SAMPLE QUESTION PAPER

MATHEMATIS

CLASS-XII(2014-15)

TYPOLOGY

	VSA(1 M)	LA-I (4 M)	LA-II (6 M)	100
Remembering	2,5	11,15,19	24	20
Understanding	1,4	8,12	23	16
Applications	6	14,18,13	21,26	25
HOTS	3	10,17	20,22	21
Evaluation & MD	-	7,9,16	25	

Blueprint

Unit	**VSA(1 mark)**	**SA(4 marks)**	**LA(6 marks)**	**Total**
1. Relations and Functions.	-	-	1*	6 } 10
Inverse Trigonometric Functions	-	1*	-	4
2. Matrices	-	2* VBQ	-	8 } 13
Determinants	1	1	-	5
3. Continuity and Differentiability	-	3	-	12 } 44
Application Of Derivatives	-	-	1	6
Integrals	-	3*	-	12
Application Of Integrals	-	-	1	6
Differential Equations	2	-	1*	8
4. Vectors	2	1	-	6 } 17
3- Dimension Geometry	1	1*	1	11
5. Linear Programming Problems	-	-	1	6 } 16
Probability	-	1*	1	10

Note: Questions with * mark will be asked with alternative

VBQ means Value Based Question.

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Section A

Question numbers 1 to 6 carry 1 mark each.

1. The position vectors of points A and B are $\vec{a}$ and $\vec{b}$ respectively. P divides AB in the ratio 3:1 and Q is mid point of AP. Find the position vector of Q.
2. Find the area of the parallelogram, whose diagonals are $\overrightarrow{d_1} = 5\hat{\imath}$ and $\overrightarrow{d_2} = 2\hat{\jmath}$
3. If P(2,3,4) is the foot of perpendicular from origin to a plane, then write the vector equation of this plane.
4. If $\Delta = \begin{vmatrix} 1 & 3 & -2 \\ 4 & -5 & 6 \\ 3 & 5 & 2 \end{vmatrix}$, write the cofactor of a_{32}(the element of 3rd row and 2nd column).
5. If m and n are the order and degree, respectively of the differential equation

   $$y\left(\frac{dy}{dx}\right)^3 + x^3\left(\frac{d^2y}{dx^2}\right)^2 - xy = \sin x,\ then\ write\ the\ value\ of\ m+n.$$
6. Write the differential equation representing the curve $y^2 = 4ax$, where a is an arbitrary constant.

Section B

Question numbers 7 to 19 carry 4 marks each.

7. To raise money for an orphanage, students of three schools A, B and C organized an exhibition in their locality, where they sold paper bags, scrap-books and pastel sheets made by them using recycled paper, at the rate of Rs. 20, Rs. 15 and Rs. 5 per unit respectively. School A sold 25 paper bag, 12 scrap-books and 34 pastel sheets. School B sold 22 paper bag 15 ,scrap-books and 28 pastel sheets while School C sold 26 paper bag, 18 scrap-books and 36 pastel sheets. Using matrices, find the total amount raised by each school.
   By such exhibition, which values are inculcated in the students?
8. Let $A = \begin{pmatrix} 2 & 3 \\ -1 & 2 \end{pmatrix}$ then show that $A^2 - 4A + 7I = O$. Using this result calculate A^3 also.

   Or

   If $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 5 & 3 \\ 0 & 2 & 1 \end{bmatrix}$, find A^{-1}, using elementary operations.

9. If x,y,z are in GP, then using properties of determinants, show that $\begin{vmatrix} px+y & x & y \\ py+z & y & z \\ 0 & px+y & py+z \end{vmatrix} = 0, where\ x \neq y \neq z$ and p is any real number.

10. Evaluate : $\int_{-1}^{1} |x \cos \pi x| dx$.

11. Evaluate : $\int \frac{1+\sin 2x}{1+\cos 2x} . e^{2x} dx$

Or

Evaluate : $\int \frac{x^4}{(x-1)(x^2+1)} dx$

12. Consider the experiment of tossing a coin. If the coin shows tail, toss it again but if it shows head, then throw a die. Find the conditional probability of the event that 'the die shows a number greater than 3' given that 'there is at least one head'.

Or

How many times must a man toss a fair coin so that the probability of having at least one head is more than 90%?

13. For three vectors $\vec{a}, \vec{b}\ and\ \vec{c}$ if $\vec{a} X \vec{b} = \vec{c}$ and $\vec{a} X \vec{c} = \vec{b}$, then prove that $\vec{a}, \vec{b}\ and\ \vec{c}$ are mutually perpendicular vectors, $|\vec{b}|=|\vec{a}|$ and $|\vec{a}|$=1.

14. Find the equation of the line through the point (1,-1,1) and perpendicular to the lines joining the points (4,3,2), (1,-1,0) and (1,2,-1),(2,1,1).

Or

Find the position vector of the foot of perpendicular drawn from the point P(1,8,4) to the line joining A(0,-1,3) and B(5,4,4). Also find the length of this perpendicular.

15. Solve for x: $\sin^{-1} 6x + \sin^{-1} 6\sqrt{3}x = -\frac{\pi}{2}$

Or

Prove that: $2 \sin^{-1} \frac{3}{5} - \tan^{-1} \frac{17}{31} = \frac{\pi}{4}$

16. If $x = \sin t, y = \sin kt , show\ that\ (1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + k^2 y = 0.$

17. If $y^x + x^y + x^x = a^b, find\ \frac{dy}{dx}$

18. It is given that for the function $f(x) = x^3 + bx^2 + ax + 5$ on [1,3], Rolle's theorem holds with $c = 2 + \frac{1}{\sqrt{3}}$. Find values of a and b.

19. Evaluate $\int \frac{3x+1}{\sqrt{5-2x-x^2}} dx$

Section C

Question numbers 20 to 26 carry 6 marks each.

20. Let A ={1,2,3,…,9} and R be the relation in A X A defined by (a,b) R (c,d) if a+d=b+c for a,b,c,d ∈A. Prove that R is an equivalence relation. Also obtain the equivalence class [(2,5)].

Or

Let f: N→ R *be a function* defined as $f(x) = 4x^2 + 12x + 15$.
Show that f: N→ S is invertible, where S is the range of f. Hence find inverse of f.

21. Compute, using integration, the area bounded by the lines
$$x + 2y = 2,\ \ y - x = 1 \text{ and } 2x + y = 7$$

22. Find the particular solution of the differential equation
$xe^{\frac{y}{x}} - y\sin(\frac{y}{x}) + x\frac{dy}{dx}\sin\left(\frac{y}{x}\right) = 0$, given that y=0, when x=1.

Or

Obtain the differential equation of all the circles of radius r.

23. Show that the lines $\vec{r} = \left(-3\hat{\imath} + \hat{\jmath} + 5\hat{k}\right) + \lambda(-3\hat{\imath} + \hat{\jmath} + 5\hat{k})$ and $\vec{r} = \left(-\hat{\imath} + 2\hat{\jmath} + 5\hat{k}\right) + \mu(-\hat{\imath} + 2\hat{\jmath} + 5\hat{k})$ are coplanar. Also, find the equation of the plane containing these lines.
24. 40% students of a college reside in hostel and the remaining reside outside. At the end of year, 50% of the hostellers got A grade while from outside students, only 30% got A grade in the examination. At the end of year, a student of the college was chosen at the random and was found to get A grade. What is the probability that the selected student was a hosteller?
25. A man rides his motorcycle at the speed of 50 km/h. He has to spend Rs. 2 km on petrol. If he rides it at a faster speed of 80 km/h, the petrol cost increases to Rs. 3 per km. He has atmost Rs. 120 to spend on petrol and one hours time. Using LPP find the maximum distance he can travel.
26. A jet of enemy is flying along the curve $y = x^2 + 2$ and a soldier is placed at the point (3,2). Find the minimum distance between the soldier and the jet.

Answer Key

Section A

1. $\frac{1}{8}(5\vec{a} + 3\vec{b})$ 2. 5 sq. units 3. $\vec{r}.\left(2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}\right) = 29$ 4. -14 5. 4 6. $2x\frac{dy}{dx} - y = 0$

Section B

7. School A= Rs. 850, School B= Rs. 805, School C= Rs. 970 Values: Helping the orphans, use of recycled paper 8. $\begin{pmatrix} -10 & 27 \\ -9 & -10 \end{pmatrix}$ 8(or) $A^{-1} = \begin{bmatrix} -1 & 1 & -3 \\ -2 & 1 & -3 \\ 4 & -2 & 7 \end{bmatrix}$ 10. $\frac{2}{\pi}$ 11. $\frac{1}{2}\tan x\,.e^{2x} + c$

11. (or) $\frac{x^2}{2} + x + \frac{1}{2}\log|x - 1| - \frac{1}{4}\log(x^2 + 1) - \frac{1}{2}\tan^{-1}x + c$ 12. $\frac{1}{3}$ 13. 4

14. $\vec{r} = \left(\hat{\imath} - \hat{\jmath} + \hat{k}\right) + \lambda(10\hat{\imath} - 4\hat{\jmath} - 7\hat{k})$ 14(or) FP(5,4,4); $4\sqrt{2}$ 15. $-\frac{1}{12}$

17. $\frac{dy}{dx} = -\frac{x^x(1+\log x)+y.x^{y-1}+y^x\log y}{x.y^{x-1}+x^y\log x}$ 18. a=11,b=-6 19. $-3\sqrt{5-2x-x^2} - 2\sin^{-1}(\frac{x+1}{\sqrt{6}}) + c$

Section C

20. {(1,4),(2,5),(3,6),(4,7),(5,8),(6,9)} 20(or). g(y)=$\frac{(\sqrt{y-6})-3}{2}$ 21. 6 units 22. $\left[\sin\left(\frac{y}{x}\right) + \cos\left(\frac{y}{x}\right)\right] e^{-\frac{y}{x}} = logx^2 + 1$ 22(or) $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^3 = r^2\left(\frac{d^2y}{dx^2}\right)^2$ 23. $x - 2y + z = 0$ 24. $\frac{10}{19}$ 25. Max. D = $\frac{380}{7}\ km\ at\ (\frac{300}{7}, \frac{80}{7})$ 26. Minimum D=$\sqrt{5}$ at (1,3)