ISI Type-A Mock Test

Circle the correct option. Correct Answer = 4 marks, Leave Blank = 1, Wrong Answer = 0

Name:
Date:

1. If $\sqrt{3}+1$ is a root of the equation $3x^3+ax^2+bx+12=0$, where a and b are rational numbers, then b is equal to
   A. -6 B. 2 C. 6 D. 10

2. If $x=\log_e\left(\frac{1}{\sqrt{\tan 15^\circ}}\right)$, then
$$\frac{\sum_{n=0}^{\infty} e^{-2nx}}{\sum_{n=0}^{\infty}(-1)^n e^{-2nx}} =$$
   A. $\sqrt{3}$ B. $\frac{1}{\sqrt{3}}$ C. $\frac{\sqrt{3}+1}{\sqrt{3}-1}$ D. $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

3. Let S be the set of all complex numbers of the form $\frac{z+1}{z-3}$, where z varies over the set of all complex numbers with $|z|=1$. Then S is;
   A. a straight line B. a circle of radius 0.5 C. a circle of radius 0.25 D. an ellipse with axes 0.5 and 0.25

4.
$$\sum_{0\le i<j\le n}(-1)^{i-j+1}\binom{n}{i}\binom{n}{j} =$$
   A. $\binom{2n-1}{n}$ B. $\binom{2n}{n}$ C. $\binom{2n+1}{n}$ D. None of the above.

5. Let S_1 be a square of unit area. A circle C_1 is inscribed in S_1, a square S_2 is inscribed in C_1 and so on. Let a_n denote the sum of the areas of the circles $C_1, C_2, \dots C_n$, then $\lim_{n\to\infty} a_n =$
   A. $\frac{\pi}{2}$ B. $\frac{\pi}{3}$ C. $\frac{\pi}{4}$ D. $\frac{\pi}{\sqrt{2}}$

6. Let x is a cube root of unity. Then, the number of distinct possible values of the expression $(1+x+x^2+\cdots+x^m)^n$ where m,n are positive integers is;
   A. 4 B. 5 C. 7 D. ∞

7. Let $f,g:\mathbb{R}\to\mathbb{R}$ be two continuous function such that they do not intersect. The graph of which function must lie on one side of the x-axis? A. f B. $f+g$ C. $f-g$ D. fg

8. The number of real zeros of the polynomial $P(x)=(x-1)(x-2)\dots(x-2019)+2019!$ is;
   A. 0 B. 1 C. 1009 D. 2019

9. There are 2019 person in a party. Each of them has made exactly 5 handshakes with each other. How many handshakes took place in the party? A. $\binom{2019}{3}\times 3$ B. $2019!^3$ C. $3!^{2019}$ D. None of these.

10. Let z be a five digit number of the form $x679y$ which is divisible by 72. Then, the number $z/72$ lies in the range of;
    A. $[200,350]$ B. $[400,450]$ C. $[500,550]$ D. $[600,650]$

11. Let $f:\mathbb{R}\to\mathbb{R}$ be a twice differentiable function such that; $f(0)=2, f'(0)=3, f"(x)=f(x)$. Then $f(4)=$
    A. $\frac{5(e^8+1)}{e^4}$ B. $\frac{5e^8-1}{2e^4}$ C. $\frac{2e^4}{5(e^8-1)}$ D. None of these.

12.
$$\lim_{n\to\infty}\left(\frac{n!}{(2019n)^n}\right)^{1/n} =$$
    A. $\frac{1}{2019e}$ B. $\frac{2019}{e}$ C. $\frac{e}{2019}$ D. $2019e$

13. What is the last two digits of 81^{2897}? A. 31. B. 41. C. 51. D. 61.

14. Consider all 2×2 matrices with entries from only one digit positive integers. The sum of determinants of all these matrices is equal to;
    A. 0 B. 1 C. odd number except 1. D. 9!.

15. Suppose we have x_1 lines on the plane parallel in one direction, x_2 lines parallel in another direction, $\dots x_{10}$ lines parallel in another direction. If $x_i=i \quad \forall i=1,2,\dots 10$, then the maximum possible number of intersections of these lines i;
    A. 1200 B. 1260 C. 1320 D. 1380