KENDRIYA VIDYALAYA SANGATHAN, HYDERABAD REGION
MOCK TEST PAPER – 05 (2017-18)

SUBJECT: MATHEMATICS(041)

BLUE PRINT : CLASS XII

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	1(1)	2(1)	4(1)	--	**7(3)**
Determinants	--	2(1)	4(1)	--	**6(2)**
Continuity & Differentiability	--	--	8(2)	--	**8(2)**
Applications of Derivatives	--	4(2)	4(1)	6(1)	**14(4)**
Integrals	--	2(1)	4(1)	6(1)	**12(3)**
Applications of the Integrals	--	--	--	6(1)	**6(1)**
Differential Equations	--	--	4(1)	--	**4(1)**
Vector Algebra	1(1)	2(1)	4(1)	--	**5(2)**
Three-Dimensional Geometry	--	--	4(1)	6(1)	**6(1)**
Linear Programming	--	--	--	6(1)	**6(1)**
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 $\vec{a} = x\hat{i} - 4\hat{j} + z\hat{k}$ and $\vec{b} = 5\hat{i} - y\hat{j} + 2\hat{k}$ are two equal vectors, then write the value of x + y + z.

2. Find the principal value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

3. Find *gof* and *fog*, when $f: R \to R$ and $g: R \to R$ are defined by f(x) = $27x^3$ and g(x) = $x^{1/3}$

4. If a matrix has 18 elements, what are the possible orders it can have? What if it has 5 elements?

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

5. Ten cards numbered 1 to 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. If it is known that the number on the drawn card is more than 3, what is the probability that it is an even number?

6. The radius of a circle is increasing uniformly at the rate of 3 cm/s. Find the rate at which the area of the circle is increasing when the radius is 10 cm.

7. Evaluate: $\int [1 + 2\tan x(\tan x + \sec x)]^{1/2} dx$

8. Let A = {1, 2, 3, 4} and B = {5, 6, 7, 8}. Let $f: A \to B$ be defined by f ={(1, 5), (2, 6), (3, 6), (4, 7)}. Show that f is neither one-one nor onto function.

9. If $|\vec{a}| = \sqrt{26}$, $|\vec{b}| = 7$ and $|\vec{a} \times \vec{b}| = 35$, find $\vec{a} \cdot \vec{b}$

10. Using differentials, find the approximate value of $\tan^{-1}(1.004)$.

11. Prove that $\begin{vmatrix} x+y+2z & x & y \\ z & 2x+y+z & y \\ z & x & x+2y+z \end{vmatrix} = 2(x+y+z)^3$

12. If $M(x) = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, then show that *M(x)M(y) = M(x + y)*

SECTION – C

Questions 13 to 23 carry 4 marks each.

13. Find the values of a and b such that $f(x)=\begin{cases} 5, & if \quad x\le 2 \\ ax+b, & if \quad 2<x<10 \\ 21, & if \quad x\ge 10 \end{cases}$ is a continuous function.

OR

Examine the differentiability of function f defined by $f(x)=\begin{cases} x^2\sin\frac{1}{x} & if \quad x\ne 0 \\ 0 & if \quad x=0 \end{cases}$ at x = 0.

14. If $A=\begin{bmatrix} 3 & 2 \\ 2 & 5 \end{bmatrix}$ and $B=\begin{bmatrix} 2 & 1 \\ -4 & 0 \end{bmatrix}$ then find $(AB)^{-1}$

15. From a set of 100 cards numbered 1 to 100, one card is drawn at random. Find the probability that the number on the card is divisible by 6 or 8, but not by 24.

OR

There are three identical boxes I, II and III each containing two coins. In Box I, both coins are gold coins; in Box II, both are silver coins and in Box III, there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold?

16. If $\vec{a}$ and $\vec{b}$ are unit vectors inclined at an angle θ, then prove that (i) $|\vec{a}-\vec{b}|=2\sin\frac{\theta}{2}$ (ii) $|\vec{a}+\vec{b}|=2\cos\frac{\theta}{2}$.

17. Find the image of the point (1, 6, 3) in the line $\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$.

18. Show that the differential equation $x\frac{dy}{dx}\sin\left(\frac{y}{x}\right)+x-y\sin\left(\frac{y}{x}\right)=0$ is homogeneous. Find the particular solution of this differential equation, given that x = 1 when y = $\frac{\pi}{2}$.

19. A ladder 5m long is leaning against a wall. The bottom of the ladder is pulled along the ground away from the wall at the rate of 2cm/s. How fast is its height on the wall decreasing when the foot of the ladder is 4 m away from the wall?

20. If $x=a(t-\sin t), y=a(1+\cos t)$, then find $\frac{d^2y}{dx^2}$.

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

OR

Evaluate: $\int_{\pi/6}^{\pi/3}\frac{1}{1+\sqrt{\cot x}}dx$

22. If $a\ne b\ne c$ and $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}=0$ then using properties of determinants, prove that a + b + c = 0.

23. Assume that the chances of a patient having a heart attack is 40%. It is also assumed that a meditation and yoga course reduces the risk of heart attack by 30% and the prescription of a certain drug reduces its chance by 25%. At a time a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options the patient selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga. **Write the advantages of meditation and yoga in our life.**

SECTION – D

Questions 24 to 29 carry 6 marks each.

24. Show that the lines $\vec{r} = (4\hat{i} - \hat{j}) + \lambda(\hat{i} + 2\hat{j} - 3\hat{k})$ and $\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(2\hat{i} + 4\hat{j} - 5\hat{k})$ are skew lines. Also find the shortest distance between them.

OR

Find the equation of the plane passing through the line of intersection of the planes having equations x + 2y + 3z – 5 = 0 and 3x – 2y – x + 1 = 0 and cutting off equal intercepts on the x and z-axis.

25. Show that the relation R in the set A = {1, 2, 3, 4, 5} given by R = {(a, b) : |a – b| is divisible by 2 } is an equivalence relation. Show that all the elements of {1, 3, 5} are related to each other and all the elements of {2, 4} are related to each other, but no element of {1, 3, 5} is related to any element of {2, 4}.

OR

If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}, x, y, z > 0$, then find the value of xy + yz + zx.

26. Using integration, find the area bounded by the curves y = | x – 1 | and y = 3 – | x |.

27. A dietician wants to develop a special diet using two foods X and Y. Each packet (contains 30 g) of food X contains 12 units of calcium, 4 units of iron, 6 units of cholesterol and 6 units of vitamin A. Each packet of the same quantity of food Y contains 3 units of calcium, 20 units of iron, 4 units of cholesterol and 3 units of vitamin A. The diet requires at least 240 units of calcium, at least 460 units of iron and at most 300 units of cholesterol. Make an LPP to find how many packets of each food should be used to minimise the amount of vitamin A in the diet, and solve it graphically.

28. Find the point on the curve $y = \frac{x}{1+x^2}$, where the tangent to the curve has the greatest slope.

29. Evaluate: $\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx$

OR

Evaluate: $\int_0^{\pi} (x^2 + e^{2x+1}) dx$ as the limit of a sum.