CBT - 02

1. given : $f(x)=\begin{cases} x, & 0\le x<\frac{1}{2} \\ \frac{1}{2}, & x=\frac{1}{2} \\ 1-x, & \frac{1}{2}<x\le 1 \end{cases}$ and

$g(x)=\left(x-\frac{1}{2}\right)^2,\ x\in R.$

Then the area (in sq.units) of the region bounded by the curves, y = f(x) and y = g(x) between the lines, 2x = 1 and 2x = $\sqrt{3}$, is :

(a) $\frac{1}{2}-\frac{\sqrt{3}}{4}$ (b) $\frac{1}{3}+\frac{\sqrt{3}}{4}$

(c) $\frac{1}{2}+\frac{\sqrt{3}}{4}$ (d) $4\frac{\sqrt{3}}{4}-\frac{1}{3}$

2. A random variable X has the following probability distribution:

X :	1	2	3	4	5
P(x) :	K^2	2k	K	2K	$5K^2$

Then P(x > 2) is equal to :

(a) $\frac{23}{36}$ (b) $\frac{7}{12}$ (c) $\frac{1}{36}$ (d) $\frac{1}{6}$

3. If z be a complex number satisfying |Re(z)| + |Im(z)| = 4, then |z| cannot be:

(a) $\sqrt{10}$ (b) $\sqrt{8}$ (c) $\sqrt{7}$ (d) $\frac{\sqrt{17}}{2}$

4. Let a, b$\in$R, a $\neq 0$ be such that the equation, $ax^2 - 2bx + 5 = 0$ has a repeated root α, which is also a root of the equation, $x^2 - 2bx - 10 = 0$. If β is the other root of this equation, then $\alpha^2 + \beta^2$ is equal to:

(a) 25 (b) 26 (c) 24 (d) 28

5. If p $\rightarrow$(p$\wedge$ ~ q) is false, then the truth values of p and q are respectively:

(a) F, F (b) F, T (c) T, F (d) T, T

6. If $\frac{dy}{dx}=\frac{xy}{x^2+y^2}$;y(1)=1; then a value of x satisfying y(x) = e is :

(a) $\sqrt{3}e$ (b) $\frac{e}{\sqrt{2}}$ (c) $\sqrt{2}e$ (d) $\frac{1}{2}\sqrt{3}\,e$

7. The length of the minor axis (along y-axis) of an ellipse in the standard form is $\frac{4}{\sqrt{3}}$. If this ellipse touches the line, x + 6y = 8; then its eccentricity is :

(a) $\frac{1}{3}\sqrt{\frac{11}{3}}$ (b) $\sqrt{\frac{5}{6}}$

(c) $\frac{1}{2}\sqrt{\frac{11}{3}}$ (d) $\frac{1}{2}\sqrt{\frac{5}{3}}$

8. If x = 2sinθ – sin2θ and y = 2cosθ – cos2θ, θ∈[0, 2π], then $\frac{d^2y}{dx^2}$ at $\theta=\pi$ is

(a) $-\frac{3}{8}$ (b) $\frac{3}{8}$

(c) $\frac{3}{4}$ (d) $-\frac{3}{4}$

9. Let a function f : [0, 5] $\rightarrow$R be continuous, f(1) = 3 and F be defined as :

$f(x)=\int_1^x t^2 g(t)\,dt$,where $g(t)=\int_1^t t(u)\,du$. Then for the function F, the point x = 1 is :

(1) a point of local minima

(2) a point of local maxima.

(3) not a critical point

(4) a point of inflection.

10. Let a – 2b + c = 1,

If $f(x)=\begin{vmatrix} x+a & x+2 & x+1 \\ x+b & x+3 & x+2 \\ x+c & x+4 & x+3 \end{vmatrix}$, then :

(a) f(–50)= –1 (b) f(50) =1

(c) f(50) = –501 (d) f(–50) = 501

11. If one end of a focal chord AB of the parabola $y^2 = 8x$ is at $A\left(\frac{1}{2},-2\right)$, then the equation of the tangent to it at B is :

(a) x –2y + 8 = 0 (b) x + 2y + 8 = 0

(c) 2x – y – 24 = 0 (d) 2x + y – 24 = 0

12. Let [t] denote the greatest integer ≤ t and A $\lim_{x\to 0} x\left[\frac{4}{x}\right] = A$. Then the function, f(x) = $[x^2]$ sin(πx) is discontinuous, when x is equal to :

(a) $\sqrt{A}$ (b) $\sqrt{A+1}$
(c) $\sqrt{A+5}$ (d) $\sqrt{A+21}$

13. Let a_n be the nth term of a G.P. of positive terms. If $\sum_{n=1}^{100} a_{2n+1} = 200$ and $\sum_{n=1}^{100} a_{2n} = 100$, then $\sum_{n=1}^{200} a_n$ is equal to :

(a) 175 (b) 150
(c) 300 (d) 225

14. If 10 different balls are to be placed in 4 distinct boxes at random, then the probability that two of these boxes contain exactly 2 and 3 balls is :

(a) $\frac{16065}{2^{15}}$ (b) $\frac{16065}{2^{10}}$
(c) $\frac{945}{2^{10}}$ (d) $\frac{945}{2^{11}}$

15. Let f and g be differentiable functions on R such that fog is the identity function. If for some a, b∈R, g'(a)=5 and g(a) = b, then f'(b) is equal to :

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$
(c) 1 (d) 5

16. If $x = \sum_{n=0}^{\infty} (-1)^n \tan^{2n}\theta$ and $y = \sum_{n=0}^{\infty} \cos^{2n}\theta$, for $0 \le \theta < \frac{\pi}{4}$, then

(a) y(1–x) = 1 (b) y(1+x) = 1
(c) x(1+y) = 1 (d) x(1–y) = 1

17. In the expansion of $\left(\frac{x}{\cos\theta} + \frac{1}{x\sin\theta}\right)^{16}$, if l_1 is the least value of the term independent of x when $\frac{\pi}{8} \le \theta \le \frac{\pi}{4}$ and l_2 is the least value of the term independent of x when $\frac{\pi}{16} \le \theta \le \frac{\pi}{8}$, then the ratio $l_2 : l_1$ is equal to :

(a) 1 : 8 (b) 1 : 16
(c) 8 : 1 (d) 16 : 1

18. I $\int \frac{d\theta}{\cos^2\theta(\tan 2\theta + \sec 2\theta)} = \lambda \tan\theta + 2\log_e |f(\theta)| + C$ where c is a constant of integration, then the ordered pair (λ, f(θ)) is equal to :

(a) (1,1 + tanθ) (2) (–1,1 – tanθ)
(c) (–1,1 + tanθ) (4) (1,1 – tanθ)

19. If A = {x∈R : |x| < 2} and B = {x∈R : |x–2| ≥ 3} ; then :

(a) A – B = [–1, 2) (b) A ∪B = R – (2, 5)
(c) B – A = R –(–2, 5) (d) A ∩ B = (– 2, –1)

20. The following system of linear equations

7x + 6y –2z = 0
3x + 4y +2z = 0
x – 2y – 6z = 0, has

(1) infinitely many solution, (x, y, z) satisfying y = 2z
(2) infinitely many solution, (x, y, z) satisfying x = 2z
(3) Only the trivial solution.
(4) no solution.

21. The number of terms common the two A.P.'s 3, 7, 11, ….., 407 and 2, 9, 16, ….,709 is _________

(a)11 (b) 13 (c)12 (d) 14

22. If the distance between the plane, 23x –10y –2z +48 = 0 and the plane containing the lines $\frac{x+1}{2} = \frac{y-3}{4} = \frac{z+1}{3}$ and $\frac{x+3}{2} = \frac{y+2}{6} = \frac{z-1}{\lambda} (\lambda \in R)$ is equal to $\frac{k}{\sqrt{633}}$, then k is equal to ___________

(a)2 (b) 3 (c)4 (d)5

23. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors such that, $|\vec{a}| = \sqrt{3}, |\vec{b}| = 5, \vec{b}\cdot\vec{c} = 10$ and angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{3}$. If $\vec{a}$ is perpendicular to the vector $\vec{b}\times\vec{c}$, then $\left|\vec{a}\times(\vec{b}\times\vec{c})\right|$ is equal to ________

(a)27 (b)28 (c)29 (d) 30

24. If the curves, $x^2 - 6x + y^2 + 8 = 0$ and $x^2 - 8y + y^2 + 16 - k = 0$, (k > 0) touch each other at a point, then the largest value of k is ________

(a) 36 (b)34 (c)35 (d)32

25. If $C_r = {}^{25}C_r$ and $C_0 + 5.C_1 + 9.C_2 + ….. + (101).C_{25} = 2^{25}$.k, then k is equal to ____

(a)50 (b) 51 (c)49 (d) 48

ANSWER KEY (CBT - 02)

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

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