Jee 2022 shift-1 16-30

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I. Section - A

1) The area of the region $(x, y) : |x-1| \leq y \leq \sqrt{5-x^2}$ is equal to:
   a) $\frac{5}{2}\sin^{-1}(\frac{3}{5}) - \frac{1}{2}$
   b) $\frac{5\pi}{4} - \frac{3}{2}$
   c) $\frac{3\pi}{4} + \frac{3}{2}$
   d) $\frac{5\pi}{4} - \frac{1}{2}$
2) Let the focal chord of the parabola P : $y^2 = 4x$ along the line L : $y = mx + c, m > 0$ meet the parabola at the points M and N. Let the line L be the tangent to the hyperbola H : $x^2 + y^2 = 4$. If O is the vertex of P and F is the focus of H on the positive x-axis, then the area of the quadrilateral OMFN is :
   a) $2\sqrt{6}$
   b) $2\sqrt{14}$
   c) $4\sqrt{6}$
   d) $4\sqrt{14}$
3) The number of points, where the function $f : R \to R, f(x) = |x-1|cos|x-2|sin|x-1|+(x-3)\,|x^2-5x+4|$, is NOT differentiable, is :
   a) 1
   b) 2
   c) 3
   d) 4
4) Let S = 1, 2, 3, ...,2022. Then the probability, that a randomly chosen number n from the set S such that HCF$(n, 2022)$ = 1, is :
   a) $\frac{128}{1011}$
   b) $\frac{166}{1011}$
   c) $\frac{127}{1011}$
   d) $\frac{112}{1011}$
5) Let $f(x) = 3^{\left(x^2-2\right)^3+4}, x \in R$. Then which of the following statements are true ?
   P : $x = 0$ is a point of local minima of f
   Q : $x + \sqrt{2}$ is a point of inflection of f
   R : f' is increasing for $x > \sqrt{2}$
   a) Only P and Q
   b) Only P and R
   c) Only Q and R
   d) All P, Q and R

II. Section - B

6) Let $S = \theta \in (0, 2\pi) : 7cos^2\theta - 3sin^2\theta - 2cos^2\theta = 2$. Then the sum of roots of all the equations $x^2 - 2\left(tan^2\theta + cot^2\theta\right)x + 6sin^2\theta = 0\ \theta \in S$, is :

7) Let the mean and the variance of 20 observations $x_1, x_2, ...x_20$ be 15 and 9, respectively. For $\alpha \in R$, if the mean of $(x_1+\alpha)^2, (x_2+\alpha)^2, ...brakx_20+\alpha^2$ is 178, then the square of the maximum value of α is eqal to :
8) let a line with direction ratios a, -4a, -7 be perpendicular to the lines with direction ratios 3, -1, 2b and b, a, -2. If the point of intersection of the line $\frac{x+1}{a^2+b^2} = \frac{y-2}{a^2-b^2} = \frac{z}{1}$ and the plane $x - y + z = 0$ is (α, β, γ), then $\alpha + \beta + \gamma$ is equal to
9) Let $a_1, a_2, a_3, ...$ be an A.P. If $\sum_{n=1}^{\infty} \frac{a_r}{2^r} = 4$, then $4a_2$ is equal to
10) Let the ratio of the fifth term from the beginning to the fifth term from the end in the binomial expansion of $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$, in the increasing powers of $\frac{1}{\sqrt[4]{3}}$ be $\sqrt[4]{6}$: 1. If the sixth term from the beginning is $\frac{\alpha}{\sqrt[4]{3}}$, then α is equal to
11) Let number of matrices of order 3 * 3, whose entries are either 0 or 1 and the sum of all the entries is a prime number, is
12) Let p and p + 2 be prime numbers and let
$$\Delta = \begin{vmatrix} p! & (p+1)! & (p+2)! \\ (p+1)! & (p+2)! & (p+3)! \\ (p+2)! & (p+3)! & (p+4)! \end{vmatrix}$$
Then the sum of the maximum values of α and β, such that p^α and $(p+2)^\beta$ divide Δ, is
13) If $\frac{1}{2*3*4} + \frac{1}{3*4*5} + \frac{1}{4*5*6} + ... + \frac{1}{100*101*102} = \frac{k}{101}$, then 34 k is equal to
14) Let $S = 4, 6, 9$ and $T = 9, 10, 11, ...1000$. If $A = a_1 + a_2 + ... + a_k : K \in N, a_1, a_2, a_3, ..., a_k \in S$, then the sum of all the elements in the set $T - A$ is equal to
15) Let the mirrir image of a circle $c_1 : x^2 + y^2 - 2x - 6y + \alpha = 0$ in line $y = x + 1$ be $c_2 : 5x^2 + 5y^2 + 10gx + 10fy + 38 = 0$. If r is the radius of the circle c_2, then $\alpha + 6r^2$ is equal to