HALF YEARLY EXAMINATION - DECRMBER 2025

11 - STD MATHEMATICS

TOTAL MARKS : 90 **TIME : 3.00 HOURS**

I. Choose the best answer **20x1=20**

1. If $n(A) = 2$ and $n(B \cup C) = 3$, then $n[(A \times B) \cup (A \times C)]$ is

   (1) 2^3 (2) 3^2 (3) 6 (4) 5

2. Let X = {1,2,3,4}and R = $\{(1,1),(1,2),(1,3),(2,2),(3,3),(2,1),(3,1),(1,4),(4,1)\}$. Then R is

   (1)*reflexive* (2) *symmetric*

   (3) *transitive* (4)*eqiuivalance*

3. If $|x + 2| \leq 9$, then x belongs to

   (1) $(-\infty,-7)$ (2) $[-11,7]$ (3) $(-\infty,-7) \cup [11,\infty)$ (4) $(-11,7)$

4. $\cos 1° + Cos2° + Cos3° + \cdots \ldots + Cos179°$ is

   (1)0 (2) 1 (3) -1 (4) 89

5. If 1+cos(x-y)=0 then

   (1)Cosx-cosy=0 (2)sinx+cosy=0 (3) cosx+cosy=0 (4) cosx+siny=0

6. In 3 fingers ,the number of ways four rings can be worn in _____ ways

   (1)4^3-1 (2) 3^4 (3) 68 (4) 64

7. The number of rectangles that a chessboard has

   (1) 81 (2) 9^9 (3) 1296 (4) 6561

8. The coefficient of x^6 in the expansion of $(2+2x)^{10}$ is

   (1)$10C_6$ (2) 2^6 (3) $10C_6 2^6$ (4) $10C_6 2^{10}$

9. The remainder when 52^{40} is divided by 17 is

   (1)1 (2) 5 (3) 3 (4) 6

10. The slope of the line which makes an angle 45 with the line 3x-y+5=0 are

    (1)1,-1 (2) 1/2,-2 (3) 1,1/2 (4) 2,-1/2

11. The intercepts of the line perpendicular bisector of the line segment joining (1,2) and (3,4) with the coordinate axes are

    (1)5,-5 (2) 5,5 (3) 5,3 (4) 5,-4

12. The value of x, for which the matrix $A = \begin{bmatrix} e^{x-2} & e^{7+x} \\ e^{2+x} & e^{2x+3} \end{bmatrix}$ is singular is

    (1) 9 (2) 8 (3) 7 (4) 6

13. If the points (x ,2), (5, 2), (8,8) are collinear, then x is equal to

(1) -3 (2) 1/3 (3) 1 (4) 3

14. If $|\vec{a}+\vec{b}| = 60, |\vec{a}-\vec{b}| = 40$ and $|\vec{b}| = 46$, then $|\vec{a}|$ is

(1) 42 (2) 12 (3) 22 (4) 32

15. If $\alpha\hat{\imath} + 2 \propto \hat{\jmath} + 2 \propto \hat{k}$ is a unit vector, then the value of $\propto$ is

(1) 1/3 (2) 1/4 (3) 1/9 (4) 1/2

16. $\lim_{x\to\infty} \frac{Sinx}{x}$

(1)1 (2) 0 (3) ∞ (4) -∞

17. If y=mx+c and f(0)=f'(0)=1 ,then f(2) is

(1)1 (2)2 (3) 3 (4) -3

18. If f(x) =x+4 then f'(f(x)) at x=4 is

(1)8 (2) 1 (3) 4 (4) 5

19. $\int x^2 Cosx\, dx =$

(1) $x^2Sinx + 2xCosx - 2Sinx + c$ (2) $x^2Sinx - 2xCosx - 2Sinx + c$

(3) $-x^2Sinx + 2xCosx + 2Sinx + c$ (4) $-x^2Sinx - 2xCosx + 2Sinx + c$

20. Ten coins are tossed. The probability of getting at least 8 heads is

(1)7/64 (2) 7/32 (3) 7/16 (4) 7/128

II. Answer any 7 of the following .Q.No 30 is compulsory 7x2=14

21. Find the number of subsets of A if $A = \{x: x = 4n + 1, 2 \le n \le 5, n \in N\}$.

22. Find the value of Cos 75°

23. Find the distance between the line 4x + 3y + 4=0 and a point (7,-3)

24. Find the zeros of the polynomial function $f(x) = 4x^2 - 25$.

25. If A and B are square matrices of order 3 such that | A | = -1 and |B| = 3, find the value of |3AB|.

26. Find the projection of the vector $\hat{\imath} + 3\hat{\jmath} + 7\hat{k}$ on the vector $2\hat{\imath} + 6\hat{\jmath} + 3\hat{k}$.

27. Evaluate $\lim_{x\to\infty} \left(1 + \frac{1}{x}\right)^{7x}$

28. Differentiate 2^x

29. If f'(x)= 4x-5 and f(2) =1, find f(x)

30. A die is rolled. If it shows an odd number, then find the probability of getting 5.

III. Answer any 7 of the following .Q.No 40 is compulsory **7x3=21**

31. Find the range of the function $\frac{1}{2\cos x - 1}$.

32. If A+B=45°,Show that (1+tanA)(1+tanB)=2

33. Find the last two digits of the number 3^{600}.

34. Find the equation of a straight line parallel to $2x + 3y = 10$ and which is such that the sum of its intercepts on the axes is 15.

35. Determine the value of x + y if $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$

36. A bag contains 7 red and 4 black balls. 3 balls are drawn at random.Find the probability that (i) all are red (ii) one red and 2 black.

37. Find the positive integer n so that $\lim_{x \to 3} \frac{x^n - 3^n}{x-3} = 27$

38. Find dy / dx if $x = a(t - \sin t)$, $y = a(1 - \cos t)$.

39. Integrate $\int \sqrt{1 + sin2x}\, dx$

40. Find the angle between the vectors $2\hat{\imath} + \hat{\jmath} - \hat{k}$ and $\hat{\imath} + 2\hat{\jmath} + \hat{k}$ using vector product.

IV. Answer the following **7x5=35**

41. a)If $\theta + \phi = \alpha$ and $tan\,\theta = k\, tan\,\phi$, then prove that

$$sin(\theta - \phi) = \frac{k-1}{k+1} sin\,\alpha.$$ (OR)

b)Write the values of f at $-3,5,2,-1,0$ if

$$f(x) = \begin{cases} x^2 + x - 5 \text{ if } x \in (-\infty, 0) \\ x^2 + 3x - 2 \text{ if } x \in (3, \infty) \\ x^2 \text{ if } x \in (0,2) \\ x^2 - 3 \text{ otherwise} \end{cases}$$

42. a)Resolve into partial fraction $\frac{2x}{(x^2+1)(x-1)}$. (OR)

b)The seventh term of an arithmetic progression is 30 and tenth term is (i) Find the first three terms of an A.P. (ii) Which term of the A.P. is zero (if exists) (iii) Find the relationship between Slope of the straight line and common difference of A.P.

43. a)Use induction to prove that

$1^2 + 2^2 + 3^2 + \cdots \ldots \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$,for all natural numbers n (OR)

b)State and prove any one of the Napier's formulae

44. a)There are two identical Urns containing respectively 6 black and 4 red balls, 2 black and 2 red balls. An Urn is chosen at random and a ball is drawn from it. (i) find the probability that the ball is black (ii) if the ball is black, what is the probability that it is from the first urn?

(OR)

Evaluate $\lim_{x\to\infty}\left(\frac{x^2-2x+1}{x^2-4x+2}\right)^x$

45. a) If *ABCD* is a quadrilateral and *E* and *F* are the midpoints of *AC* and *BD* respectively, then prove that $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD} = 4\overrightarrow{EF}$.

(OR)

b) If one root of $k(x-1)^2 = 5x - 7$ is double the other root, show that $k = 2$ or -25.

46. a)Integrate $\int \frac{(5x-2)dx}{x^2+2x+2}$ (OR)

b)Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$.

47. a)Show that the equation $4x^2+4xy+y^2-6x-3y-4=0$ represents a pair of parallel lines . Find the distance between them (OR)

b)If $y=\frac{\sin^{-1}x}{\sqrt{1-x^2}}$ then prove that $(1-x^2)y_2-3xy_1-y=0$

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