MATHEMATICS

1. A survey shows that 73% of the persons working in an office like coffes, whereas 65% like tea. If x denotes the percentage of them, who like both coffee and tea, then x cannot be :
(a) 36 (b) 63
(c) 38 (d) 54

2. If the function $f(x)=\begin{cases}k_1(x-\pi)^2-1, & x\le\pi\\ k_2cosx, & x>\pi\end{cases}$ is twice differentiable, then the ordered pair (k_1, k_2) is equal to :
(a) $\left(\frac{1}{2},-1\right)$ (b) $\left(\frac{1}{2},1\right)$
(c) (1, 0) (d) (1, 1)

3. If $3^{2sin2\alpha-1}, 14$ and $3^{4-2sin2\alpha}$ are the first three terms of an A.P. for some α, then the sixth term of this A.P. is
(a) 81 (b) 65
(c) 66 (d) 78

4. If S is the sum of the first 10 terms of the series $tan^{-1}\left(\frac{1}{3}\right)+tan^{-1}\left(\frac{1}{7}\right)+tan^{-1}\left(\frac{1}{13}\right)+tan^{-1}\left(\frac{1}{21}\right)+\ldots$.. then tan(S) is equal to :
(a) $-\frac{6}{5}$ (b) $\frac{5}{11}$
(c) $\frac{5}{6}$ (d) $\frac{10}{11}$

5. If $2^{10}+2^9.3^1+2^8.3^2+\ldots..+2.3^9+3^{10}=3^{10}=S-2^{11}$ then S is equal to
(a) 3^{11} (b) 2.3^{11}
(c) $\frac{3^{11}}{2}+2^{10}$ (d) $3^{11}-2^{12}$

6. If the common tangent to the parabolas, $y^2=4x$ and $x^2=4y$ also touches the circles, $x^2+y^2=c^2$, then c is equal to :
(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{2\sqrt{2}}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

7. If y = y(x) is the solution of the differential equation $\frac{5+e^x}{2+y}\frac{dy}{dx}+e^x=0$ satisfying y(0) = 1, then a value of $y(log_e 13)$ is
(a) –1 (b) 0 (c) 2 (d) 1

8. If $\int(e^{2x}+2e^x-e^{-x}-1)e^{(e^x+e^{-x})}dx=g(x)e^{(e^x+e^{-x})+c}$, where c is a constant of integration, then g(0) is equal to :
(a) 1 (b) e (c) e^2 (d) 2

9. If α is the positive root of the equation, $p(x)=x^2-x-2=0$, then $\lim_{x\to\alpha}\frac{\sqrt{1-\cos(p(x))}}{x+\alpha-4}$ is equal to :
(a) $\frac{3}{2}$ (b) $\frac{3}{\sqrt{2}}$
(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

10. If the co-ordinates of two points A and B are $(\sqrt{7},0)$ and $(-\sqrt{7},0)$ respectively and P is any point on the conic, $9x^2+16y^2=144$, then PA + PB is equal to :
(a) 8 (b) 16 (c) 9 (d) 6

11. The product of the roots of the equation $9x^2-18|x|+5=0$ is :
(a) $\frac{25}{81}$ (b) $\frac{5}{27}$
(c) $\frac{25}{9}$ (d) $\frac{5}{9}$

12. If the volume of a parallelepiped, whose conterminous edges are given by the vectors $\vec{a}=\hat{\imath}+\hat{\jmath}+n\hat{k}$, $\vec{b}=2\hat{\imath}+4\hat{\jmath}-n\hat{k}$ and $\vec{c}=\hat{\imath}+n\hat{\jmath}+3\hat{k}$ ($n\ge 0$), is 158 cu-units, then :
(a) n = 7 (b) n = 9
(c) $\vec{b}.\vec{c}$ = 10 (d) $\vec{a}.\vec{c}$ = 17

13. If the point P on the curve, $4x^2+5y^2=20$ is farthest from the point Q(0, –4) then PQ^2 is equal to :
(a) 29 (b) 48
(c) 21 (d) 36

14. If (a, b, c) is the image of the point (1, 2, –3) in the line, $\frac{x+1}{2}-\frac{y-3}{-2}=\frac{z}{-1}$, then a + b + c is equal to :
(a) 3 (b) –1 (c) 2 (d) 1

15. If the four complex numbers z, $\bar{z}$, $\bar{z}-2Re(\bar{z})$ and z – 2Re(z) represent the vertices of a square of side 4 units in the Argand plane, then |z| is equal to :
(a) 4 (b) 2
(c) $4\sqrt{2}$ (d) $2\sqrt{2}$

16. If the minimum and the maximum values of the function $f:\left[\frac{\pi}{4},\frac{\pi}{2}\right]\to$ R, defined by
$f(\theta)=\begin{vmatrix}-sin^2\theta & -1-sin^2\theta & 1\\ -cos^2\theta & -1-cos^2\theta & 1\\ 12 & 10 & -2\end{vmatrix}$ are m and M respectively, then the ordered pair (m, M) is equal to :
(a) (–4, 4) (b) $(0, 2\sqrt{2})$
(c) (–4, 0) (d) (0, 4)

17. The negation of the Boolean expression $x\leftrightarrow\sim y$ is equivalent to :
(a) $(\sim x\wedge y)\vee(\sim x\wedge\sim y)$ (b) $(x\wedge y)\vee(\sim x\wedge\sim y)$
(c) $(x\wedge\sim y)\vee(\sim x\wedge y)$ (d) $(x\wedge y)\wedge(\sim x\vee\sim y)$

18. Let $\lambda\in R$. The system of linear equations
$2x_1-4x_2+\lambda x_3=1$
$x_1-6x_2+x_3=2$
$\lambda x_1-10x_2+4x_3=3$
In inconsistent for :
(a) every value of λ
(b) exactly two values of λ
(c) exactly one positive value of λ
(d) exactly, one negative value of λ

19. The mean and variance of 7 observations are 8 and 16, respectively. If five observation are 2, 4, 10, 12, 14 then the absolute difference of the remaining two observations is
(a) 1 (b) 2 (c) 3 (d) 4

20. The value of $\int_{-\pi/2}^{\pi/2}\frac{1}{1+e^{\sin x}}dx$ is :
(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{2}$ (d) π

21. The number of words, with or without meaning, that can be formed by taking 4 letters at a time from the letters of the word 'SYLLABUS' such that two letters are distinct and two letters are alike, is _____

22. The natural number m, for which the coefficient of x in the binomial expansion of $\left(x^m + \frac{1}{x^2}\right)^{22}$ is 1540, is ________

23. If the line, 2x – y + 3 = 0 is at a distance $\frac{1}{\sqrt{5}}$ and $\frac{2}{\sqrt{5}}$ from the lines 4x – 2y + α = 0 and 6x – 3y + β = 0, respectively, then the sum of al possible values of α and β is _______

24. Let $f(x) = x.\left[\frac{x}{2}\right]$, for –10 < x < 10, where [t] denotes the greatest integer function. Then the number of points of discontinuity of f is equal to _______

25. Four fair dice are thrown independently 27 times. Then the expected number of times at least two dice show up a three or a five, is _________

ANSWER

1. (a)	**2.** (b)	**3.** (c)	**4.** (c)	**5.** (a)	**6.** (a)	**7.** (a)	**8.** (d)	**9.** (b)	**10.** (a)
11. (a)	**12.** (c)	**13.** (d)	**14.** (c)	**15.** (d)	**16.** (c)	**17.** (b)	**18.** (d)	**19.** (b)	**20.** (b)
21. (240.00)	**22.** (13.00)	**23.** (30.00)	**24.** (08.00)	**25.** (11.00)					