CBSE 12th Mathematics 2012 Unsolved Paper Outside Delhi

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TIME - 3HR. | QUESTIONS - 29

THE MARKS ARE MENTIONED ON EACH QUESTION

SECTION – A

Question numbers 1 to 10 carry 1 mark each.

Q.1. The binary operation *: R x R → R, is defined as a*b = 2a + b. find (2*3)*4. *1 mark*

Q.2. Find the principle value of *1 mark*

$$tan^{-1}\sqrt{3} - sec^{-1}(-2).$$

Q.3. find the value of *x* + y from the following equation: *1 mark*

$$2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

Q.4. if $A^T \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix} and\ B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}. then\ find\ A^T - B^T.$ *1 mark*

Q.5. Let A be a square matrix of order 3 x 3. Write the value of $|2A|$, where $|A|$=4. *1 mark*

Q.6. Evaluate:

$$\int_0^2 \sqrt{4-x^2}dx.$$

Q.7. Given $\int e^x\ (tan\ x + 1)sec\ x\ dx = e^x\ f(x) + c$

Write *f(x)* satisfying above *1 mark*

Q.8. write the value of $(\hat{i} \times \hat{j}).\hat{k} + \hat{i}.\hat{j}.$ *1 mark*

Q.9. Fine the scalar components of the vector $\overline{AB}$ with initial A (2, 1) and terminal point B (-5, 7). *1 mark*

Q.10. Find the of the plane 3*x* – 4y + 12z = 3 from the origin. *1 mark*

SECTION – B

Question numbers 11 to 22 carry 4 marks each.

Q.11. prove the following: *4 marks*

$$cos\left(sin^{-1}\frac{3}{5} + cot^{-1}\frac{3}{2}\right) = \frac{6}{5\sqrt{13}}$$

Q.12. Using properties of determinates, show that *4 marks*

$$\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$$

Q.13. Show that $f: N \longrightarrow N$**, given by,** *4 marks*

$$f(x) = \begin{cases} x+1, & if \quad x \text{ is odd} \\ x-1, & if \quad x \text{ is even} \end{cases} \text{ is both one} - \text{one and onto.}$$

OR

Consider the binary operations* : R x R ⟶R defined as a * b = $|a-b|$ **and a o b = a for all a, b** ϵ **R. show that '*' is commutative but not associative 'o' is associative but not commutative.**

Q.14. If, *4 marks*

$$x = \sqrt{a^{\sin^{-1}t}}, y = \sqrt{a^{\cos^{-1}t}}, \text{show that} \frac{dy}{dx} = -\frac{y}{x}.$$

OR

Differentiate

$$\tan^{-1}\left[\frac{\sqrt{1+x^2}-1}{x}\right] \text{with respect } x.$$

Q.15. If x **= a (cos** t **+** t **sin** t **) and** *4 marks*

$$y = a\,(\sin t - t\cos t), 0 < t < \frac{\pi}{2}, \text{find}$$
$$\frac{d^2x}{dt^2}, \frac{d^2y}{dt^2} \text{and} \frac{d^2y}{dx^2}.$$

Q.16. A ladder 5 m long is leaning against a wall. The bottom of the ladder is pulled along the ground, away from the wall, at the rate of 2 cm/s. how fast is its height on the wall decreasing when the fool of the ladder is 4 m away from the wall? *4 marks*

Q.17. Evaluate: *4 marks*

$$\int_{-1}^{2} |x^3 - x| dx$$

OR

Evaluate:

$$\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x}\, dx$$

Q.18. From the differential equation of the family of circles in the second quadrant and touching the coordinate axes. *4 marks*

OR

Find the particular solution of the differential equation

$$\frac{x(x^2-1)dy}{dx} = 1; y = 0 \text{ when } x = 2.$$

Q.19. solve the following differential equation: *4 marks*

$$(1+x^2)dy + 2xy\, dx = \cot x\, dx; x \neq 0$$

Q. 20. $Let\ \vec{a} = \hat{\imath} + 4\hat{\jmath} + 2\hat{k}, \vec{b} = 3\hat{\imath} - 2\hat{\jmath} + 7\hat{k}\ and\ \vec{c} = 2\hat{\imath} - \hat{\jmath} + 4\hat{k}.$

Find a vector $\vec{p}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p}.\vec{c} = 18$. *4 marks*

Q. 21. Find the coordinates of the point where the line through the point A (3, 4, 1) and B (5, 1, 6) crosses the XY-plane. *4 marks*

Q. 22. Two cards are drawn simultaneously (without replacement) from a well- shuffled pack of 52 cards. Find the mean and variance of the number of red cards. *4 marks*

SECTION-C

Question numbers 23 to 29 carry 6 marks each.

Q. 23. Using matrices, solve the following system of equation: *6 marks*

$$2x + 3y + 3z = 5, x - 2y + z = -4,$$

$$3x - y - 2z = 3$$

Q. 24. Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of the cone. *6 marks*

OR

An open box with a square base is to be made out of a given quantity of cardboard of area c^2 square units. Show that maximum volume of the box is

$$\frac{c^3}{6\sqrt{3}}\ cubic\ units.$$

Q. 25. Evaluate: *6 marks*

$$\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}}\, dx$$

OR

Evaluate:

$$\int \frac{x^2+1}{(x-1)^2\,(x+3)}\, dx.$$

Q. 26. Find the area of the region *6 marks*

$$\{(x, y): x^2 + y^2 \leq 4, x + y \geq 2\}.$$

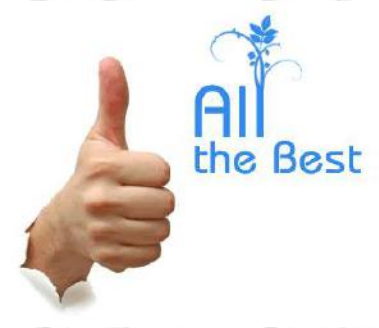
Q. 27. If the line

$$\frac{x-1}{-3} = \frac{y-2}{-2k} = \frac{z-3}{2} \text{ and } \frac{x-1}{k} = \frac{y-2}{1} = \frac{z-3}{5} \text{ are perpendicular,}$$

Find the value of k and hence find the equation of plane containing these lines. *6 marks*

Q. 28. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin 3 times and notes the number of heads. If she gets 1,2,3 or 4 she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1,2,3 or 4 with the die? *6 marks*

Q. 29. A dietician wishes to mix two types of Foods in such a way that the vitamin contents of the mixture contains at least 8 units of vitamin A and 10 units of vitamin C. Food I contains 2 units/kg of vitamin A and 1 unit/kg of vitamin C while Food II contains 1 unit/kg of vitamin A and 2 unit/kg of vitamin C. It costs Rs5 per kg to purchase food I and Rs7 per kg to purchase Food II. Determine the minimum cost of such a mixture. Formulate the above as a LPP and solve it graphically. *6 marks*



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