ratio (by weight)?

(a) 5:4 (b) 3:4 (c) 3:2 (d) 1:1

**47.** Three villages P, Q and R are located in such a way that the distance PQ = 13 km, QR = 14 km and RP = 15 km, as shown in the figure. A straight road joins Q and R. It is proposed to connect P to this road QR by constructing another road. What is the minimum possible length (in km) of this connecting road?

Note: The figure shown is representative.



## **PRODUCTION AND INDUSTRIAL ENGINEERING (PI)**

- 48. A rectangle has a length L and a width W, where L > W. If the width, W, is increased by 10%, which one of the following statements is correct for all values of L and W?
  - (a) Length of the diagonals increases by 10%.
  - (b) Perimeter increases by 10%.
  - (c) Area increases by 10%.
  - (d) The rectangle becomes a square.
- **49.** A regular dodecagon (12-sided regular polygon) is inscribed in a circle of radius r cm as shown in the figure. The side of the dodecagon is d cm. All the triangles (numbered 1 to 12) in the figure are used to form squares of side r cm and each numbered triangle is used only once to form a square.

The number of square that can be formed and the number of triangles required to form each square, respectively, are:

Note: The figure shown is representative.



(a) 3; 4
(b) 4; 3
(c) 3; 2
(d) 3; 3
50. The number of patients per shift (X) consulting Dr. Gita in her past 100 shifts is shown in the figure.

If the amount she earns is ₹1000 (X – 0.2), what is the average amount (in ₹) she has earned per shift in the past 100 shifts?

Note: The figure shown is representative.



**51.** A 4  $\times$  4 digital image has pixel intensities (U) as shown in the figure. The number of pixels with U  $\leq$  4 is:

0	1	0	2
4	7	3	3
5	5	4	4
6	7	3	2

(a) 3 (b) 9 (c) 11 (d) 8

**52.** Weight of a person can be expressed as a function of their age. The function usually varies from person to person. Suppose this function is identical for two brothers and it monotonically increases till the age of 50 years and then it monotonically

decreases. Let  $a_1$  and  $a_2$  (in years) denote the age of the brothers and  $a_1 < a_2$ .

Which one of the following statements is correct about their age on the day when they attain the same weight?

(a)  $a_1 < a_2 < 50$ (b)  $a_1 < 50 < a_2$ (c) Either  $a_1 = 50$  or  $a_2 = 50$ (d)  $50 < a_1 < a_2$ 53. If a real variable *x* satisfies  $3^{x^2} = 27 \times 9^x$ , then the  $2^{x^2}$ 

value of 
$$\frac{-}{(2^{x})^{2}}$$
 is:  
(a)  $2^{3}$  (b)  $2^{15}$  (c)  $2^{-1}$  (d)  $2^{0}$ 

**54.** In the given figure, the numbers associated with the rectangle, triangle, and ellipse are 1, 2, and 3, respectively. Which one among the given options is the most appropriate combination of P, Q and R?



nically	(c) $P = 5; Q = 6; R = 3$ (d) $P = 3; Q = 6; R = 6$
Answ	er Key
	Chapter Name

			5
Q. No.	Answer	Topic Name	Chapter Name
1	(c)	Average	Average
2	(c)	Direction	Direction
3	(a)	Average	Geometry
4	(a)	Probability	Probability
5	(a)	Paper Folding	Non Verbal
6	(b)	Permutation	Permutation
7	(a)	Equations	Equations
8	(a)	Dice	Non Verbal
9	(b)	Number System	Number System
10	(b)	Coding-Decoding	Coding-Decoding
11	(a)	Equations	Equations
12	(d)	Quadrilateral	Quadrilateral
13	(c)	Figures	Non Verbal
14	(c)	Time & Distance	Time & Distance

15	(d)	Function	Algebra
16	(a)	Probability	Probability
17	(d)	Coding-Decoding	Coding-Decoding
18	(b)	Water Image	Non Verbal
19	(b)	Figures	Non Verbal
20	(a)	Probability	Probability
21	(a)	Lines	Coordinate Geometry
22	(c)	Surds	Number System
23	(c)	Number System	Number System
24	(b)	Average	Average
25	(c)	Circles	Geometry
26	(a)	Triangles	Area
27	(b)	Series	Numbe <mark>r Syste</mark> m
28	(b)	Triangles	Geometry
29	(a)	Function	Function
30	(d)	Triangles	Triangles
31	(d)	Circular Arrangement	Sitting arrangement
32	(c)	Percentage	Percentage
33	(b)	Percentage	Percentage
34	(c)	Number System	Number System
35	(a)	Cubes	Verbal
36	(b)	Figures	Non Verbal
37	(c)	Time & Distance	Time & Distance
38	(a)	Figures	Non Verbal
39	(b)	Circles	Coordinate Geometry
40	(b)	Figures	Non Verbal
41	(b)	Percentage	Percentage
42	(c)	Figures	Non Verbal
43	(a)	Percentage	Percentage
44	(b)	Coding-Decoding	Coding-Decoding
45	(c)	Sitting arrangement	Sitting arrangement
46	(a)	Mixtures	Alligation & Mixture
47	(c)	Triangles	Triangles
48	(c)	Percentage	Percentage
49	(a)	Figures	Non-Verbal
50	(b)	Bar Graph	Statistics
51	(c)	Matrix	Non-Verbal
52	(b)	Increasing/Decreasing	Calculus
53	(a)	Number System	Number System
54	(a)	Venn Diagram	Non-Verbal

# **Reasoning & QA**





## **COMPUTER SCIENCE & IT (CS-1)**

## 1. Option (c) is correct.

- $(New \ average old \ average) \times Number \ of \ students$
- = Difference in marks

 $(31.4 - 30.8) \times x = 42 - 24$  $x = 18 \div 0.6$ x = 30

2. Option (c) is correct.



From given figure, Chemistry lab is to the Southeast of the physics lab.

3. Option (a) is correct.



Area of trapezium SQRT  $= \frac{\frac{1}{2} \times \text{base} \times \text{height}}{\frac{1}{2} \times \sup_{a \times x} \text{of parallel sides} \times \text{height}}$ 

$$=\frac{2^{2a\times x}}{\frac{1}{2}\times(4a+2a)\times x}$$

 $=\frac{2ax}{6ax}=\left(\frac{1}{3}\right)$ 

## 4. Option (a) is correct.

P(A) =Getting six in first throw

P(B) =Getting Six in second throw

## 10. Option (b) is correct.

P(C) = Getting six in third throw Required probability

$$= P(A) \times P(\overline{B}) \times P(\overline{C}) + P(\overline{A}) \times P(\overline{B}) \times P(C) + P(\overline{A})$$

$$\times P(B) \times P(\overline{C})$$

$$= \left(\frac{1}{6}\right) \times \left(\frac{5}{6}\right) \times \left(\frac{5}{6}\right) + \left(\frac{5}{6}\right) \times \left(\frac{5}{6}\right) \times \left(\frac{1}{6}\right) + \left(\frac{5}{6}\right) \times \left(\frac{1}{6}\right) \times \left(\frac{5}{6}\right)$$
$$= \frac{75}{216}$$

5. Option (a) is correct.



(I) (II) (III) (IV) Logic: -Following the pattern and the symmetry Hence, option (a) is the correct answer

## 6. Option (b) is correct.

3 scoops of ice cream of the same flavour ways = 4 2 scoops of the same+1 scoop of different flavour =  $4 \times 3 = 12$  ways All scoops of the different flavours = 4 ways

All scoops of the different flavours = 4 ways Total ways = 4 + 12 + 4 = 20

## **COMPUTER SCIENCE & IT (CS-2)**

7. Option (a) is correct.  $Pe^{x} = Qe^{-x}$ Multiply both sides by  $e^{x}$ 

$$Pe^{x}e^{x} = Qe^{-x}$$
$$\frac{Q}{P} = e^{2x}$$

$$O = Pe^{2x}$$

8. Option (a) is correct.

 $\Rightarrow$ 



Logic: Alternate faces are opposite to each other and can never be adjacent to each other. Hence, correct option is (a).

#### 9. Option (b) is correct.

The condition should be satisfied for all the prime numbers. Hence, option (b) is the correct answer.

Alphabets	Α	В	С	D	E	F	G	Н	Ι	J	Κ	L	М
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Alphabets	Ζ	Y	X	W	V	U	Т	S	R	Q	Р	0	Ν
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14



## 17. Option (d) is correct.

For HIDE, H - 19 I - 23 D - 7 E - 11For CAGE, C - 5 A - 2 G - 17 E - 11Hence, the code for HIGH is H = 19 I - 23 G - 17H - 19

## 18. Option (b) is correct.

First take the water image and then rotate  $90^\circ$  clockwise.

In the water image, top and bottom become top, and left and right will remain as it is.

## **19.** Option (b) is correct.

Line of symmetry in an isosceles triangle = 1 Line of symmetry in an equilateral triangle = 3 Line of symmetry in a square triangle = 4 Line of symmetry in a circle = many (infinite)

## 20. Option (a) is correct.

 $\Rightarrow$ 

The probability that she receives a job offer from both companies

 $P = 0.8 \times 0.6$ P = 0.48 $0.4 \le P \le 0.6$ 

#### **ELECTRICAL ENGINEERING**

**21. Option (a) is correct.** Points are (0, 4) and (–2, 0)

Slope = 
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 4}{-2 - 0}$$

Slope = 
$$\frac{-4}{2}$$
 = 2

 $-2^{-2}$ 

and from option (a), put  $p = \frac{-1}{2}$ , q = 2

$$x - \frac{1}{2}y + 2 = 0$$

y = 2x + 4

Hence, slope from the equation is also 2. Hence, option (a) is the correct answer.

## 22. Option (c) is correct.

$$\left(\frac{3^{81}}{27^4}\right)^{\frac{1}{3}} = \frac{3^{81\times\frac{1}{3}}}{\left(3^3\right)^{4\times\frac{1}{3}}}$$

 $= \frac{3^{27}}{3^4}$ =  $3^{27-4}$ =  $3^{23}$ **23. Option (c) is correct.** (i)  $EG = 5 \times 7 = 35$ (ii)  $FG = 6 \times 7 = 42$ Hence, option (c) is the correct answer. **24. Option (b) is correct.** Average score of P = 54.71Average score of Q = 56Median of P = 50Median of Q = 56Difference between maximum and minimum Score of P = 89 - 22= 67

Difference between maximum and minimum Score of Q = 81 - 35= 46

Median score of *P* is same as median. Score of *Q* is incorrect. Hence, option (b) is the correct answer.

## 25. Option (c) is correct.



In 
$$\triangle ABC$$

$$y^2 = x^2 + x^2$$
$$y = \sqrt{2x^2}$$

Put x = 1

$$y = \sqrt{2}$$

Hence, value of  $\frac{y}{x} = \frac{\sqrt{2}}{1} = \sqrt{2}$ 

Hence, option (c) is the correct answer. **26. Option (a) is correct.** 

Given:

$$PT : TR = 3 : 2$$

$$Let PS = d$$

$$PQ = D$$

$$\Delta PST \sim \Delta PQR$$

$$\therefore \qquad \frac{PT}{PR} = \frac{PS}{PQ}$$

$$\frac{3K}{5K} = \frac{PS}{PQ}$$

$$\Rightarrow \qquad PQ = \frac{5}{3}PS$$

$$D = \frac{5}{3}d$$

Now,

Area of shaded part

= Area of big semi-circle – Area of small semi-circle

$$= \frac{1}{2}\pi \left(\frac{D}{2}\right)^2 - \frac{1}{2}\pi \left(\frac{d}{2}\right)$$
$$= \frac{\pi}{8} [D^2 - d^2]$$
$$= \frac{\pi}{8} \left[ \left(\frac{25}{9}d^2\right) - d^2 \right]$$
$$= \frac{16}{9} \times \frac{\pi}{8} PS^2$$

Hence, option (a) is the correct answer.

## ELECTRONICS ENGINEERING

27. Option (b) is correct.

Given: Common ratio =  $\sqrt[12]{2} = (2)^{\frac{1}{12}}$ The ratio of frequencies of notes  $F^{\#}$  and C

$$= \frac{7^{\text{th}} \text{ term}}{1^{\text{st}} \text{ term}}$$
$$= \frac{ar^{6}}{a}$$
$$= r^{6}$$
$$= \left[ (2)^{\frac{1}{12}} \right]^{6}$$
$$= (2)^{\frac{6}{12}}$$
$$= \sqrt{2}$$

Hence, option (b) is the correct answer.

#### 28. Option (b) is correct.

Iteration 0 : total length =  $1 \times 1 = 1$ 

Iteration 1 : total length =  $5 \times \frac{1}{3} = \frac{5}{3}$ 

Iteration 2 : total length =  $25 \times \frac{1}{9} = \frac{25}{9} = \left(\frac{5}{3}\right)^2$ Similarly,

Iteration *n* : total length =  $\left(\frac{5}{3}\right)^n$ 

Hence, option (b) is the correct answer.

#### 29. Option (a) is correct.

$$f(x) = \frac{-(-x)}{x} = 1; x < 0$$
$$\frac{-x}{x} = -1; x \ge 0$$

Hence, option (a) is the correct answer.

#### 30. Option (d) is correct.

We know that the necessary condition to form a triangle is sum of any two sides should be greater than the third side.

Hence,  $b_1 + b_2 < 1$  is not possible. Hence, option (d) is the correct answer. 31. Option (d) is correct. After 1<sup>st</sup> round, *S* will be out After 2<sup>nd</sup> round, *U* will be out After  $3^{rd}$  round, *R* will be out After 4th round, P will be out. So rest of the students will be Q, T, V, W. 32. Option (c) is correct. Total medals USA have = 125Total medals JAPAN have = 45Total medals CANADA have = 90Total medals AUSTRALIA have = 52Total medals FRANCE have = 64Medals awarded to USA and Canada = 90 + 125= 215 $\frac{215}{376} \times 100 = 57.18\%$ *.*.. Hence option (c) is the correct answer. 33. Option (b) is correct. Let the consulting fee = x**Case (1):** If  $x \le 5,00,000$ Total cost = x + 20% of x= 1.2xTax = 18% of 1.2x= 0.216xTotal amount paid = 1.2x + 0.216x= 1.416xGiven, that the client can only pay = 10,00,0001.416x = 10,00,000 $\Rightarrow$ x = 7.06, 215Case (ii): If *x* > 5,00,000 Overhead = 1,00,000 + 10% [x - 5,00,000]= 1,00,000 + 0.1[x - 5,00,000] $Total \cos t = x + 1,00,000 + 0.1[x - 5,00,000]$ = 1.1x + 50,000 $Tax = \frac{18}{100} [1.1x + 5,00,000] = 0.198x + 9000$ Total amount paid by the client

= 1.1x + 5,000 + 0.198x + 90,000Given that the client can only pay = 10,00,0001.298x + 39000 = 10,00,000x = 724961Hence, option (b) is the correct answer.

#### **CIVIL ENGINEERING (CE-1)**

34. Option (c) is correct.

$$e^{x} = 1 + \frac{x}{1!} + \frac{x^{2}}{2!} + \frac{x^{3}}{3!} + \dots$$
  
put  $x = 1$   
 $e^{1} = 1 + \frac{1}{1!} + \frac{1^{2}}{2!} + \frac{1^{3}}{3!} + \dots$ 

$$e-1 = \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots$$

Hence, option (c) is the correct answer.

#### 35. Option (a) is correct.

Total length of wire = 12 mLength of edge of a cube = 1 mFrom 1 cut length of wire used = 9 m



The dotted part is made from remaining 2 cuts.

 $\therefore$  Total cuts required = 3

Hence, option (a) is the correct answer.

## 36. Option (b) is correct.

Shaded portion

 $90^{\circ} + 45^{\circ} - 135^{\circ} + 45^{\circ} - 180^{\circ} + 45^{\circ} - 225^{\circ}$ 

and shading part is moving in  $90^\circ$  clockwise direction.

Hence, option (b) is the correct answer.

## **37. Option (c) is correct.**

Relative speed of minute hand and hour hand = 6 - 0.5 = 5.5 degree/minute.

So, again they will coincide after time or time spend

by Rohit = 
$$\frac{360^{\circ}}{5.5^{\circ}}$$
  
=  $\frac{720}{11}$   
=  $65\frac{5}{11}$  minutes

Hence, option (c) is the correct answer.

#### 38. Option (a) is correct.

Only option (a) is correct because K(black) is present in all figures.

Hence, option (a) is the correct answer.

#### 39. Option (b) is correct.

Equation of circle with centre (0.5, 0) and radius 0.5  $(x - 0.5)^2 + y^2 = (0.5)^2$   $(x - 0.5)^2 + y^2 = 0.25$  ...(i) and equation of circle with centre (1, 1) and radius 1  $(x - 1)^2 + (y - 1)^2 = 1^2$  ...(ii)

Both equation (i) and (ii) are satisfied by (0.2, 0.4). Hence, option (b) is the correct answer.

#### 40. Option (b) is correct.

Each dot is moving by 90° clockwise. Hence, option (b) is the correct answer.

#### **CIVIL ENGINEERING (CE-2)**

**41. Option (b) is correct.** Power = 40 watt

$$= \frac{40}{1000} kW$$
$$= 0.04 kW$$

Total energy consumption for 180 days =  $10 \times 180 \times 0.04 = 72 \text{ kWh}$ 

Total cost =  $72 \times 7 = ₹504$ 

Percentage increase in cost of consumption

$$= \frac{12-10}{10} \times 100$$
$$= \frac{2}{10} \times 100 = 20\%$$

Hence, option (b) is the correct answer.

42. Option (c) is correct.

Position of alphabet is written diagonally

N	U	F	(i) I	
 21	14	9	6	
Н	L	(ii) J	0	
12	(iv) 8	15	(iii) 10	

Hence, option (c) is the correct answer.

## 43. Option (a) is correct.

According to the question,

V + R + Y + G = 100%

Y + 2V = 50

$$V + G = 50$$

$$Y + R = 50$$
$$V + 2R = 50$$

Only option (a) verify the above conditions. Hence, option (a) is the correct answer.

## 44. Option (b) is correct.

Clockwise movement = + Anticlockwise movement = -

$$O^* = O + 2 Q + 2 S - 5 Z + 2 P + 2 R + 2 T$$

$$X^* = X + 2 Z + 2 P - 5 W + 2 Y + 2 O + 2 Q$$

Similarly,

$$P^* = P + 2 R + 2 T - 5 O + 2 O + 2 S + 2 U$$

Hence, option (b) is the correct answer.

## 45. Option (c) is correct.

According to conditions, the arrangement will be:

- 3 P P 2 T T
- 2 T T 1 R R
  - R R

Hence, option (c) is the correct answer.

## 46. Option (a) is correct.

Cost price of variety P per kg =  $\frac{800}{5}$  = ₹160



#### 47. Option (c) is correct.



So, the minimum possible length of this connecting road = PL

$$PL = \sqrt{169 - 25}$$
$$PL = \sqrt{144}$$
$$PL = 12 \text{ Km}$$

Hence, option (c) is the correct answer.

#### **PRODUCTION AND INDUSTRIAL ENGINEERING (PI)**

**48.** Option (c) is correct. Let length = x units width = y units Area of rectangle = xy square units Perimeter of rectangle = 2 (x + y) units = 2x + 2yDiagonal of rectangle =  $\sqrt{x^2 + y^2}$  units If width is increased by 10%, new width = (1 + 0.1) y = 1.1 y New area =  $x \times 1.1y = 1.1xy = (1 + 0.1) xy$ Hence, the area is increased by 10%.

New perimeter = 2(x + 1.1y) = 2x + 2.2y

New diagonal =  $\sqrt{x^2 + (1.1y^2)}$ 

We cannot say that a rectangle becomes a square, unless we know the relation between x and y. Hence, the correct option is (c).

#### 49. Option (a) is correct.

According to the question, we have to form a square of side r cm, using the triangles.



1 square is formed using 4 triangles. On clubbing triangles (1, 2, 3, 10), (4, 5, 6, 11) and (7, 8, 9, 12), we can make 3 squares, each using 4 triangles. Hence, the correct option is (a).

#### 50. Option (b) is correct.

Average number of patients per shift

$$= \frac{5 \times 20 + 6 \times 40 + 7 \times 30 + 8 \times 10}{(20 + 40 + 30 + 10)}$$
  
=  $\frac{630}{100}$   
= 6.3  
Average amount she earned per shift  
= 1000 (X - 0.2)  
= 1000 (6.3 - 0.2)

 $= 1000 \times 6.1 = 6100$ 

## 51. Option (c) is correct.

The number of pixels with U < 4 is Row 1: 0, 1, 0, 2 = 4 Row 2: 4, 3, 3 = 3 Row 3: 4, 4 = 2 Row 4: 3, 2 = 2 <u>11</u>

Total number of pixels with  $U \le 4$  is 11.

52. Option (b) is correct.

Since the function increases until age 50,

 $\Rightarrow a_1 < 50$  (1)

also given that  $a_1 < a_2$  and from (1)  $a_1 < 50$ 

 $\Rightarrow$  *a*<sup>2</sup> can be greater than or less than 50

if  $a_2 > 50$ , then, the second brother is in decreasing part of the function and they can have same weight and vice-versa.

$$\Rightarrow a_2 > 50 \qquad (2)$$
  
from (1) and (2)  
 $a_1 < 50 < a_2$ 

# 53. Option (a) is correct.

$$3^{x^{2}} = 27 \times 9^{x}$$
  

$$3^{x^{2}} = 3^{3} \times (3^{2})^{x}$$
  

$$3^{x^{2}} = 3^{x} \times 3^{2x}$$
  

$$3^{x^{2}} = 3^{3+2x}$$

Since the base is same, powers will be equal.

$$x^{2} = 3 + 2x$$

$$x^{2} - 2x - 3 = 0$$

$$x^{2} - 3x + x - 3 = 0$$

$$x (x - 3) + 1 (x - 3) = 0$$

$$(x - 3) (x + 1) = 0$$

$$x = 3, x = -1$$

put 
$$x = -1$$

$$\frac{2^{(-1)^2}}{(2^{-1})^2} = \frac{2}{\left(\frac{1}{4}\right)} = 2 \times 4 = 8$$

Put x = 3

$$\frac{3^{3^2}}{(2^3)^2} = \frac{2^9}{2^6} = 2^3$$

#### 54. Option (a) is correct.

The number of a region is the sum of the numbers associated with the shape that contains the region.

P = triangle + circle + rectangle P = 2 + 3 + 1 P = 6 R = rectangle + triangle R = 1 + 2 R = 3 Q = circle + triangle Q = 3 + 2 Q = 5