CLASS
12

SAMPLE PAPER

Science Olympiad Foundation
For Excellence in Science, Maths & IT

NATIONAL CYBER OLYMPIAD

The actual test paper has 50 questions. Time allowed : 60 minutes. There are 3 sections, 15 questions in section I, 15 in section II and 20 in section III.

SYLLABUS

Section – I (Mental ability) : Sets, Relations and functions, Mathematical induction, Logarithms, Complex numbers, Linear inequation, Quadratic equation, Sequences and series, Trigonometry, Cartesian system of rectangular coordinates, Straight line and family of straight lines, Circles, Conic section, Permutations and combinations, Binomial theorem, Exponential and logarithmic series, Mathematical logic, Statistics, Introduction to three dimensional geometry, Vectors, Stocks, Shares and debentures, Average and partition values, Index numbers, Matrices and determinants, Limits, Differential calculus.

Section – II (Logical and analytical reasoning) : Verbal and nonverbal reasoning.

Section – III (Computers and IT) : Computer fundamentals, Programming methodology, Introduction to programming in C++, Computer system organization.

MENTAL ABILITY

1. The equation $x^{\frac{3}{4}(\log_2 x)^2+\log_2(x)-\frac{5}{4}} = \sqrt{2}$ has

(A) Atleast one real solution (B) Exactly four real solutions
(C) Exactly two irrational solutions (D) Complex roots (E) None of these.

2. The roots of the equation $x^3 + ax^2 + bx + c = 0$ are p, q and r. The equation with roots are $\frac{1}{\sqrt{p}}, \frac{1}{\sqrt{q}}, \frac{1}{\sqrt{r}}$ is

(A) $x^4 + ax^2 + b = 0$ (B) $bx^4 + ax^2 + 1 = 0$
(C) $(x^2 + ax + b)^2 = 0$ (D) $(x^2 - ax - b)^2 = 0$ (E) None of these.

3. Find $\underset{x\to 0}{Lim}\left\{\tan\left(\frac{\pi}{4}+x\right)\right\}^{\frac{1}{x}}$

(A) e (B) e^2 (C) e^3 (D) e^{-1} (E) None of these.

4. The domain of definition of the function $f(x) = \frac{1}{\sqrt{|[x]-1|-5}}$, where $[\,f\,]$ stands for greatest integer function, is

(A) $[6, \infty)$ (B) $(-\infty,7)\cup(7,\infty)$ (C) $(-\infty,7]\cup[7,\infty)$ (D) All of these (E) None of these.

5. If the function $f(x)$ increases in the interval (a, b) then the function $\phi(x) = [f(x)]^2$

(A) Increases in (a, b) (B) Decreases in (a, b)
(C) We cannot say that $\phi(x)$ increases or decreases in (a, b)
(D) All of these (E) None of these.

6. $\underset{x\to 1}{Lim}\frac{\int_a^x \log t\,dt}{\int_a^x \cos\frac{\pi}{2t}dt}$ is equal to

(A) $\pi/2$ (B) 0 (C) $2/\pi$ (D) Does not exist (E) All of these.

7. The value of $f(x)$, so that the function $f(x) = \frac{\sqrt{a^2-ax+x^2}-\sqrt{a^2+ax+x^2}}{\sqrt{a+x}-\sqrt{a-x}}$ becomes continuous for all x, is given by

(A) $a^{3/2}$ (B) $a^{1/2}$ (C) $-a^{1/2}$ (D) $-a^{3/2}$ (E) None of these.

8. The function $f(x) = \begin{cases} |x-3| & , \ x \geq 1 \\ \left(\frac{x^2}{4}\right)-\left(\frac{3x}{2}\right)+\left(\frac{13}{4}\right) & , \ x < 1 \end{cases}$ is :

(A) Continuous at $x = 1$ (B) Not differentiable at $x = 1$
(C) Not continuous at $x = 3$ (D) Differentiable in (– 1, 1) (E) None of these.

9. The functions defined by $f(x) = \max\{x^2, (x-1)^2, 2x(1-x)\}$, $0 \leq x \leq 1$

(A) Is differentiable for all x (B) Is differentiable for all x except at one point
(C) Is differentiable for all x except at two points
(D) Is not differentiable at more than two points
(E) Is not differentiable at more than two points.

LOGICAL & ANALYTICAL REASONING

10. In a group of persons working in a software company, 6 persons can operate on DOS, 15 can operate on windows operating system and 6 can operate on Linux. In that group none can operate on any other operating system. If 2 persons in the group can work on two operating systems and one person can work on all the three, then how many persons are there in the group?

(A) 21 (B) 22 (C) 23 (D) 24 (E) None of these.

11. Four persons Alok, Bhupesh, Chandu and Dinesh have a total of Rs. 100 among themselves. Alok and Bhupesh between them have as much money as Chandu and Dinesh between them but Alok has more money than Bhupesh, and Chandu has only half the money that Dinesh has. Alok has in fact Rs. 5 more than Dinesh. Who has the most money?

(A) Alok (B) Bhupesh (C) Chandu (D) Dinesh (E) None of thse.

12. The letters *L, M, N, O, P, Q, R, S* and *T* in their order are substituted by nine integers 1 to 9 but not in that order. 4 is assigned to *P*. The difference between *P* and *T* is 5. The difference between *N* and *T* is 3. What is the integer assigned to *N* ?

(A) 7 (B) 5 (C) 4 (D) 6 (E) None of these.

13. Which one of the following four logical diagrams represents correctly the relationship between musicians, instrumentalists and violinists?

(A)  (B)  (C)  (D)  (E) None of these.

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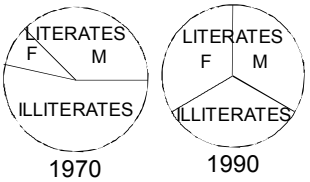
14. The given pie charts show the proportion of literates and illiterates in a country, in the years 1970 and 1990, and also the proportion of males (M) and females (F) among the literates. Which one of the following statements can be said to be beyond any doubt?



(A) In 1970 half of the illiterates were women (females)
(B) The proportion of literate males to the total population of males remained the same over the years
(C) The ratio of male literates to female literates did not improve significantly over this period
(D) Male literacy did not improve over this period (E) None of the above.

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15. Six roads lead to a country. They may be indicated by letters *X*, *Y*, *Z* and digits 1, 2, 3. When there is storm, *Y* is blocked. When there are floods *X*, 1 and 2 will be affected. When road 1 is blocked, *Z* also is blocked. At a time when there are floods and a storm also blows, which road(s) can be used ?

(A) *Z* and 2 (B) Only *Z* (C) Only 3 (D) Only *Y* (E) None of these.

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16. Two important characteristics of a hypothesis are that it should be testable and that it should be stated in a manner that it can be refuted. Which one of the following hypothesis, fulfills these characteristics?

(A) Intelligent persons have good memory (B) Some birds are animals
(C) Some businessmen are dishonest (D) All men are mortal
(E) None of the above.

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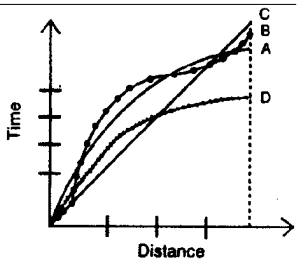
17. Distance-time graph in respect of a race among four persons is shown in the given figure. Consider the following statements in this regard:



1. '*A*' stood first in the race. 2. '*C*' led all the way.
3. '*D*' ran faster than others in the later part of the race.

Of these statements,

(A) 1 and 3 are false and 2 is true (B) 1 and 2 are false and 3 is true
(C) 1 and 3 are true and 2 is false (D) 1 is true and 2 and 3 are false
(E) None of the above.

COMPUTERS & INFORMATION TECHNOLOGY

18. Which of the following statements about C++ are true

Statement 1 : C++ was developed by Bjarne Stroustrup in early 1980s
Statement 2 : C++ provides following tokens (smallest individual unit in program) : keywords, identifiers, literals, punctuator, operators
Statement 3 : C++ allows following literals: integer-constant (Decimal, Octal, Hexadecimal), character-constant, floating-constant, string-literal
Statement 4 : C++ provides two types of data types: fundamental and derived data types.
Which of the above statements are true ?

(A) 1 and 2 only (B) 1 only (C) 1, 3 and 4 only (D) All except 3 (E) All of these.

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19. Match the following

	Properties	**Network**
	(1) A total data rate of at least several Mbps	(A) LAN
	(2) Span entire countries	(B) WAN
	(3) Very low error rates	
	(4) Owned by multiple organization	

(A) 1A, 2B, 3A, 4B (B) 1A, 2B, 3B, 4A
(C) 1B, 2B, 3A, 4A (D) 1A, 2A, 3B, 4B (E) All of these.

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20. **Assertion (A) :** Antivirus programs protect a computer from computer virus.
Reason (R) : These programs work by examining all the files on a disk, looking for the tell-tale 'signatures' of virus code

(A) A is true but R is false (B) Both A and R are true but R is not the correct reason of A
(C) A and R are true and R is the correct explanation of A
(D) A is false but R is true (E) None of these.

ANSWER KEY

1.	(A)	2.	(E)	3.	(B)	4.	(E)	5.	(C)	6.	(C)	7.	(C)	8.	(A)	9.	(C)	10.	(B)
11.	(A)	12.	(D)	13.	(A)	14.	(D)	15.	(C)	16.	(A)	17.	(B)	18.	(E)	19.	(A)	20.	(B)