🌼 CBSE CLASS XII MATHEMATICS - 2004

Instructions

1. **All** questions are compulsory .

2. The question paper consists of 29 questions into three sections A,B and C. Section A comprises of 10 questions of one mark each, Section B comprises of 12 questions of four marks each and Section C comprises of 7 questions of six marks each.

3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

4. There is no overall choice . However, internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

5. Use of calculator is not permitted.

SECTION -A

1. Does the following table represent a probability distribution ?

X	-1	0	1
P(X)	1/3	1/2	1/ 6

Answer: Yes

2. The total cost $C(x)$ in rupees associated with the production of x units of an item is given by $C(x) = 0.007x^3 - 0.003x^2 + 15x + 4000$. Find the marginal cost when 17 units are produced.

Answer:$= Rs20.967.$

3. Evaluate : $\int (x^2 + 5)^3 dx$

Answer:$\dfrac{x^7}{7} + 3x^5 + 25x^3 + 125x + C$

4. Prove that the function $f(x) = x^n$ is continuous at x = n, where n is a positive integer.

5. Find equation of line joining (1, 2) and (3, 6) using determinants.

Answer: $y = 2x$

6. Form a differential equation representing the given family of curves by eliminating arbitrary constants a and $b.$ $\dfrac{x}{a} + \dfrac{y}{b} = 1$

Answer:$y'' = 0$

7. .Evaluate : $\displaystyle\int_0^1 \dfrac{\tan^{-1}x}{1+x^2}dx$

Answer: $\dfrac{\pi^2}{32}$

8. If a matrix has 18 elements, what are the possible orders it can have? What, if it has 5 elements?

Answer:6, 2

9. If a line has direction ratios $-18, 12, -4$ then what are its direction cosines ?

Answer:$< -\dfrac{9}{11}, \dfrac{6}{11}, \dfrac{-2}{11} >$

10. Consider two points P and Q with position vectors $\overrightarrow{OP} = 3\vec{a} - 2\vec{b}$ and $\overrightarrow{OQ} = \vec{a} + \vec{b}$. Find the position vector of a point R which divides the line joining P and Q in the ratio $2 : 1$ internally,

Answer:$\dfrac{5\vec{a}}{3}$

$$\boxed{\text{SECTION -B}}$$

11. Show that the area of parallelogram having diagonals $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$ is $5\sqrt{3}$ sq. units.

12. . Prove that the equation of the plane making intercepts a, b and c on the coordinate axes is of the form $\dfrac{x}{a} + \dfrac{y}{b} + \dfrac{z}{c} = 1$.

13. If the sum of the mean and variance of a binomial distribution for 5 trials is 1.8, then find the distribution.

Answer:$^2C_r\left(\dfrac{1}{5}\right)^r\left(\dfrac{4}{5}\right)^{5-r}$

14. If $\overrightarrow{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\overrightarrow{b} = \hat{i} - 3\hat{j} - 5\hat{k}$, then show that the vectors $(\overrightarrow{a} + \overrightarrow{b})$ and $(\overrightarrow{a} - \overrightarrow{b})$ are orthogonal.

15. . Evaluate the integral : $\displaystyle\int \sin^4 2x\, dx$

Answer : $\dfrac{3}{8}x - \dfrac{\sin 4x}{8} + \dfrac{\sin 8x}{64} + C$

16. Evaluate the integral : $\displaystyle\int_0^{\frac{\pi}{2}} \dfrac{\cos x}{(1+\sin x)(2+\sin x)}dx$

Answer : $\log \dfrac{4}{3}$

17. Solve the differential equation : $\dfrac{dy}{dx} + y\cot x = 2\cos x$.

Answer:$y\sin x = \dfrac{-\cos 2x}{2} + C$

18. Using properties of determinants, solve for x. $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$

Answer :$x = 0, 3a.$

19. Find the interval in which the function is increasing and decreasing : $f(x) = \dfrac{4x^2 + 1}{x}$.

Answer: $\left(-\infty, \dfrac{-1}{2}\right) \cup \left(\dfrac{1}{2}, \infty\right) \left(\dfrac{-1}{2}, \dfrac{1}{2}\right) - (0)$

20. Find the equations of tangent and the normal to the curve $x = 1 - \cos\theta, y = 6 - \sin\theta$ at $\theta = \dfrac{\pi}{4}$.

Answer: $\left(y - \dfrac{\pi}{4} + \dfrac{1}{\sqrt{2}}\right) = \left(\sqrt{2-1}\right)\left(x - 1 + \dfrac{1}{\sqrt{2}}\right) \left(y - \dfrac{\pi}{4} + \dfrac{1}{\sqrt{2}}\right) = \left(\sqrt{2+1}\right)\left(x - 1 + \dfrac{1}{\sqrt{2}}\right)$

OR

Find the equations of the tangent and the normal to the curve $y = x^2 + 4x + 1$ at the point whose x-coordinate is 3 .

Answer: $x + 10y = 223$

21. Differentiate $\tan^{-1}\left[\dfrac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}}\right]$ w.r.t. x.

Answer : $\dfrac{-1}{2}$

OR

Differentiate following with respect to x. $(x)^{\cos x} + (\sin x)^{\tan x}$

Answer : $x^{\cos x}\left(\dfrac{\cos x}{x} - \sin x \log x\right) + \sin x^{\tan x}(1 + \sec^2 x \log \sin x)$

22. If $A = \begin{bmatrix} 3 & 4 \\ -4 & -3 \end{bmatrix}$, find $f(A)$,if $f(x) = x^2 - 5x + 7$.

Answer: $\begin{bmatrix} -15 & -20 \\ 20 & 15 \end{bmatrix}$

SECTION -C

23. Show that the lines $\dfrac{x-1}{2} = \dfrac{y-2}{3} = \dfrac{z-3}{4}$ and $\dfrac{x-4}{5} = \dfrac{y-1}{2} = z$ intersect. Find the point of intersection.

Answer : $(-1, -1, -1)$

24. An oil company requires 12000, 20,000 and 15,000 barrels of high grade, medium grade and low grade oil respectively. Refinery A produces 100, 300 and 200 barrels per day of high, medium and low grade oil respectively whereas B produces 200, 400 and 100 barrels per day respectively. If A costs Rs.400 per day and B costs Rs. 300 per day to operate, then how many days should each be run to minimise the cost of requirement ?

Answer :
Refinery A = 60 days, Refinery B = 30 days

25. Find the area bounded by the circle $x^2 + y^2 = 16$ and the line $y = x$ in the first quadrant.

Answer : 2π sq. units

26. Show that aright circular cylinder, which is open at the top and has a given surface area, will have the greatest volume, if its height is equal to the radius of its base.

27. . There are 3 urns A, B and C. Urn A contains 4 red balls and 3 black balls, urn B contains 5 red balls and 4 black balls. Um C contains 4 red balls and 4 black balls. One ball is drawn Rom each of these ums. What is the probability that the 3 balls drawn consist of 2 red balls and a black ball?

Answer: $\dfrac{17}{42}$

28. Evaluate the integral using limits of sums : $\displaystyle\int_{0}^{2}(x+4)\,dx$

Answer : 10

29. If $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 3 \\ 0 & -2 & 1 \end{bmatrix}$, find A^{-1}. Using A^{-1}, solve the system of linear equations : $x - 2y = 10, 2x + y + 3z = 8, -2y + z = 7.$

Answer : x =4 , y =-3 , z = 1

Our Mathematics E-Books

1. J.E.E. (Join Entrance Exam)
   - ★ Chapter Tests (Full Syllabus- Fully Solved)
   - ★ Twenty Mock Tests (Full Length - Fully Solved)

2. B.I.T.S.A.T. Twenty Mock Tests (Fully Solved)

3. C.BS.E.
   - ★ Work-Book Class XII (Fully Solved)
   - ★ Objective Type Questions Bank C.B.S.E. Class XII (Fully Solved)
   - ★Chapter Test Papers Class XII (Fully Solved)
   - ★ Past Fifteen Years Topicwise Questions (Fully Solved)
   - ★ Sample Papers Class XII (Twenty Papers Fully Solved- includes 2020 solved paper)
   - ★ Sample Papers Class X (Twenty Papers Fully Solved -includes 2020 solved paper)

4. I.C.S.E. & I.S.C.
   - ★Work-Book Class XII (Fully Solved)
   - ★ Chapter Test Papers Class XII (Fully Solved)
   - ★ Sample Papers Class XII (Twenty Papers Fully Solved -includes 2020 solved paper)
   - ★ Sample Papers Class X (Twenty Papers Fully Solved -includes 2020 solved paper)

5. Practice Papers for SAT -I Mathematics (15 Papers - Fully Solved)

6. SAT - II Subject Mathematics (15 Papers - Fully Solved)

USE E-BOOKS & SAVE ENVIRONMENT WWW.MATHSTUDY.IN