MATHEMATICS

1. The number of bit strings of length 10 that contain either five consecutive 0's or five consecutive 1's is

   A) 64 B) 112 C) 220 D) 222

2. If $0 < x < \pi$ and $\cos x + \sin x = \frac{1}{2}$, then the value of $\tan x$ is

   A) $\frac{4-\sqrt{7}}{3}$ B) $\frac{4+\sqrt{7}}{3}$ C) $\frac{1+\sqrt{7}}{4}$ D) $\frac{1-\sqrt{7}}{4}$

3. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are the position vectors of the vertices A, B, C of a triangle ABC, then the area of the triangle ABC is

   A) $\frac{1}{2}\left|\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}\right|$ B) $\left|\vec{a}\times\vec{b}\right|$

   C) $\frac{1}{2}\left|\vec{a}\times\vec{b}-\vec{b}\times\vec{c}-\vec{c}\times\vec{a}\right|$ D) $\left|\vec{a}\times(\vec{b}\times\vec{c})\right|$

4. If $\int e^x(f(x)-f'(x))dx = \phi(x)$, then the value of $\int e^x f(x)dx$ is

   A) $\phi(x)+e^x f(x)$ B) $\phi(x)-e^x f(x)$ C) $\frac{1}{2}\left[\phi(x)+e^x f(x)\right]$ D) $\frac{1}{2}\left[\phi(x)+e^x f'(x)\right]$

5. If $3x + 4y + K = 0$ is a tangent to the hyperbola $9x^2 - 16y^2 = 144$, then the value of K is

   A) 0 B) 1 C) −1 D) −3

6. The foot of the perpendicular from the point (2, 4) upon $x + y = 1$ is

   A) $\left(\frac{1}{2}, \frac{3}{2}\right)$ B) $\left(-\frac{1}{2}, \frac{3}{2}\right)$ C) $\left(\frac{4}{3}, \frac{1}{2}\right)$ D) $\left(\frac{4}{3}, -\frac{1}{2}\right)$

7. The value of K for which the equation $(K-2)x^2 + 8x + K + 4 = 0$ has both real, distinct and negative roots is

   A) 0 B) 2 C) 3 D) −4

8. If (2, 1), (−1, −2), (3, 3) are the midpoints of the sides BC, CA, AB of a triangle ABC, then equation of the line BC is

   A) $5x + 4y + 6 = 0$ B) $5x - 4y - 6 = 0$

   C) $5x + 4y - 6 = 0$ D) $5x - 4y + 6 = 0$

9. If a fair dice is rolled successively, then the probability that 1 appears in an even numbered throw is

   A) $\frac{5}{36}$ B) $\frac{6}{11}$ C) $\frac{1}{6}$ D) $\frac{5}{11}$

10. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} - \hat{k}$ be three vectors. A vector $\vec{v}$ in the plane of $\vec{a}$ and $\vec{b}$ whose projection on $\frac{\vec{c}}{|\vec{c}|}$ is $\frac{1}{\sqrt{3}}$, is

A) $3\hat{i} - \hat{j} + 3\hat{k}$ B) $\hat{i} - 3\hat{j} + 3\hat{k}$ C) $5\hat{i} - 2\hat{j} + 5\hat{k}$ D) $2\hat{i} - \hat{j} + 3\hat{k}$

11. The value of $\int_{-\pi/3}^{\pi/3} \frac{x \sin x}{\cos^2 x} dx$ is

A) $\frac{1}{3}(4\pi + 1)$ B) $\frac{4\pi}{3} - 2\log \tan\frac{5\pi}{12}$

C) $\frac{4\pi}{3} + \log \tan\frac{5\pi}{12}$ D) $\frac{4\pi}{3} - \log \tan\frac{5\pi}{3}$

12. The foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide, then the value of b^2 is

A) 1 B) 5 C) 7 D) 9

13. If $A + B + C = \pi$, then, the value of $\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix}$ is

A) 0 B) 1 C) 2 sin A sin B D) 2

14. If the mean deviation of the numbers $1, 1+d, 1+2d, \ldots, 1+100d$ from their mean is 255, then the value of d is

A) 20.0 B) 10.1 C) 20.2 D) 10.0

15. If $P = \sin^{20}\theta + \cos^{48}\theta$, then the inequality that holds for all values of θ is

A) $P \geq 1$ B) $0 < P \leq 1$ C) $1 < P < 3$ D) $0 \leq P \leq 1$

16. Let $\vec{a}$ and $\vec{b}$ be two vectors. Which of the following vectors are not perpendicular to each other?

A) $(\vec{a} \times \vec{b})$ and $\vec{a}$ B) $(\vec{a} + \vec{b})$ and $\vec{a} \times \vec{b}$

C) $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ D) $\vec{a} - \vec{b}$ and $\vec{a} \times \vec{b}$

17. If $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$, where a, b, c are real positive numbers such that $abc = 1$ and $A^T A = I$, then the equation that holds true among the following is

A) $a + b + c = 1$ B) $a^2 + b^2 + c^2 = 1$

C) $ab + bc + ca = 0$ D) $a^3 + b^3 + c^3 = 4$

18. The equation of the tangent at any point of the curve $x = a\cos 2t$, $y = 2\sqrt{2}\, a \sin t$, with m as its slope, is

A) $y = mx + a\left(m - \frac{1}{m}\right)$ B) $y = mx - a\left(m + \frac{1}{m}\right)$

C) $y = mx + m\left(a + \frac{1}{a}\right)$ D) $y = amx + a\left(m - \frac{1}{m}\right)$

19. The locus of the mid points of all chords of the parabola $y^2 = 4x$, which are drawn through its vertex, is

A) $y^2 = 8x$ B) $y^2 = 2x$

C) $x^2 + 4y^2 = 16$ D) $x^2 = 2y$

20. The value of $\lim\limits_{x \to a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}$ is

A) $\frac{2}{3}$ B) $\frac{2}{\sqrt{3}}$ C) $\frac{3\sqrt{3}}{2}$ D) $\frac{2}{3\sqrt{3}}$

21. If a, b, c are in geometric progression, then $\log_{ax} x$, $\log_{bx} x$ and $\log_{cx} x$ are in

A) Arithmetic progression B) Geometric progression

C) Harmonic progression D) Arithmetico-geometric progression

22. If $\vec{a}$ and $\vec{b}$ are vectors in space, given by $\vec{a} = \frac{\hat{i} - 2\hat{j}}{\sqrt{5}}$ and $\vec{b} = \frac{2\hat{i} + \hat{j} + 3\hat{k}}{\sqrt{14}}$ then the value of $\left(2\vec{a} + \vec{b}\right) \cdot \left[\left(\vec{a} \times \vec{b}\right) \times \left(\vec{a} - 2\vec{b}\right)\right]$ is

A) 3 B) 4 C) 5 D) 6

23. The value of the sum $\frac{1}{2\sqrt{1} + 1\sqrt{2}} + \frac{1}{3\sqrt{2} + 2\sqrt{3}} + \frac{1}{4\sqrt{3} + 3\sqrt{4}} + \ldots + \frac{1}{25\sqrt{24} + 24\sqrt{25}}$ is

A) $\frac{9}{10}$ B) $\frac{4}{5}$ C) $\frac{14}{15}$ D) $\frac{7}{15}$

24. If $\vec{a} = \hat{i} - \hat{k}, \vec{b} = x\hat{i} + \hat{j} + (1-x)\hat{k}$ and $\vec{c} = y\hat{i} + x\hat{j} + (1+x-y)\hat{k}$, then $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$ depends on

A) Neither x nor y B) Only x

C) Only y D) Both x and y

25. If $42\ ({}^nP_2) = {}^nP_4$ then the value of n is

A) 2 B) 4

C) 9 D) 42

26. If the angles of a triangle are in the ratio 2 : 3 : 7, then the ratio of the sides opposite to these angles is

A) $\sqrt{2} : 2 : \sqrt{3}+1$

B) $2 : \sqrt{2} : \sqrt{3}+1$

C) $2 : \sqrt{2} : \frac{\sqrt{2}}{\sqrt{3}-1}$

D) $\frac{1}{\sqrt{2}} : 2 : \frac{\sqrt{3}+1}{2}$

27. Suppose that A and B are two events with probabilities $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$. Then which of the following is true?

A) $\frac{1}{3} \le P(A \cap B) \le \frac{1}{2}$

B) $\frac{1}{4} \le P(A \cap B) \le \frac{1}{3}$

C) $\frac{1}{6} \le P(A \cap B) \le \frac{1}{3}$

D) $\frac{1}{4} \le P(A \cap B) \le \frac{1}{2}$

28. The number of one-to-one functions from {1, 2, 3} to {1, 2, 3, 4, 5} is

A) 125 B) 243 C) 10 D) 60

29. A harbour lies in a direction 60° South of West from a fort and at a distance 30 km from it, a ship sets out from the harbour at noon and sails due East at 10 km an hour. The time at which the ship will be 70 km from the fort is

A) 7 PM B) 8 PM C) 5 PM D) 10 PM

30. If x, y, z are three consecutive positive integers, then log (1 + xz) is

A) log y B) $\log \frac{y}{2}$ C) log (2y) D) 2 log (y)

31. The value of $\sin^{-1}\frac{1}{\sqrt{2}} + \sin^{-1}\frac{\sqrt{2}-\sqrt{1}}{\sqrt{6}} + \sin^{-1}\frac{\sqrt{3}-\sqrt{2}}{\sqrt{12}} + \ldots$ to infinity is equal to

A) π B) $\frac{\pi}{3}$ C) $\frac{\pi}{2}$ D) $\frac{\pi}{4}$

32. If two circles $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other then which of the following is true?

A) $gf = g'f'$ B) $g'f = gf'$ C) $gg' = ff'$ D) None of these

33. $\int_0^{\pi} [\cot x]\,dx$, where $[\bullet]$ denotes the greatest integer function, is equal to

A) $\frac{\pi}{2}$ B) 1 C) -1 D) $-\frac{\pi}{2}$

34. In a right angled triangle, the hypotenuse is four times the perpendicular drawn to it from the opposite vertex. The value of one of the acute angles is

A) 45° B) 30° C) 15° D) None of these

35. A is targeting B, B and C are targeting A. Probability of hitting the target by A, B and C are $\frac{2}{3}, \frac{1}{2}$ and $\frac{1}{3}$ respectively. If A is hit then the probability that B hits the target and C does not, is

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{3}{4}$

36. A professor has 24 text books on computer science and is concerned about their coverage of the topics (P) compilers, (Q) data structures and (R) operating systems. The following data gives the number of books that contain material on these topics : $n(P) = 8, n(Q) = 13, n(R) = 13, n(P \cap Q) = 5, n(P \cap R) = 3, n(Q \cap R) = 6, n(P \cap Q \cap R) = 2$, where $n(x)$ is the cardinality of the set x. Then the number of text books that have no material on compilers is

A) 4 B) 8 C) 12 D) 16

37. The value of $\tan\left(\frac{7\pi}{8}\right)$ is

A) $1 - \sqrt{2}$ B) $1 + \sqrt{2}$ C) $\sqrt{2} + \sqrt{3}$ D) $\sqrt{2} - \sqrt{3}$

38. If $\vec{a}$ and $\vec{b}$ are vectors such that $|\vec{a}| = 13, |\vec{b}| = 5$ and $\vec{a} \cdot \vec{b} = 60$ then the value of $|\vec{a} \times \vec{b}|$ is

A) 625 B) 225 C) 45 D) 25

39. Two towers face each other separated by a distance of 25 meters. As seen from the top of the first tower, the angle of depression of the second tower's base is 60° and that of the top is 30°. The height (in meters) of the second tower is

A) $\frac{50}{\sqrt{3}}$ B) $\frac{25}{\sqrt{3}}$ C) 50 D) $25\sqrt{3}$

40. If $\vec{a} = 4\hat{i} + 6\hat{j}$ and $\vec{b} = 3\hat{j} + 4\hat{k}$, then the vector form of the component of $\vec{a}$ along $\vec{b}$ is

A) $\frac{18}{10\sqrt{13}}\left(3\hat{j} + 4\hat{k}\right)$ B) $\frac{18}{5}\left(3\hat{j} + 4\hat{k}\right)$

C) $\frac{18}{\sqrt{13}}\left(3\hat{j} + 4\hat{k}\right)$ D) $\left(3\hat{j} + 4\hat{k}\right)$

41. With the usual notation, $\frac{d^2x}{dy^2}$ is

A) $\left(\frac{d^2y}{dx^2}\right)^{-1}$ B) $\frac{d^2y}{dx^2}\left(\frac{dy}{dx}\right)^{-2}$

C) $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$ D) $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

42. The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ and having its centre at (0, 3) is

A) 4 units B) 3 units C) $\sqrt{12}$ units D) $\frac{7}{2}$ units

43. A function $f:(0,\pi)\to\mathbb{R}$ defined by $f(x)=2\sin x+\cos 2x$ has

A) A local minimum but no local maximum
B) A local maximum but no local minimum
C) Both local minimum and local maximum
D) Neither a local minimum nor a local maximum

44. A matrix M_r is defined as $M_r=\begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix}$ $r\in N$, then the value of $\det(M_1)+\det(M_2)+\ldots+\det(M_{2015})$ is

A) 2014^2 B) 2013^2 C) 2015 D) 2015^2

45. If $\overrightarrow{AC}=2\hat{i}+\hat{j}+\hat{k}$ and $\overrightarrow{BD}=-\hat{i}+3\hat{j}+2\hat{k}$ then the area of the quadrilateral ABCD is

A) $\frac{5}{2}\sqrt{3}$ B) $5\sqrt{3}$ C) $\frac{15}{2}\sqrt{3}$ D) $10\sqrt{3}$

46. a, b, c are positive integers such that $a^2+b^2-2bc=100$ and $2ab-c^2=100$. Then the value of $\frac{a+b}{c}$ is

A) 10 B) 100 C) 2 D) 20

47. If (−4, 5) is one vertex and $7x-y+8=0$ is one diagonal of a square, then the equation of the other diagonal is

A) $x+7y=21$ B) $x+7y=31$ C) $x+7y=28$ D) $x+7y=35$

48. Out of 2n+1 tickets, which are consecutively numbered, three are drawn at random. Then the probability that the numbers on them are in arithmetic progression is

A) $\frac{n^2}{4n^2-1}$ B) $\frac{n}{4n^2-1}$ C) $\frac{3n^2}{4n^2-1}$ D) $\frac{3n}{4n^2-1}$

49. A circle touches the X-axis and also touches another circle with centre at (0, 3) and radius 2. Then the locus of the centre of the first circle is

A) a parabola B) a hyperbola
C) a circle D) an ellipse

50. Let $\overline{P}$ and $\overline{Q}$ denote the complements of two sets P and Q. Then the set $(P-Q)\cup(Q-P)\cup(P\cap Q)$ is

A) $P\cup Q$ B) $\overline{P}\cup\overline{Q}$ C) $P\cap Q$ D) $\overline{P}\cap\overline{Q}$

ANALYTICAL ABILITY AND LOGICAL REASONING

51. How many 3-digit numbers divisible by 5, can be formed using the digits 2, 3, 5, 6, 7 and 9, without repetition of digits?
A) 216 B) 20 C) 120 D) 24

52. Using only 2, 5, 10, 25 and 50 paise coins, what is the smallest number of coins required to pay exactly 78 paise, 69 paise and ₹ 1.01 to three different persons?
A) 19 B) 20 C) 17 D) 18

53. Which of the following two patterns will fit in the blanks of the series ZA_5, Y_4B, XC_6, W_3D, _____, _____?
A) VE_7 and U_2E B) V_2E and U_7F C) VE_7 and U_2F D) VF_7 and U_2E

54. Which of the following numbers comes next in the two-digit decimal number sequence 61, 52, 63, 94, _____?
A) 65 B) 64 C) 56 D) 46

55. Three ladies X, Y and Z marry three men A, B and C. X is married to A, Y is not married to an engineer. Z is not married to a doctor, C is not a doctor and A is a lawyer. Then which of the following statements is correct?
A) X is married to a doctor B) Y is married to C, who is a doctor
C) Z is married to B, who is an engineer D) None of these

Questions **56** and **57** are based on the following :
The letters of English alphabet from A to M were written, leaving space for one letter between every two letters and then the remaining letters were inserted beginning with N and ending the series with Z after M.

56. Which letter would be 3rd to the right of the 7th letter from the left?
A) C B) O C) R D) S

57. Which letter would be exactly in the middle of eighteenth letter from the beginning and fifteenth from the end?
A) G B) H C) J D) L

58. In an examination there are 100 questions divided into 3 parts A, B, C and each part should contain at least one question. Each question in parts A, B and C carry 1, 2 and 3 marks respectively. Part A is for at least 60% of the total marks and part B should contain 23 questions. How many questions must be set in part C?
A) 1 B) 2
C) 3 D) Cannot be determined

59. If ÷ means addition, – means division, × means subtraction and + means multiplication, then the value of $\frac{(36 \times 4) \div 8 \times 4}{4 + 8 \times 2 + 16 \div 1}$ is
A) 0 B) 8 C) 12 D) 16

60. Which letter in the word CYBERNETICS occupies the same position as it does in the English alphabet?
A) C B) E C) I D) T

61. The remainder when 2^{31} is divided by 5 is
A) 1 B) 2 C) 3 D) 4

62. If the English word "EXAMINATION" is coded as 56149512965, then the word "GOVERNMENT" is coded as
A) 7645954552 B) 7654694562 C) 7645955423 D) 7654964526

63. Gopal starts from his house towards West. After walking a distance of 30 meters, he turned towards right and walked 20 meters. He turned left and after moving a distance of 10 meters, turned to his left again and walked 40 meters. He then turned left and walked 5 meters. Finally, he turns to his left. In which direction is he walking now?
A) North B) South C) East D) South West

64. Read the conclusion and then decide which of the given conclusions logically follows from the two given statements, (i) and (ii) disregarding commonly known facts.
Statements : (i) No woman teacher can play. (ii) Some woman teachers are athletes.
Conclusions : I. Male athletes can play. II. Some athletes can play.
A) Only conclusion I follows B) Only conclusion II follows
C) Either I or II follows D) Neither I nor II follows

65. Which of the following numbers come next in the series 8, 6, 9, 23, 87, ____?
A) 128 B) 226 C) 324 D) 429

Questions **66** to **69** are based on the following :
- There is a family of six members A, B, C, D, E and F
- There are two married couples in the family and the family members represent three generations.
- Each member has a distinct choice of a colour amongst Green, Yellow, Black, Red, White and Pink.
- No lady member likes either Green or White.
- C, who likes Black colour, is the daughter-in-law of E.
- B is the brother of F and son of D and likes Pink.
- A is the grandmother of F and F does not like Red.
- Wife of the husband having a choice for Green colour, likes Yellow.

66. Which of the following is the colour preference of A?
A) Red B) Yellow
C) Either Red or Yellow D) Cannot be determined

67. Which of the following could be the colour combination of one of the couples?
A) Yellow-Red B) Green-Black C) Red-Yellow D) Yellow-Green

68. Which of the following is one of the married couples?
A) CD B) AC C) AD D) Cannot be determined

69. Which of the following is true about F?
A) Brother of B B) Sister of B C) Daughter of C D) Cannot be determined

70. If Tuesday falls on the fourth of a month then which day will fall three days after 24th of the same month?
A) Monday B) Tuesday C) Thursday D) Friday

71. If the statements "All chickens are birds", "Some chickens are hens" and "Female birds lay eggs", are all facts, then which of the following must also be a fact?
I. All birds lay eggs II. Some hens are birds III. Some chickens are not hens
A) I and II B) II and III C) I and III D) Neither I nor II nor III

Questions **72** to **75** are based on the following :

A circular field with inner radius of 10 meters and outer radius of 20 meters is divided into 5 successive stages for ploughing, The ploughing at each stage, with starting points P1, P2, P3, P4 and P5, was allotted to one of the five farmers F1, F2, F3, F4, and F5, not necessarily in that order.

- F5 was allotted the stage starting at point P4.
- The stage from P5 to P3 was not the first stage.
- F4 was allotted the work of the fourth stage.
- Finishing point of stage 3 was P1 and the work was not allotted to F1.
- F3 was allotted the work of stage ending at P5.

72. Which of the following is the finish point for farmer F2?
A) P1 B) P2 C) P3 D) P4

73. Which stage was ploughed by F5?
A) 2 B) 3 C) 4 D) 5

74. What are the starting and ending points of the field ploughed by F4?
A) P1 and P2 B) P1 and P4 C) P4 and P2 D) P2 and P4

75. What is the starting point for stage 3?
A) P2 B) P3 C) P4 D) Cannot be determined

76. How many times do the hour and the minute hands of a clock overlap in 24 hours?
A) 24 B) 22 C) 26 D) 20

77. In a certain code, TOGETHER is coded as RQEGRJCT. In the same code, PAROLE will be written as :
A) NCPQJG B) NCQPJG C) RCPQJK D) RCTQNG

78. A drawer contains 10 black and 10 brown socks which are all mixed up. What is the smallest number of socks to be taken from the drawer to decide without seeing them, to be sure that there is atleast one pair of socks of the same colour?
A) 11 B) 10 C) 3 D) Cannot be determined

79. Find the missing number in the series : 4, 7, 25, 10, _____, 20, 16, 19.
A) 13 B) 15 C) 20 D) 28

Questions **80** to **83** are based on the following :

A, B, C, D, E, F and G are seven girls having different amount of money from among ₹ 10, 20, 40, 60, 80, 120 and 200 with them. They had 3 chocolates, 2 toffees and 2 lollipops together, each one having one of these seven items.

- B and F do not have chocolates and they have ₹ 200 and ₹ 80 respectively.
- C has ₹ 60 with her and G has an amount which is neither ₹ 40 nor ₹ 120.
- A has ₹ 10 and does not have a toffee.
- The girl having ₹ 40 with her is the only one other than A to have the same type of item.
- E and the girl having ₹ 20 with her have the same kind of item.

80. How much amount does G have with her?
A) ₹ 20 B) ₹ 10 C) ₹ 60 D) None of these

81. Which of the following girls have chocolates with them?
A) F, C, G B) C, G, E C) C, G, D D) G, D, E

82. Which of the following combination is definitely correct?
A) C – chocolate – ₹ 60
B) G – toffee – ₹ 20
C) D – chocolate – ₹ 40
D) None of these

83. Which girl has ₹ 40 with her ?
A) E
B) A
C) D
D) None of these

84. P, Q, R, S, T, U and V are sitting in a row facing North. In order to determine, who is sitting exactly in the middle of the row, which of the following information is needed?
I) T and U are sitting at extreme ends of the row
II) S is third to the right of T
III) Q is four places to the left of R and P is two places to the left of V
A) I and II only are sufficient
B) I and III only are sufficient
C) I and either II or III are sufficient
D) I, II and III

Questions **85** to **88** are based on the following :

- In a family of six person A, B, C, D, E and F there are two married couples.
- D is grandmother of A and mother of B.
- C is wife of B and mother of F
- F is the grand daughter of E.

85. What is C to A?
A) Daughter
B) Grandmother
C) Mother
D) Cannot be determined

86. How many male members are there in the family?
A) Two
B) Three
C) Four
D) Cannot be determined

87. Who among the following is one of the couples?
A) CD
B) DE
C) EB
D) Cannot be determined

88. Which of the following is true?
A) A is brother of F
B) A is sister of F
C) B has two daughters
D) None of these

89. There are five books A, B, C, D and E placed on a table. If A is placed below E, C is placed above D, B is placed below A and D is placed between A and E, then which of the following books can be on the top?
A) D or E
B) C or E
C) A or E
D) None of these

90. Among five children A, B, C, D and E, B is taller than E but shorter than D. A is shorter than C but taller than D. If all the children stand in a line according to their heights, then who would be the fourth if counted from the tallest one?
A) D
B) C
C) B
D) A

GENERAL ENGLISH

Questions **91** to **93** are based on the following :

The proud warrior class of the samurai (meaning 'those who serve') grew from a band of mercenaries hired by feudal landowners in the 11th century to win them the control of Honshu, Japan's main island. These mercenaries lived by the cult of the sword, worshipping athletic prowess and martial skills. They developed a fierce loyalty to their masters and a fearlessness that made them formidable adversaries. They fought in elaborate armour, wielding their most prized possession, a double-edged sabre with which they could cut a man in half.

Later the spartan principles of Zen Buddhism, with its love of nature softened their fighting zeal. It became fashionable for them to live sparce and frugal lives during the Kamakura era (1192-1333), when the ruling warrior family Minamato moved their seat of power to the eastern city of Kamakura.

91. Who are usually refered to as mercenaries?
    A) Soldiers with martial skills
    B) Proud warriors
    C) Soldiers who fight for money
    D) Loyal warriors

92. Which of the following best describes the warriors?
    A) Proud, greedy
    B) Fearless, worshipful
    C) Loyal, fearless
    D) Possessive, soft

93. In the Kamakura period it became fashionable for these warriors to live
    A) Zealous lives
    B) Austere lives
    C) Powerful lives
    D) Natural lives

94. Choose the one which best expresses the following sentence in passive/active voice :
    "You can play with these kittens quite safely".
    A) These kittens can be played with quite safely.
    B) These kittens can play with you quite safely.
    C) These kittens can be played with you quite safely.
    D) These kittens can played with quite safely.

95. Which of the following terms refers to the original inhabitants of a place?
    A) Originals
    B) Aborigines
    C) Abominables
    D) Cannibals

96. Replace the underlined word with one of the choices given without changing the meaning of the sentence : "The news of our success was met with exuberant cries".
    A) Excited
    B) Pathetic
    C) Exclusive
    D) Poignant

97. Select the word that is furthest in meaning to the word AFFLUENCE.
    A) Stagnation
    B) Misery
    C) Neglect
    D) Poverty

98. Rearrange the parts of a sentence referred to by P, Q, R and S to form a complete and meaningful sentence : "I enclose _____ _____ _____ _____"
    P : and the postage
    Q : a postal order
    R : the price of books
    S : which will cover
    A) R P S Q
    B) Q S P R
    C) Q S R P
    D) Q P S R

99. Which of the following is the antonym of the word "Exigency"?
A) Penchant B) Emergency C) Earnestness D) Indifference

100. Which of the following propositions fills up the blank in the sentence?
"Quinine is an effective antidote _____ Malaria".
A) to B) against C) for D) none of these

101. In the sentence "The defence labs have showcased many new innovations this year", there is an error of
A) redundancy B) word order C) collocation D) omission

102. Find the most suitable phrasal verb to be filled in the blank in the following sentence :
"Left too long in the sun, the leaves had all _____".
A) shrugged off B) shared out C) shrivelled up D) skived off

103. Fill in the blank from among the choices in the sentence :
A 'Couch potato' is a person who _____
A) spends a lot of time watching television B) spends money on potatoes
C) likes potatoes D) is lazy, but intelligent

104. Which of the following sentences is grammatically incorrect?
A) She never travelled abroad for fear of becoming ill through eating foreign food.
B) She avoids foreign travel as she fears she will become ill through eating foreign food.
C) She never travelled abroad due to her fear of becoming ill through eating foreign food.
D) She never travelled abroad in fear for becoming ill with eating foreign food.

105. Match the most suitable phrasal verb from Group L to each word in Group M.

Group L	Group M
(1) Call out	(P) A Foot baller
(2) Stand in for	(Q) A Criminal
(3) Send down	(R) A colleague
(4) Send off	(S) A Doctor

A) 3 – R, 2 – S, 1 – P, 4 – Q B) 1 – S, 2 – R, 3 – Q, 4 – P
C) 1 – P, 2 – Q, 3 – R, 4 – S D) 2 – P, 3 – S, 4 – R, 1 – Q

106. Identify the type of error in the sentence : "The cost of this project will be much lesser than 5% more than that predicted earlier".
A) syntactical error B) punctuation error C) grammatical error D) conflicting words

107. Insert appropriate prepositions in the blanks to complete the sentence "This property has been _____ the possession _____the royal family _____ generations".
A) with, of, of B) in, of, for C) in, with, by D) of, by, since

108. Choose the right word to fill in the blank in the sentence :
"The mermaid legend _____ have originated with a group of mammals collectively known to science as Srinians"
A) should B) may C) need D) can

109. Identify appropriate word to fill the blank in the sentence "The feeling of guilt left a _____ impression in the life".
A) perennial B) parennial C) perannial D) perinial

110. Which of the following sentences is grammatically incorrect?
A) He is smiling. B) He smiles.
C) He always smiles. D) He is always smiling.

COMPUTER AWARENESS

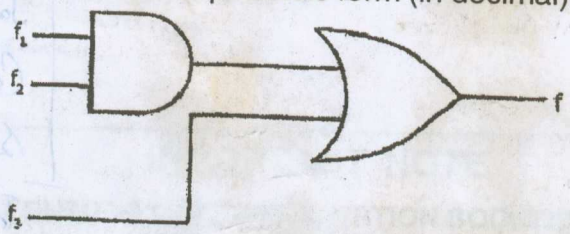
111. $\{p \rightarrow q \vee r, q \rightarrow s, r \rightarrow s\}$ is logically equivalent to
A) $q \rightarrow r$ B) $r \rightarrow q$ C) $p \rightarrow s$ D) $s \rightarrow p$

112. The minimum number of MOS transistors required to make a dynamic RAM cell is
A) 1 B) 2 C) 3 D) 4

113. When the value 37H is divided by 17H, the remainder is
A) C0H B) 03H C) 07H D) 09H

114. The number of Boolean functions possible with n binary variables is equal to
A) 2^{2^n} B) 2^n C) $2^{2^{n-1}}$ D) 2^{n-1}

115. Given f_1, f_3 and f in canonical sum of products form (in decimal) for the circuit



$f_1 = \Sigma m(4, 5, 6, 7, 8)$, $f_3 = \Sigma m(1, 6, 15)$ and $f = \Sigma m(1, 6, 8, 15)$ then f_2 is
A) $\Sigma(4, 6)$ B) $\Sigma(4, 8)$ C) $\Sigma(6, 8)$ D) $\Sigma(4, 6, 8)$

116. Which of the following is equivalent to the expression $\left(\overline{\overline{X + Y} + \overline{Z}}\right)$?
A) $(\overline{X} + \overline{Y})Z$ B) $(X + Y)\overline{Z}$ C) $(\overline{X} + \overline{Y})\overline{Z}$ D) $(X + Y)Z$

117. Which optical phenomenon is utilized in the operation of the latest write-once optical storage medium called digital paper?
A) Polarisation B) Interference C) Internal reflection D) Diffraction

118. P is a 16-bit signed integer. The 2's complement representation of P is $(F87B)_{16}$. The 2's complement representation of 8*P is
A) $(C3D8)_{16}$ B) $(187B)_{16}$ C) $(F878)_{16}$ D) $(987B)_{16}$

119. Consider 4-bit gray code representation of numbers. Let $h_3h_2h_1h_0$ be the gray code representation of a number n and $g_3g_2g_1g_0$ be the gray code representation of the number (n + 1) modulo 16. Which one of the following functions is correct?
A) $g_0(h_3h_2h_1h_0) = \Sigma(1, 2, 3, 6, 10, 13, 14, 15)$
B) $g_1(h_3h_2h_1h_0) = \Sigma(4, 9, 10, 11, 12, 13, 14, 15)$
C) $g_2(h_3h_2h_1h_0) = \Sigma(2, 4, 5, 6, 7, 12, 13, 15)$
D) $g_3(h_3h_2h_1h_0) = \Sigma(0, 1, 6, 7, 10, 11, 12, 13)$

120. The minimum number of NAND gates required to realize $AB + AB'C + AB'C'$ is
A) 3 B) 2 C) 1 D) 0