QUARTERLY EXAMINATION - 2024

STD - XI **MATHEMATICS**

TIME : 3.00 Hrs **MARKS : 90**

PART - A

I. Choose the most suitable answer from the given four alternatives. **20 x 1 = 20**

1. If n((A x B) ∩ (A x C)) = 8 and n(B∩C) = 2, then n(A) is
   (a) 4 (b) 8 (c) 16 (d) 6
2. The number of relations on a set containing 3 elements is
   a) 1024 b) 9 c) 81 d) 512
3. The number of constant functions from a set containing m elements to a set containing n elements is
   (a) n (b) m (c) $m+n$ (d) mn
4. The solution set of the following inequality $|x-1| \geq |x-3|$ is
   (a) (0, 2) (b) [0, 2] (c) [2, ∞) (d) (−∞, 2)
5. The value of $\log_{\sqrt{2}} 512$ is
   a) 12 (b) 9 (c) 18 (d) 16
6. The value of $\log_3 11 . \log_{11} 13 . \log_{13} 15 . \log_{15} 27 . \log_{27} 81$ is
   (a) 3 (b) 1 (c) 4 (d) 2
7. If $\tan 40^0 = \lambda$, then $\dfrac{\tan 140^\circ - \tan 130^\circ}{1+\tan 140^\circ \tan 130^\circ} =$
   (a) $\dfrac{1+\lambda^2}{2\lambda}$ (b) $\dfrac{1-\lambda^2}{2\lambda}$ (c) $\dfrac{1-\lambda^2}{\lambda}$ (d) $\dfrac{1+\lambda^2}{\lambda}$
8. If $\tan\alpha$ and $\tan\beta$ are the roots of $x^2+ax+b=0$, then $\dfrac{\sin(\alpha+\beta)}{\sin\alpha \sin\beta}$ is equal to
   (a) $\dfrac{-b}{a}$ (b) $\dfrac{b}{a}$ (c) $\dfrac{-a}{b}$ (d) $\dfrac{a}{b}$
9. $\dfrac{\cos 6x + 6\cos 4x + 15\cos 2x + 10}{\cos 5x + 5\cos 3x + 10\cos x}$ is equal to
   (a) $\cos 3x$ (b) $\cos 2x$ (c) $\cos x$ (d) $2\cos x$
10. In 3 fingers, the number of ways four rings can be worn is .... ways.
    (a) 3^4 (b) $4^3 - 1$ (c) 64 (d) 68
11. The number of rectangles that a chessboard has ....
    (a) 6561 (b) 1296 (c) 9^9 (d) 81
12. 1 + 3 + 5 + 7 +.........+ 17 is equal to
    (a) 71 (b) 61 (c) 81 (d) 101
13. If a is the arithmetic mean and g is the geometric mean of two numbers, then
    (a) $a=g$ (b) $a>g$ (c) $a \geq g$ (d) $a \leq g$
14. The remainder when 38^{15} is divided by 13 is
    (a) 5 (b) 12 (c) 1 (d) 11

15. The coefficient of x^5 in the series e^{-2x} is

(a) $\frac{3}{2}$ (b) $\frac{2}{3}$ (c) $\frac{4}{15}$ (d) $\frac{-4}{15}$

16. The length of $\perp$ from the origin to the line $\frac{x}{3}-\frac{y}{4}=1$ is

(a) $\frac{5}{12}$ (b) $\frac{5}{7}$ (c) $\frac{11}{5}$ (d) $\frac{12}{5}$

17. If the two straight lines $x + (2K - 7)y + 3 = 0$ and $3Kx + 9y - 5 = 0$ are perpendicular then the value of K is

(a) $K=\frac{3}{2}$ (b) $K=\frac{2}{3}$ (c) $K=\frac{1}{3}$ (d) $K=3$

18. One of the equation of the lines given by $x^2 + 2xy\cot\theta - y2 = 0$ is

(a) $x\cos\theta + y(\sin\theta + 1) = 0$ (b) $x - y\cot\theta = 0$
(c) $x\sin\theta + y(\cos\theta + 1) = 0$ (d) $x + y\tan\theta = 0$

19. Domain of the function $f(x)=\frac{1}{x(x-1)}$ is

(a) R (b) R - { 0 } c) R - { 1 } d) R - { 0, 1 }

20. $\cos 15^0 =$ (a) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (b) $\frac{\sqrt{3}-1}{2\sqrt{3}}$ (c) $\frac{1-\sqrt{3}}{2\sqrt{3}}$ (d) $\frac{\sqrt{3}+1}{2\sqrt{3}}$

PART - B

II. Answer any seven questions. Q.No.30 is compulsory. ***7 x 2 = 14***

21. If n (A ∩ B) = 3 and n (A ∪ B) = 10, then find n (P (A Δ B)).
22. Let f and g be the two function from R to R defined by $f(x) = 3x - 4$ and $g(x) = x^2 + 3$. Find gof and fog.
23. Solve : | 5x - 12 | < -2.
24. Simplify and hence find the value n : $\frac{3^{2n}9^2 3^{-n}}{3^{3n}} = 27$
25. Express the following product as a sum or difference $\cos 110^0 \sin 55^0$
26. Find the principal value of $\tan^{-1}\left(\frac{-1}{\sqrt{3}}\right)$
27. Count the number of three-digit numbers which can be formed from the digits 2, 4, 6, 8 if repetitations of digits is not allowed.
28. Find the coefficient of x^3 in the expansion of $(2 - 3x)^7$.
29. Find the equation of the line passing through the point (1,1) and (-2, 3).
30. If $nC_3 = 35$; what is n?

PART - C

III. Answer any seven questions. Q.No.40 is compulsory. ***7 x 3 = 21***

31. If A and B are two sets so that n(B - A) = 2n(A - B) = 4n(A ∩ B) and n(A ∪ B) = 14, then find n(P(A)).
32. If f: R → R is defined by $f(x) = 2x^2 - 1$, find the pre-images of 17, 4 and -2.

33. A model rocket is launched from the ground. The height h reached by the rocket after t seconds from lift off is given by $h(t) = -5t^2 + 100t$, $0 \le t \le 20$. At what time the rocket is 495 feet above the ground?

34. Prove that $cot(A+B) = \frac{cot A cot B - 1}{cot A + cot B}$

35. If $A + B = 45^0$, show that $(1 + tan A)(1+tan B) = 2$.

36. If ${}^{(n+2)}C_7 : {}^{(n-1)}P_4 = 13 : 24$ find n.

37. If a, b, c are respectively the p^{th}, q^{th} and r^{th} terms of a GP, show that $(q - r) \log a + (r - p) \log b + (p - q) \log c = 0$.

38. Find $\sqrt[3]{65}$

39. Separate the equation : $5x^2 + 6xy + y^2$.

40. Solve : $log_8 x + log_4 x + log_2 x = 11$.

PART - D

IV. Answer all the questions. **7 x 5 = 35**

41. a) On the set of natural number let R be the relation defined by $a R b$ if $2a + 3b = 30$. Write down the relation by listing all the pair. Check whether it is
i) reflexive ii) symmetric iii) transitive iv) equivalence (OR)

b) The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is twice that of the other, show that $8h^2 = 9ab$.

42. a) Rewrite $\sqrt{3}x + y + 4 = 0$ into normal form. (OR)

b) If the difference of the roots of the equation $2x^2 - (a+1)x + (a-1) = 0$ is equal to their product then prove that $a = 2$.

43. a) If A + B + C = π, prove that $cos^2 A + cos^2 B + cos^2 C = 1 - 2 cosA\, CosB\, cosC$ (OR)

b) Resolve into partial fractions : $\frac{2x^2 + 5x - 11}{x^2 + 2x - 3}$

44. a) Solve : $cos\, x + sin\, x = cos\, 2x + sin\, 2x$ (OR)

b) Prove that for any natural number n, $a^n - b^n$ is divisible by $a - b$ where $a > b$.

45. a) In ΔABC, to prove $tan\frac{B-C}{2} = \frac{b-c}{b+c} cot\frac{A}{2}$ (OR)

b) Prove that $\sqrt{\frac{1-x}{1+x}}$ is approximately equal to $1 - x + \frac{x^2}{2}$ when x is very small.

46. a) If a, b, c are in G.P. and if $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$, then prove that x, y, z are in A.P. (OR)

b) In ΔABC, to prove $sin\left(\frac{B-C}{2}\right) = \frac{b-c}{a} cos\frac{A}{2}$.

47. a) Find the sum of all 4-digit numbers that can be formed using the digits 1, 2,4, 6, 8

(OR)

b) Find the largest possible domain of the real valued function $f(x) = \frac{\sqrt{4-x^2}}{\sqrt{x^2-9}}$.

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1.	a) 4	I - 8	11)	b) 1296	- IV - 19
2	d) 512	I - 12	12)	c) 81	IV - 24
3	a) n	- I - 18	13)	c) $a \geq g$	V - 5
4	c) $[2, \infty)$	- II - 5	14)	b) 12	V - 18
5	c) 18	- II - 6	15)	d) $-\frac{4}{15}$	V - 18
6	c) 4	- II - 20	16)	d) $\frac{12}{5}$	VI - 17
7	b) $\frac{1-x^2}{2x}$	- III - 6	17)	d) $k=3$	VI - 19
8	c) $-\frac{a}{b}$	III - 13	18)	c) $x\sin\theta + y(\cos\theta+1)=0$	VI - 25
9	d) $2\cos x$	III - 16	19)	c) $R - \{1\}$	
10	a) 3^4	IV - 5	20)	a) $\frac{\sqrt{3}+1}{2\sqrt{2}}$	Eg: 3.15

2 Mark

II - 21) $n(A \Delta B) = n(A \cup B) - n(A \cap B)$

$= 10 - 3$

$n(A \Delta B) = 7$

$n(P(A \Delta B)) = 2^7 = 128$

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22) $f(x) = 3x - 4$

$g(x) = x^2 + 3$

$g \circ f(x) = g[f(x)]$

$= g(3x-4)$

$= (3x-4)^2 + 3$

$g \circ f(x) = 9x^2 - 24x + 19$

$f \circ g(x) = f[g(x)]$.

$= f(x^2+3)$

$= 3(x^2+3) - 4$

$= 3x^2 + 9 - 4$

$f \circ g(x) = 3x^2 + 5$

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23) $|5x - 2| < -2$

Given inequation does not satisfy any x value in R

x has no solution.

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24) $\frac{3^{2n} \, 9^2 \, . 3^{-n}}{3^{3n}} = 27$

$= 3^{2n} (3^2)^2 \, 3^{-n} \, 3^{-3n} = 3^3$

$= 3^{2n - n - 3n + 4} = 3^3$

$4 - 2n = 3$

$2n = 1$

$n = \frac{1}{2}$

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25) $\cos 110° \sin 55°$

$\cos A \sin B = \frac{1}{2}[\sin(A+B) - \sin(A-B)]$

$\cos 110° \sin 55° = \frac{1}{2}[\sin 165° - \sin 55°]$

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26) $y = \tan^{-1}(-1/\sqrt{3})$

$\tan y = -\tan \frac{\pi}{6}$

$y = -\pi/6$

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27) 100 10 1

$4 \times 4 \times 4 = 64$ ways

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28) $(2 - 3x)^7$

$T_{r+1} = nC_r a^{n-r} b^r$

$T_{r+1} = 7C_r (2)^{7-r} (-3x)^r$

$r = 3$ $T_{3+1} = 7C_3 (2)^4 (-3)^3 x^3$

$= -15120 x^3$

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29) $(1, 1)$, $(-2, 3)$
$x_1 \, y_1$ $x_2 \, y_2$

$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1} \Rightarrow \frac{y-1}{3-1} = \frac{x-1}{-2-1}$

$\frac{y-1}{2} = \frac{x-1}{-3}$

$2x + 3y = 5$

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30) $nC_3 = 35$

$\frac{n(n-1)(n-2)}{3 \times 2 \times 1} = 35$

$n(n-1)(n-2) = 7 \times 5 \times 3 \times 2$

$n(n-1)(n-2) = 7 \times 6 \times 5$

$n = 7$

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