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CBSE 12th Mathematics 2008 Unsolved Paper Delhi Board

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 $f(x) = x + 7$ **and** $g(x) = x - 7, x \in R$,

find (fog) (7). *1 mark*

Q. 2. Evaluate: *1 mark*

$$\sin\left[\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right]$$

Q. 3. Find the value of x **and** y **if:** *1 mark*

$$2\begin{bmatrix}1 & 3\\ 0 & x\end{bmatrix} + \begin{bmatrix}y & 0\\ 1 & 2\end{bmatrix} = \begin{bmatrix}5 & 6\\ 1 & 8\end{bmatrix}$$

Q. 4. Evaluate: $\begin{vmatrix} a+ib & c+id \\ -c+id & a-ib \end{vmatrix}$ *1 mark*

Q. 5. Find the co-factor of a_{12} **in the following:** *1 mark*

$$\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$$

Q. 6. Evaluate: *1 marks*

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

Q. 7. Evaluate: *1 mark*

$$\int_0^1 \frac{dx}{1+x^2}.$$

Q. 8. Find a unit vector in the direction of $\vec{a} = 3\hat{\imath} - 2\hat{\jmath} + 6\hat{k}$. *1 mark*

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Q. 9. Find the angle between the vectors *1 mark*

$$\vec{a} = \hat{\imath} - \hat{\jmath} + \hat{k} \text{ and } \vec{b} = \hat{\imath} + \hat{\jmath} - \hat{k} .$$

Q. 10. For what value of λ are the vectors $\vec{a} = 2\hat{\imath} + \lambda\hat{\jmath} + \hat{k}$ and $\vec{b} = \hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ Perpendicular to each other? *1 mark*

SECTION-B

Question numbers 11 to 22 carry 4 marks each

Q. 11. (i) Is The binary operation *, defined on set N, given by

$a * b = \frac{a+b}{2}$ **for all** $a, b \in Q$, **commutative?** (ii) **is the above binary operation * associative?** *4 marks*

Q. 12. Prove the following: *4 marks*

$$\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}.$$

Q. 13. $Let\ A = \begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}$ **. Express A as sum of two matrices such that one is symmetric and other is skew symmetric.** *4 marks*

OR

$$IF\ A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}, \quad verify\ that$$

$$A^2 - 4A - 5I = 0.$$

Q. 14. For what value of k is the following function continuous at $x = 2$? *4 marks*

$$f(x) = \begin{cases} 2x + 1 ; & x < 2 \\ k \quad ; & x = 2 \\ 3x - 1 ; & x > 2 \end{cases}$$

Q. 15. Differentiate the following with respect to x : *4 marks*

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

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Q. 16. Find the equation of tangent to the curve *4 marks*

$$x = sin\ 3t, y = cost\ 2t, at\ t = \frac{\pi}{4}.$$

Q. 17. Evaluate: *4 marks*

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

Q. 18. Solve the following differential equation: *4 marks*

$$(x^2 - y^2)dx + 2\ xy\ dy = 0\ given\ that\ y = 1\ when\ x = 1.$$

OR

Solve the following differential equation:

$$\frac{dy}{dx} = \frac{x(2y - x)}{x(2y + x)}, if\ y = 1\ when\ x = 1.$$

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

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

Q. 20. If $\vec{a} = \hat{\imath} + \hat{\jmath} + \hat{k}$ and $\vec{b} = \hat{\jmath} - \hat{k}$, find a vector $\vec{c}$ such that $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a}.\vec{c}$ 3. *4 marks*

OR

If $\vec{a} + \vec{b} + \vec{c} = 0$ and $|\vec{a}| = 3, |\vec{b}| = 5$ and $|\vec{c}| = 7$, show that the angle between $\vec{a}$ and $\vec{b}$ is 60^o.

Q.21. Find the shortest distance between the following lines: *4 marks*

$$\frac{x - 3}{1} = \frac{y - 5}{-2} = \frac{z - 7}{1}\ and \frac{x + 1}{7} = \frac{y + 1}{-6} = \frac{z + 1}{1}.$$

OR

Find the point on the line

$$\frac{x + 2}{3} = \frac{y + 1}{2} = \frac{z - 3}{2}$$

at a distance $3\sqrt{2}$ from the point $(1, 2, 3)$.

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Q.22. A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability distribution of number of successes. *4 marks*

SECTION – C

Question numbers 23 to 29 carry 6 marks each.

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

$$\begin{vmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \beta+\gamma & \gamma+\alpha & \alpha+\beta \end{vmatrix} = (\alpha-\beta)(\gamma-\alpha)(\alpha-\beta-\gamma).$$

Q.24. Show that the rectangle of maximum area that can be inscribed in a circle is a square. *6 marks*

OR

Show that the height of the cylinder of maximum volume that can be inscribed in s cone of height h is $\frac{1}{3}$ h.

Q.25. Using integration find the area of the region bounded by the parabola $y^2 = 4x$ and the circle $4x^2 + 4y^2 = 9$. *6 marks*

Q.26. $Evalute$: *6 marks*

$$\int_{-a}^{a} \sqrt{\frac{a-x}{a+x}}\, dx.$$

Q.27. Find the equation of the plane passing through the point (-1, -1, 2) and perpendicular to each of the following: *6 marks*

$$2x + 3y - 3z = 2 \; and \; 5x - 4y + z = 6.$$

OR

Find the equation of the passing through the points (3, 4, 1) and (0,1,0) and parallel to the line

$$\frac{x+3}{2} = \frac{y-3}{7} = \frac{z-2}{5}.$$

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Q.28. A factory owner purchases two type of machines, A and B for his factory. The requirements and the limitations for the machines are as follows:

Machine	Area Occupied	Labour Force	Daily output (in units)
A	$1000\ m^2$	12 men	60
B	$1200\ m^2$	8 men	40

He has maximum area of $9000\ m^2$ available, and 72 skilled labourer's who can operate both the machine. How many machines of each types should he buy to maximize the daily output? *6 marks*

Q.29. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter, a car and a truck are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter drivers. *6 marks*

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