# ISI Type-A Mock Test

| Circle the correct option. Correct Answer = 4 marks, Leave Blank = 1, Wrong Answer = 0 |
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1. Consider a cube of 1 unit side each. The least distance to be covered by an ant from $(0,0,0)$ to $(1,1,1)$ is A. $\sqrt{6}$ B. $\sqrt{5}$ C. $2\sqrt{3}$ D. $1+\sqrt{3}$
2. The sum of the series $\sum_{k=1}^{n}\left(k^2+3k+1\right)k!$ is A. $(n+1)!$ B. $(n+2)!-1$ C. $n(n+1)!$ D. None of these
3. Sum of all the factors of 30030 is; A. 96768 B. 32256 C. 30030 D. None of these.
4. In $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}=1$, the number of integral solutions where all of $a,b,c$ and $d$ are odd is;
A. 0 B. 4 C. 6 D. 8
5. The equations $x^3+2x^2+2x+1=0$ and $x^{2020}+x^{2019}+1=0$ have; A. No B. Exactly 1 C. Exactly 2 D. More than 2 common roots.
6. Locus of the points for which $z^2=2\bar{z}^2$ is a; A. straight line B. circle C. hyperbola D. point
7. $f(x)=\min\{|x-1|,|x-2|,...|x-n|\}$. Then $\int_0^{n+1} f(x)dx$ is;
A. $(n+2)/4$ B. $(n+3)/4$ C. $(n+4)/4$ D. $(n+2)/2$
8. $a_n=(1+\frac{2}{n!})^n$. Then the limit of the sequence as $n\to\infty$ is;
A. 0 B. 1 C. $e$ D. Does not exist.
9. The least number for which last digit is 7 and it becomes 5 times larger when last digit is carried to the beginning of the number.
A. 14287 B. 12857 C. 142857 D. 124857
10. The largest three digit prime factor of (2000 choose 1000) is; A. 657 B. 661 C. 667 D. 671
11. If $a_0,a_1,\ldots$ are the coefficients of the polynomial $(1+x+x^2)^{25}$, in increasing powers of $x$, then the sum $a_0+a_2+\ldots+a_{50}$ is equal to; A. multiple of 25 B. multiple of 3 C. odd D. even
12. Which of the following functions is differentiable at $x=0$?
A. $\cos(|x|)+|x|$ B. $\cos(|x|)-|x|$ C. $\sin(|x|)+|x|$ D. $\sin(|x|)-|x|$
13. What is the number of non-constant polynomial $P$ such that $xP(x)=(x+\sqrt{2})P(x+\sqrt{3})$? A. $\infty$ B. 6 C. 1 D. 0
14. If $z_1,z_2$ and $z_3$ are vertices of $\triangle ABC$, taken in anti-clockwise direction, and $z_0$ is the circumcentre, then
$$\frac{(z_0-z_1)\sin 2A}{(z_0-z_2)\sin 2B}+\frac{(z_0-z_3)\sin 2C}{(z_0-z_2)\sin 2B}=$$
A. 0 B. 1 C. $(-1)$ D. 2
15. The number of roots to the equation $\sec x=x^2$ is; A. Infinite B. 2 C. 1 D. 1
16. The number of distinct possible marks that a student can get in this grading scheme for 30 questions is; A. 120 B. 118 C. 117 D. 115
17. If two non zero complex numbers $z_1$ and $z_2$ satisfies $z_1\bar{z}_2+\bar{z}_1z_2=0$, then the difference of their amplitude is; A. 0 B. $\pi/4$ C. $\pi/2$ D. $\pi$
18. If $a_1,a_2,\ldots a_{2020}$ are the zeros of the polynomial $x^{2020}-2x^{2019}+5$, then
$$(2-a_1)(2-a_2)\ldots(2-a_{2020})=$$
A. 5 B. $5^{2020}$ C. $3\times5^{2019}+5$ D. $5^{2020}-2^{2020}$
19. Let $S=\{1,2,\ldots 6\}$. Then the number of ordered pair of sets $A$ and $B$ such that $A\cap B=\phi$ and $A,B\subseteq S$ is;
A. 63 B. 126 C. 242 D. 728
20. The value of $\cos^{-1}\left(\cos\left(2\cot^{-1}\left(\sqrt{2}-1\right)\right)\right)$ is; A. $\sqrt{2}-1$ B. $\pi/4$ C. $\pi/2$ D. $3\pi/4$