P.V.G.'s

Muktangan English School & Jr. College, Pune - 9

Annual Examination (2024-25)

STD XI

Subject : Mathematics & Statistics | Marks - 80

Date : 29.03.2025 | Time : - 1.30 pm to 4.30 pm

General Instructions :

The questions paper is divided into Four sections

1) **Section A :** Q1 contains **Eight** multiple choice type questions carrying **Two** marks each.
   Q 2 contains **Four** very short answer type questions carrying **One** mark each.
2) **Section B :** contains **Twelve** short answer type questions carrying **Two** marks each (Attempt any **Eight**)
3) **Section C :** contains **Twelve** short anwer type questions carrying Three marks each (Attempt any **Eight**)
4) **Section D :** contains **Eight** long answer type questions carrying Four marks each (Attemp any **Five**)
5) Use of **log table** is allowed. Use of calculator is **not** allowed.
6) Figures to right indicate full marks.
7) For each MCQ, only first attempt will be considered for evaluation.
8) Start answer to each section on a new page.

Section A

Q.1 Select and write the most appropriate answer from the given alternatives for each sub-question : (2 marks each) [16]

i) If a circle passes through the points (0,0), (a,0), (0,b) then the coordinates of its centre are _____.

A) $\left(\frac{-a}{2}, \frac{-b}{2}\right)$ B) $\left(\frac{a}{2}, \frac{-b}{2}\right)$ C) $\left(-\frac{a}{2}, \frac{b}{2}\right)$ D) $\left(\frac{a}{2}, \frac{b}{2}\right)$

ii) If w is complex cube root of unity, then the value of $w + \frac{1}{w}$ is _____.

A) 1 B) -1 C) 0 D) w

iii) There are 2 shelves. One shelf has 5 Physics and 3 Biology books and the other has 4 Physics and 2 Biology books. The probability of drawing a Physics book is _____.

A) $\frac{9}{14}$ B) $\frac{31}{48}$ C) $\frac{9}{38}$ D) $\frac{1}{2}$

iv) Value of Sin 150^0 is _____.

A) 1 B) $\frac{\sqrt{3}}{2}$ C) $\frac{1}{\sqrt{2}}$ D) $\frac{1}{2}$

v) If set A has 2 elements then n[P(P(A)] is _____.

A) 2 B) 6 C) 8 D) 16

vi) which of the following matrix is singular?

A) $\begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}$ B) $\begin{bmatrix} -2 & 2 \\ 4 & 4 \end{bmatrix}$ C) $\begin{bmatrix} 4 & -4 \\ 2 & -2 \end{bmatrix}$ D) $\begin{bmatrix} 1 & -3 \\ 1 & -2 \end{bmatrix}$

vii) $\lim_{x \to \infty} \left[\frac{(2x + 3)^7 \ (x - 5)^3}{(2x - 5)^{10}} \right]$

A) $\frac{3}{8}$ B) $\frac{1}{8}$ C) $\frac{1}{6}$ D) $\frac{1}{4}$

viii) The number of terms in expansion of $(4y + x)^8 - (4y - x)^8$

A) 4 B) 5 C) 8 D) 9

Q.2 Answer the following questions : (1 mark each) **(4)**

i) There are 4 pens : Red, Green, Blue, Purple in a desk drawer of which two pens are selected at random one after the other with replacement. State the sample space.

ii) Find the value of the determinant $\begin{bmatrix} 2 & -4 \\ 7 & -15 \end{bmatrix}$

iii) Find the value of : $i + i^2 + i^3 + i^4$

iv) If $5^{2x + 7} = 125$, find x.

Section B

Attempt any EIGHT of the following questions : (2marks each) **(16)**

Q.3 Find the range of the data

575, 609, 335, 280,729, 544, 852, 427, 367, 250

Q.4 Find the equation of the line having slope 5 and passing through the point A (-1,2).

Q.5 Examine the consistency of the equations

$x + y = 2, 2x + 3y = 5, 3x - 2y = 1$

Q.6 Find the cartesian coordinates of point, whose polar coordinates are $(3\sqrt{2}, 45^0)$

Q.7 Find the centre and radius of circle $x^2 + y^2 - 6x - 2y - 55 = 0$

Q.8 Find the cartesian coordinates of the point on the parabola $y^2 = 12x$ whose parameter $t = 2$.

Q.9 For a G.P. If $a = 2$ and $r = \frac{-2}{3}$ find S_6.

Q.10 If $U = \{x / x \in N, \text{ and } 1 \leq x \leq 12\}$, $A = \{1, 4, 7, 10\}$, $B = \{2, 4, 6, 7, 11\}$, $C = \{3, 5, 8, 9, 12\}$
Find a) $A \cup B \cup C$ b) $A \cap (B \cup C)$

Q.11 Find n, if $\frac{n}{6!} = \frac{4}{8!} + \frac{3}{6!}$

Q.12 Evaluate the limit : $\lim_{x \to 0} \frac{x \tan x}{1 - \cos x}$

Q.13 Find x, if $f(x) = g(x)$, where $f(x) = x^4 + 2x^2$, $g(x) = 11x^2$

Q.14 Prove that $C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8 + C_9 + C_{10} = 1023$

Section C

Attempt any Eight of the following questions : (3 marks each) **(24)**

Q.15 The perimeter of a sector of the circle of area 25π sq. cm. Find the area of the sector.

Q.16 Prove that $\sin^2 A + \sin^2 B - \sin^2 C = 2\sin A \sin B \cos C$

Q.17 Find the equation of the circle passing through the points (5, -6), (1, 2), (3, -4).

Q.18 Find the acute angle between the lines
$12x - 4y = 5$ and $4x + 2y = 7$.

Q.19 For two events A and B of a sample space S, $P(A) = \frac{3}{8}$, $P(B) = \frac{1}{2}$,
$P(A \cup B) = \frac{5}{8}$. Find the value of the following

a) $P(A \cap B)$ b) $P(A' \cap B')$ c) $P(A' \cup B')$

Q.20 Find co-ordinates of the focus, equation of the directrix, length of the latus rectum of the parabola $5y^2 = 24x$.

Q.21 Examine the continuity of the function $f(x) = \frac{x^2 - 3x - 18}{x - 6}$

Q.22 Evaluate $\lim_{x \to 0} \left[\frac{5^x - 3^x}{\sin x} \right]$

Q.23 If w is a complex cube root of unity, find the value of :

$(1 - w)(1 - w^2)(1 - w^4)(1 - w^5) = 9$

Q.24 Find the number of ways of drawing 9 balls from a bag that has 6 red balls, 7 blue balls and 8 green balls. So that 3 balls of every colour are drawn.

Q.25 Solve for x, if $\log_2 x + \log_4 x + \log_{16} x = \frac{21}{4}$

Q.26 Insert two numbers between $\frac{1}{4}$ and $\frac{1}{3}$, so that the resulting sequence is a H.P.

Section D

Attempt any FIVE of the following questions : (4marks each) **(20)**

Q.27 Following data gives age of 100 students in a college. Calculate variance and S.D.

Age (in years)	16	17	18	19	20	21
no. of students	20	7	11	17	30	15

Q.28 Find a, if $[1\ a\ 1]\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & 2 & 5 \end{bmatrix}\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} = 0$

Q.29 a) find the distance between the parallel lines

$6x + 8y + 21 = 0$ and $6x + 8y + 14 = 0$

b) find the distance of a point A(-2, 3) from the line $12x - 5y = 13$.

Q.30 A fair dice is thrown two times, find the probability that,

a) sum of the numbers on them is 5.

b) sum of the numbers on them is at least 8.

c) first throw gives a multiple of 2 and second throw gives a multiple of 3.

d) product of numbers on them is 12.

Q.31 Find the middle terms in the expansion of $\left(2x - \frac{1}{4x}\right)^9$.

Q.32 a) If A = {1, 2} find cartesian product A x A.

b) Write the given relation in Roaster form and find its Domain and Range.

$R = \{(x, y) / x + y = 3.x, y \in \{0, 1, 2, 3\}\}$

Q.33 If $f(x) = 2x^2 + 3$, $g(x) = 5x - 2$, then find : i) $g \circ f(x)$ ii) $f \circ g(x)$

Q.34 Evaluate : $\lim_{x \to 2} \frac{x^2 - 4}{\sqrt{x + 2} - \sqrt{3x - 2}}$

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