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CBSE 12th Mathematics 2007 Unsolved Paper

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TIME - 3HR. | QUESTIONS - 29

THE MARKS ARE MENTIONED ON EACH QUESTION

SECTION - A

Question number 1 to 10 carry 1 mark each.

Q.1. If: *1 mark*

$$\int_0^1 (3x^2 + 2x + k)\, dx = 0, find\ the\ value\ of\ k.$$

Q.2. If A is an invertible matrix of order 3 and $|A| = 5$, then find $|adj. A|$. *1 mark*

Q. 3. What is the principal value of: *1 mark*

$$sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)?$$

Q. 4. Evaluate: *1 mark*

$$\int \frac{\log x}{x}\, dx$$

Q.5. Write the value of: *1 mark*

$$\int \frac{dx}{x^2 + 16}.$$

Q.6. Write the intercept cut off by the plane $2x + y - z = 5$ on $x - axis$. *1 mark*

Q.7. If $\begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}\begin{pmatrix} 1 & -3 \\ -2 & 4 \end{pmatrix} = \begin{pmatrix} -4 & 6 \\ -9 & x \end{pmatrix}$, write the value of x. *1 marks*

Q. 8. Find the projection of the vector $\hat{\imath} + 3\hat{\jmath} + 7\hat{k}$ on the vector $2\hat{\imath} - 3\hat{\jmath} + 6\hat{k}$. *1 marks*

Q.9. write the vector equation of the plane, passing through the point (a, b, c) and

Parallel to the plane $\vec{r} . (\hat{\imath} + \hat{\jmath} + \hat{k}) = 2$. *1 marks*

Q.10. Write the principle value of: *1 mark*

$$cos^{-1}\left(\frac{1}{2}\right) - 2\ sin^{-1}\left(-\frac{1}{2}\right).$$

SECTION- B

Question numbers 11 to 22 carry 4 marks each.

Q. 11. Show that the function f in $A = R - \left\{\frac{2}{3}\right\}$ *4 marks*

Defined as $f(x) = \frac{4x+3}{6x-4}$ is $one - one$ and $onto. hence\ find\ f^{-1}$.

Q.12. How many times must a man toss a fair coin, so that the probability of having at least one head is more than 80%? *4 marks*

Q.13. Find the value of $'a'$ for which the function f defined as: *4 marks*

$$f(x) = \begin{cases} a \sin\dfrac{\pi}{2}(x + 1), & x \leq 0 \\ \dfrac{\tan x - \sin x}{x^3}, & x > 0 \end{cases} \text{ is continuous at } x = 0.$$

Q.14. Using elementary row operations, find the inverse of the following matrix:

$\begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$ *4 marks*

Q.15. Find the particular solution, satisfying the given condition, for the following differential equation: *4 marks*

$$\frac{dy}{dx} - \frac{y}{x} + cosec\left(\frac{y}{x}\right) = 0; y = 0 \text{ when } x = 1.$$

Q.16. Solve the following differential equation: *4 marks*

$$(x^2 - 1)\frac{dy}{dx} + 2xy = \frac{2}{x^2 - 1}.$$

Q.17. Prove that, for any three vectors $\vec{a}, \vec{b}, \vec{c}$. *4 marks*

$$\left[\vec{a} + \vec{b}, \vec{b} + \vec{c}, \vec{c} + \vec{a}\right] = 2\left[\vec{a}, \vec{b}, \vec{c}\right]$$

OR

Vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 3, |\vec{b}| = 5$ and $|\vec{c}| = 7$ find the angle between $\vec{a}$ and $\vec{b}$.

Q. 18. Using properties of determinants, prove the following: *4 marks*

$$\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = (1 - x^3)^2.$$

Q.19. If a, b, c are three vectors such that $|\vec{a}| = 5, |\vec{b}| = 12 \ and \ |\vec{c}| = 13$, and

$\vec{a} + \vec{b} + \vec{c} = \vec{o}$, find the value of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$. *4 marks*

Q. 20. Solve the following differential equation: *4 marks*

$$\cos^2 x \frac{dy}{dx} + y = \tan x.$$

Q.21. Find the particular solution of the differential equation satisfying the given conditions: *4 marks*

$$x^2\, dy + (xy + y^2)dx = 0$$

$$where\ y = 1, when\ x = 1.$$

Q. 22. Find the equation of the tangent to the curve $y = \sqrt{3x - 2}$ which is parallel to the line $4x - 2y + 5 = 0$. *4 marks*

OR

Find the intervals in which the function f given by $f(x) = x^3 + \frac{1}{x^3}, x \neq 0\ is$

$(i)increasing\ (ii)decreasing.$

SECTION – C

Question numbers 23 to 29 carry 6 marks each.

Q.23. Suppose 5% of men and 0.25% of woman have grey hair A grey haired person is selected at random. What is the probability that there are equal number od males and females? *6 marks*

Q.24. Of the students in a collage, it is know that 60% reside in hostel and 40% are day scholars (not residing in hostel). Precious year results report that 30 % of all students who reside in hotel attain 'A' grade and 20 % of day scholars attain 'A' grade in their annual examination At the end of the year, one student is chosen at random from the college and he has an 'A' grade, what is the probability that the student is a hosteller ? *6 marks*

Q.25. Show that the differential equation $2ye^{x/y}\, dx + \left(y - 2x\ e^{\frac{x}{y}}\right) dy = 0$ is homogeneous, find the particular solution of this differential equation, given that $x = 0$ when y = 1 *6 marks*

Q. 26. Find the area of the region in the first quadrant enclosed by the $x - axis$,

The line $y = x$ and the circle $x^2 + y^2 = 32$. *6 marks*

Q.27. If A and B are two independent events such that

$$P(\bar{A} \cap B) = \frac{2}{15} \ and \ P(A \cap \bar{B}) = \frac{1}{6},$$

then find P(A) and P(B). *6 marks*

Q.28. Evaluate: *6 marks*

$$\int_0^\pi \frac{e^{\cos x}}{e\cos^x + e^{-\cos}} dx.$$

OR

Evacuate:

$$\int_0^{\pi/2} (2\ log\ sin\ x - log\ sin\ 2x) dx$$

Q.29. Using properties of determinants, show the following: *6 marks*

$$\begin{vmatrix} (b+c)^2 & ab & ca \\ ab & (a+c)^2 & bc \\ ac & bc & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$$

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