KENDRIYA VIDYALAYA SANGATHAN, HYDERABAD REGION
MOCK TEST PAPER – 02 (2016-17)

SUBJECT: MATHEMATICS(041)

<u>BLUE PRINT : CLASS XII</u>

Chapter	VSA (1 mark)	Short answer (2 marks)	Long answer - I (4 marks)	Long answer - II (6 marks)	Total
Relations and Functions	1(1)	2(1)	--	--	**3(3)**
Inverse Trigonometric Functions	1(1)	--	--	6(1)	**7(2)**
Matrices	--	2(1)	--	6(1)	**8(2)**
Determinants	1(1)	--	4(1)	--	**5(2)**
Continuity & Differentiability	--	2(1)	--	6(1)	**8(2)**
Applications of Derivatives	--	2(1)	8(2)	6(1)	**16(4)**
Integrals	--	--	4(1)	6(1)	**10(2)**
Applications of the Integrals	--	--	4(1)	--	**4(1)**
Differential Equations	--	2(1)	4(1)	--	**6(2)**
Vector Algebra	1(1)	--	4(1)	--	**5(2)**
Three-Dimensional Geometry	--	2(1)	4(1)	6(1)	**12(3)**
Linear Programming	--	2(1)	4(1)	--	**6(2)**
Probability	--	2(1)	8(2)	--	**10(3)**
Total	**4(4)**	**16(8)**	**44(11)**	**36(6)**	**100(29)**

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SUBJECT: MATHEMATICS | **MAX. MARKS : 100**
CLASS : XII | **DURATION : 3 HRS**

General Instruction:
(i) **All** questions are compulsory.
(ii) This question paper contains **29** questions.
(iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.
(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.
(v) Question **13-23** in **Section C** are long-answer-I type questions carrying **4** marks each.
(vi) Question **24-29** in **Section D** are long-answer-II type questions carrying **6** marks each.

SECTION – A
Questions 1 to 4 carry 1 mark each.

1. If $f : \mathbf{R} \to \mathbf{R}$ be given by $f(x) = (3 - x^3)^{1/3}$, then find $f o f(x)$.

2. What is the principal value of $\cot^{-1}\left(\frac{-1}{\sqrt{3}}\right)$?

3. A is a square matrices of order 3 such that | A | = 4. Find | 3A |

4. Find the value of $\vec{a}.\vec{b}$, if $|\vec{a}| = 10$, $|\vec{b}| = 10$ and $|\vec{a} \times \vec{b}| = 16$

SECTION – B
Questions 5 to 12 carry 2 marks each.

5. Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let f = {(1, 4), (2, 5), (3, 6)} be a function from A to B. Show that f is one-one.

6. If $A = \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 5 \\ 3 & 4 \end{bmatrix}$, then find (3A – B).

7. Find the differential equation representing the curve $y = e^{-x} + ax + b$, where a and b are arbitrary constants.

8. If $y = \sqrt{e^{\sqrt{x}}}$, then find $\frac{dy}{dx}$

9. The length x of a rectangle is decreasing at the rate of 3 cm/minute and the width y is increasing at the rate of 2cm/minute. When x =10cm and y = 6cm, find the rates of change of (a) the perimeter and (b) the area of the rectangle.

10. Find the value of a + b, if the points (2, a, 3), (3, – 5, b) and (– 1, 11, 9) are collinear.

11. In a school, there are 1000 students, out of which 430 are girls. It is known that out of 430, 10% of the girls study in class XII. What is the probability that a student chosen randomly studies in Class XII given that the chosen student is a girl?

12. Solve the following Linear Programming Problem graphically:
Maximize Z = 250x + 75y; subject to $x + y \le 60, x \ge 0$ *and* $y \ge 0$

SECTION – C

Questions 13 to 23 carry 4 marks each.

13. Evaluate: $\int \frac{dx}{x^3(x^5+1)^{3/5}}$.

14. Using properties of determinant, prove that

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$$

15. Verify Mean Value Theorem, if $f(x) = x^3 - 5x^2 - 3x$ in the interval $[a, b]$, where $a = 1$ and $b = 3$. Find all $c \in (1, 3)$ for which $f'(c) = 0$.

16. Find the equations of the tangent and the normal to the curve $y = \frac{x-7}{(x-2)(x-3)}$ at the point where it cuts the x-axis.

OR

Find the absolute maximum and absolute minimum values of the function f given by $f(x) = \cos^2 x + \sin x$, $x \in [0, \pi]$.

17. Evaluate: $\int_2^4 \{|x-2|+|x-3|+|x-4|\}dx$

OR

Evaluate: $\int_0^{\pi/4} \frac{\sec x}{1+2\sin^2 x}dx$

18. Find the particular solution of the differential equation $(y - \sin x)\,dx + (\tan x)\,dy = 0$ satisfying the condition that $y = 0$ when $x = 0$.

OR

Solve the following differential equation : $\frac{dy}{dx} + y\cot x = 4x\,\text{cosec}\,x$, given that $y = 0$ when $x = \frac{\pi}{2}$.

19. A cooperative society of farmers has 50 hectare of land to grow two crops X and Y. The profit from crops X and Y per hectare are estimated as Rs 10,500 and Rs 9,000 respectively. To control weeds, a liquid herbicide has to be used for crops X and Y at rates of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used in order to protect fish and wild life using a pond which collects drainage from this land. Write any one value reflected in the problem.

20. An unbiased coin is tossed 'n' times. Let the random variable X denote the number of times the head occurs. If P(X =1), P(X = 2) and P(X = 3) are in AP, find the value of n.

21. Bag I contains 4 red and 5 black balls and bag II contains 3 red and 4 black balls. One ball is transferred from bag I to bag II and then two balls are drawn at random (without replacement) from bag II. The balls so drawn are both found to be black. Find the probability that the transferred ball is black.

22. Show that the four points with position vectors $4\hat{i}+8\hat{j}+12\hat{k}$, $2\hat{i}+4\hat{j}+6\hat{k}$, $3\hat{i}+5\hat{j}+4\hat{k}$ and $5\hat{i}+8\hat{j}+5\hat{k}$ are coplanar

23. Find the vector and cartesian equations of a 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).

SECTION – D

Questions 24 to 29 carry 6 marks each.

24. If $\tan^{-1}\left(\frac{x-5}{x-6}\right)+\tan^{-1}\left(\frac{x+5}{x+6}\right)=\frac{\pi}{4}$, then find the value of x.

OR

Check whether the operation * defined on the set A = R × R as (a, b) * (c, d) = (a + c, b + d) is a binary operation or not, where R is the set of all real numbers. If it is a binary operation, is it commutative and associative too ? Also find the identity element of *.

25. Using elementary transformations, find the inverse of the following matrix : $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 0 \end{bmatrix}$

OR

For the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 4I = O$. Hence find A^{-1}.

26. Find the value of k for which the following lines are perpendicular to each other :

$\frac{x+3}{k-5}=\frac{y-1}{1}=\frac{5-z}{-2k-1};\frac{x+2}{-1}=\frac{2-y}{-k}=\frac{z}{5}$

Hence find the equation of the plane containing the above lines.

27. Using integration, find the area of the region bounded by the line y – 1 = x, the x-axis and the ordinates x = – 2 and x = 3.

OR

Evaluate $\int_1^4 (x^2 - x)dx$ as a limit of sums.

28. Find $\frac{dy}{dx}$, if $y = (\sin x)^{\cos x} + (\cos x)^{\sin x}$.

29. A window is in the form of a rectangle surmounted by a semi-circular opening. The total perimeter of the window is 10 metres. Find the dimensions of the rectangle so as to admit maximum light through the whole opening.