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CBSE 12th Mathematics 2010 Unsolved Paper Outside Delhi

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: $R \rightarrow R$ be defined by $f(x) = (3 - x^3)^{1/3}$, then find of (x) . 1 mark

Q.2. Write the principal value of $\sec^{-1}(-2)$. 1 mark

Q.3. What positive value of x makes the following pair of determinants equal? 1 mark

$$\begin{vmatrix} 2x & 3 \\ 5 & x \end{vmatrix}, \begin{vmatrix} 16 & 3 \\ 5 & 2 \end{vmatrix}$$

Q.4. Evacuate: 1 mark

$$\int \sec^2(7 - 4x) dx$$

Q.5. Write the adjoint of the following matrix: 1 mark

$$\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$$

Q.6. Write the value of the following integral: 1 mark

$$\int_{-\pi/2}^{\pi/2} \sin^5 x dx.$$

Q.7. A is a square matrix of order 3 and $|A|=7$. Write the value of $|\text{adj } A|$. 1 mark

Q.8. Write the distance of the following plane from the origin: 1 mark

$$2x - y - 2z + 1 = 0$$

Q.9. Write a vector of magnitude 9 units in the direction of vector $-2\hat{i} + \hat{j} + \hat{k}$. 1 mark

Q.10. Find λ if

$$(2\hat{i} + 6\hat{j} + 14\hat{k}) \times (\hat{i} - \lambda\hat{j} + 7\hat{k}) = \vec{0}. \text{ 1 mark}$$

SECTION – B

Question numbers 11 to 22 carry 4 marks each.

Q.11. A family has 2 children. Find the probability that both are boys, if it is known that

(i) at least one of the children is a boy,

(ii) the elder child is a boy. 4 marks

Q.12. Show that the relation S in the set $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$ given by

$S = \{(a, b) : a, b \in \mathbb{Z}, |a - b| \text{ is divisible by } 4\}$ is an equivalence relation. Find the set of all elements related to 1. 4 marks

Q.13. Prove the following: 4 marks

$$\tan^{-1}x + \tan^{-1}\left(\frac{2x}{1-x^2}\right) = \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right).$$

OR

Prove the following:

$$\cos [\tan^{-1}\{\sin(\cot^{-1}x)\}] = \sqrt{\frac{1+x^2}{2+x^2}}.$$

Q.14. Express the following matrix as the sum of a symmetric and a skew symmetric matrix, and verify your result: 4 marks

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

Q.15. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 4\hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$, find a vector of magnitude 6 units which is parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$. 4 marks

OR

Let $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$. Find a vector \vec{d} which is perpendicular to both \vec{a} and \vec{b} and $\vec{c} \cdot \vec{d} = 18$.

Q.16. find the points on the line 4 marks

$$\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2} \text{ at a distance of 5 units from the point } P(1, 3, 3).$$

OR

Find the distance of the point P (6, 5, 9) from the plane determined by the point A (3, -1, 2), B (5, 2, 4) and C (-1, -1, 6).

Q.17. Solve the following differential equation: 4 marks

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

OR

Solve the following differential equation:

$$\sqrt{1 + x^2 + y^2 + x^2y^2} + xy \frac{dy}{dx} = 0.$$

$$\therefore \sqrt{1 + y^2} = -\sqrt{1 + x^2} - \frac{1}{2} \log \left| \frac{\sqrt{1 + x^2} - 1}{\sqrt{1 + x^2} + 1} \right| + c.$$

Q.18. Show that the differential equation $(x - y) \frac{dy}{dx} = x + 2y$, is homogeneous and solve it. 4 marks

Q. 19. Evaluate the following: 4 marks

$$\int \frac{x + 2}{\sqrt{(x - 2)(x - 3)}} dx.$$

Q.20. Evaluate the following: 4 marks

$$\int_1^2 \frac{5x^2}{x^2 + 4x + 3} dx.$$

Q. 21. If $y = e^{a \sin^{-1}x}$, $-1 \leq x \leq 1$, then show that 4 marks

$$(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - a^2y = 0$$

Q. 22. IF 4 marks

$$y = \cos^{-1} \left(\frac{3x + 4\sqrt{1 - x^2}}{5} \right), \text{ find } \frac{dy}{dx}.$$

SECTION - C

Question numbers 23 to 29 carry 6 marks each.

Q. 23. Using properties of determinants, prove the following: 6 marks

$$\begin{vmatrix} x & x^2 & 1 + Px^3 \\ y & y^2 & 1 + Py^3 \\ z & z^2 & 1 + Pz^3 \end{vmatrix} \\ = (1 + Pxyz)(x - y)(y - z)(z - x).$$

OR

Find the inverse of the following matrix using elementary operations:

$$A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$$

- Q.24.** A bag contains 7 red, 4 white and 5 black balls. Two balls are drawn at random, from the bag. What is the probability that both the balls are white? *6 marks*
- Q.25.** One kind of cake requires 300 g of flour and 15 g of fat, another kind of cake requires 150 g of flour and 30 g of fat. Find the maximum number of cakes which can be made from 7.5 kg of flour and 600 g of fat, assuming that there is no shortage of the other ingredients used in making the cakes. Make it as an L.P.P. and solve it graphically. *6 marks*
- Q.26.** Find the coordinates of the foot of the perpendicular and the perpendicular distance of the point P (3, 2, 1) from the plane $2x - y + z + 1 = 0$. Find also, the image of the point in the plane. *6 marks*
- Q.27.** Find the area of the circle $4x^2 + 4y^2 = 9$ which is interior to the parabola $x^2 = 4y$. *6 marks*

OR

Using integration, find the area of the triangle ABC, coordinates of whose vertices are A(4, 1) B(6, 6) and C(8, 4).

- Q.28.** If the length of three sides of a trapezium other than the base is 10 cm each, find the area of the trapezium, when it is maximum. *6 marks*
- Q.29.** Find the interval in which the following function $f(x) = 20 - 9x + 6x^2 - x^3$ is
- strictly increasing,
 - strictly decreasing. *6 marks*



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