ISI Type-A Mock Test

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

Name:
Date:

1. In $\triangle ABC$, the angle $\angle C = \frac{\pi}{2}$. If r is the inradius and R is the circumradius, then $2(r+R) =?$
   A. $(a+b)$ B. $(a+c)$ C. $(b+c)$ D. $(a+b+c)$
2. The number of integral values for which $7\cos x + 5\sin x = 2k+1$ has a solution is; A. 4 B. 8 C. 10 D. 12
3. If a complex number z be such that $|z^2-1| = |z|^2+1$, then the locus of z is; A. A circle B. An ellipse C. Real axis D. Imaginary axis
4. If z is a 2019-th root of unity, then the limit $\lim_{n\to\infty}(z+z^2+\ldots z^{2017}-z^{2018})^n/3^n$ is; A. Does not exist B. 0 C. 1 D. (-1)
5. If $f(x)$ be a real valued function such that $|f(x)-f(y)| < 2^{-2019}(x-y)$ for any $x, y \in \mathbb{R}$ and if $f(0) = 2^{2019}$, then $f(1) =?$; A. 0 B. 1 C. 2^{2019} D. (-2^{2019})
6. If the polynomial $a_n x^n + a_{n-1}x^{(n-1)} + \cdots + a_1 x + a_0$ has only a single positive root α, with $a_1 \neq 0$, then the polynomial $na_n x^{(n-1)} + (n-1)a_{n-2}x^{(n-2)} + \cdots + a_1$ has a positive root; A. greater than or equal to α B. equal to α C. less than or equal to α D. None of these.
7. The following function;
$$f(x) = \begin{cases} x\exp\left[-\left(\frac{1}{x}+\log\left(\frac{1}{|x|}\right)\right)\right] & \text{if } x \neq 0 \\ 0 \text{if } x = 0 \end{cases}$$
   A. is discontinuous at $x = 0$
   B. is continuous but not differentiable $x = 0$
   C. is differentiable at $x = 0$ but not infinitely many times.
   D. is differentiable infinitely many times at $x = 0$.
8. The value of the integral $\int_0^1 x^2(1-x)^n dx =?$ A. $2/n$ B. $2/(n+1)$ C. $2/(n+2)$ D. $2/(n+3)$
9. The series $\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}+\ldots$ is equal to; A. $(e^2-1)/2$ B. $(e-1)^2/2e$ C. $(e^2-1)/2e$ D. $(e^2-2)/e$
10. If x, y, z are the p, q and r-th term of an arithmetic progression respectively, then the value of $x^{(y-z)}y^{(z-x)}z^{(x-y)}$ is; A. xyz B. 0 C. $(p+q+r)$ D. None of these.
11. A rectangle is constructed of length $(2m-1)$ and breadth $(2n-1)$ units respectively. The rectangle is divided into small unit rectangular grids by drawing parallel lines to its sides. The total number of rectangles having odd side lengths which can be inscribed within the large rectangle is; A. m^2-n^2 B. $mn(m+1)(n+1)$ C. $4^{(m+n-2)}$ D. m^2n^2
12. The maximum number of regions in which 10 circles can divide a plane is; A. 1024 B. 512 C. 92 D. None of these.
13. Let x_n be a sequence in $(0,1)$. Suppose, $4x_n(1-4x_{n+1}) > 1$ for all $n \in \mathbb{R}$, then; A. The limit x_n does not exist. B. $\lim_{n\to\infty} x_n = 0.5$ C. $\lim_{n\to\infty} x_n = 1$ D. $\lim_{n\to\infty}$ may not exist depending on x_1 and x_2.
14. A point (x, y) in the plane satisfying the equation $x^2 + 2x\sin(xy) + 1 = 0$ lie on; A. A pair of straight lines B. A family of hyperbolas C. A parabola D. An ellipse
15. Two ants are both standing on the origin of the number line, and both have to go right or left by one unit in each step,, irrespective of the other. Then in how many ways can they travel along the number line such that after n steps, they are standing at the same point? A. 2^n B. $\binom{n}{2}$ C. $\binom{2n}{n}$ D. 4^n

This is easier than previous tests. All the best!