

KENDRIYA VIDYALAYA SANGATHAN - AHMEDABAD REGION

SESSION ENDING EXAMINATION: MARCH 2015

CLASS: XI

SUBJECT: MATHEMATICS

TIME: 3 HOURS

M.M. 100

General Instructions:

- (i) All questions are compulsory.
- (ii) The question paper consists of 26 questions divided into three sections – A, B and C. Section A comprises of 6 questions of 1 mark each; Section B comprises of 13 questions of 4 marks each and Section C comprises of 7 questions of 6 marks each.
- (iii) There is no overall choice. However, internal choice has been provided in 4 questions of 4 marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
- (v) Use of calculator is not permitted. You may ask for logarithmic tables if required

SECTION- A

- 1 Write the set $\left\{ \frac{1}{2}, \frac{2}{5}, \frac{3}{10}, \frac{4}{17}, \frac{5}{26}, \frac{6}{37}, \frac{7}{50} \right\}$ in the set builder form 1

- 2 Find the multiplicative inverse of $2 - 3i$. 1

- 3 Write the negation of the statement: " $\sqrt{7}$ is a rational number". 1

- 4 Write the contra positive of the following statement: 1

"If a triangle is equilateral, it is isosceles."

- 5 Write the converse of the following statement: 1

"If a number n is even, then n^2 is even."

- 6 Name the octant in which the point $(4, -2, 3)$ lies. 1

SECTION- B

- 7 In a survey it was found that 21 persons liked product P1 ,26 liked product P2 and 29 liked product P3.If14 persons liked products P1 and P2 ,12 persons liked product P3 and P1, 14 persons liked products P2 and P3 and 8 liked all the three products .Find how many liked product P3 only. What is your opinion about surveys? 4
- 8 Prove that- 4
- $$\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$$
- 9 In any triangle ABC, prove that $(a - b)^2 \cos^2 \frac{C}{2} + (a + b)^2 \sin^2 \frac{C}{2} = c^2$ 4
- 10 Find the sum to n terms of the following series – 4
- $$7+77+777+7777+\dots$$

OR

Find the sum to n terms of the series whose nth term is $n(n+3)$.

- 11 If $(x + iy)^3 = u+iv$, show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$. 4
- 12 Prove that $-C_r^n + C_{r-1}^n = C_r^{n+1}$ 4

OR

From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decided that either all of them will join or none of them will join. In how many ways can the excursion party be chosen?

- 13 Calculate the mean deviation about median for the following distribution: 4

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Numbers of Boys	6	7	15	16	4	2

What is your opinion about the performance of boys?

- 14 Prove that: $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$ 4
- 15 Find the distance between the parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$. 4

OR

Find the coordinates of the foot of perpendicular from the point $(-1, 3)$ to the line $3x - 4y - 16 = 0$

- 16 Find the equation of the circle passing through $(0, 0)$ and making intercepts a and b on the coordinate axes. 4

OR

Find the coordinates of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the latus rectum of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$.

- 17 Find the equation of the hyperbola where foci are $(0, \pm 12)$ and length of the latus rectum is 36. 4
- 18 Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that (a) you both enter the same section? (b) You both enter the different sections (c) Which section will you prefer to choose and why? 4
- 19 Find the mean and variance for first n natural numbers. 4

SECTION-C

- 20 Show that the middle term in the expansion of $(1 + x)^{2n}$ is $\frac{1 \cdot 3 \cdot 5 \dots (2n-1)}{n!} 2^n x^n$ where n is a positive integer. 6
- 21 A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added 6

22 Using PMI prove that $(2n+7) < (n+3)^2$ 6

OR

Using PMI prove that $3^{2n+2} - 8n - 9$ is divisible by 8.

23 The sum of two numbers is 6 times their geometric mean, show that numbers are in the ratio $(3+2\sqrt{2}) : (3-2\sqrt{2})$ 6

24 Find the derivative of $f(x)$ from the first principle, where $f(x)$ is 6

(i) $\sin x + \cos x$

(ii) $x \sin x$

25 Prove that: $\cos^2 x + \cos^2(x + \frac{\pi}{3}) + \cos^2(x - \frac{\pi}{3}) = \frac{3}{2}$ 6

OR

Find the value of $\tan \frac{\pi}{8}$

26 Let R be a relation from Q to Q defined by $R = \{(a,b) : a,b \in Q \text{ and } a - b \in Z\}$. 6

Show that

(i) $(a,a) \in R$ for all $a \in Q$

(ii) $(a,b) \in R$ implies that $(b,a) \in R$

(iii) $(a,b) \in R, (b,c) \in R$ implies that $(a,c) \in R$