SECOND REVISION EXAMINATION - 2023

11 - STD **MATHS**

Exam Time : 03:00:00 Hrs Reg.No. :

Total Marks : 90

I. **ANSWER THE FOLLOWING** 20 x 1 = 20

1) The function f:[0,2π]→[-1,1] defined by f(x) = sin x is

(a) one-to-one (b) on to (c) bijection (d) cannot be defined

2) The rule $f(x) = x^2$ is a bijection if the domain and the co-domain are given by

(a) R, R (b) R, $(0, \infty)$ (c) $(0, \infty)$, R (d) $[0, \infty)$, $[0,\infty)$

3) The solution 5x-1< 24 and 5x+1 > -24 is

(a) (4,5) (b) (-5,-4) (c) (-5,5) (d) (-5,4)

4) If a and b are the real roots of the equation $x^2 - kx + c = 0$, then the distance between the points (a, 0) and (b, 0) is

(a) $\sqrt{k^2-4c}$ (b) $\sqrt{4k^2-c}$ (c) $\sqrt{4c-k^2}$ (d) $\sqrt{k-8c}$

5) $\left(1+cos\frac{\pi}{8}\right)\left(1+cos\frac{3\pi}{8}\right)\left(1+cos\frac{5\pi}{8}\right)\left(1+cos\frac{7\pi}{8}\right) =$

(a) $\frac{1}{8}$ (b) $\frac{1}{2}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{2}}$

6) The number of 5 digit numbers all digits of which are odd is

(a) 25 (b) 5^5 (c) 5^6 (d) 625

7) The n^{th} term of the sequence 1, 2, 4, 7, 11,... is

(a) $n^3 + 3n^2 + 2n$ (b) $n^3 \cdot 3n^2 + 3n$ (c) $\frac{n(n+1)(n+2)}{3}$ (d) $\frac{n^2-n+2}{2}$

8) Which of the following point lie on the locus of $3x^2 + 3y^2 - 8x - 12y + 17 = 0$

(a) (0, 0) (b) (-2, 3) (c) (1, 2) (d) (0, -1)

9) The line (p + 2q)x + (p - 3q)y = p - q for different values of p and q passes through the point

(a) $\left(\frac{3}{5},\frac{5}{2}\right)$ (b) $\left(\frac{2}{5},\frac{2}{5}\right)$ (c) $\left(\frac{3}{5},\frac{3}{5}\right)$ (d) $\left(\frac{2}{5},\frac{3}{5}\right)$

10) What must be the matrix X, if $2x + \begin{bmatrix}1 & 2\\3 & 4\end{bmatrix} = \begin{bmatrix}3 & 8\\7 & 2\end{bmatrix}$?

(a) $\begin{bmatrix}1 & 3\\2 & -1\end{bmatrix}$ (b) $\begin{bmatrix}1 & -3\\2 & -1\end{bmatrix}$ (c) $\begin{bmatrix}2 & 6\\4 & -2\end{bmatrix}$ (d) $\begin{bmatrix}2 & -6\\4 & -2\end{bmatrix}$

11) If $A + I = \begin{bmatrix}3 & -2\\4 & 1\end{bmatrix}$, then (A + I)(A - I) is equal to

(a) $\begin{bmatrix}-5 & -4\\8 & -9\end{bmatrix}$ (b) $\begin{bmatrix}-5 & 4\\-8 & 9\end{bmatrix}$ (c) $\begin{bmatrix}5 & 4\\8 & 9\end{bmatrix}$ (d) $\begin{bmatrix}-5 & -4\\-8 & -9\end{bmatrix}$

12) The value of $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{DA} + \overrightarrow{CD}$ is

(a) $\overrightarrow{AD}$ (b) $\overrightarrow{CA}$ (c) $\vec{0}$ (d) $-\overrightarrow{AD}$

13) If $\vec{a}$ and $\vec{b}$ are two vectors of magnitude 2 and inclined at an angle 60°, then the angle between $\vec{a}$ and $\vec{a}+\vec{b}$ is

(a) 30° (b) 60° (c) 45° (d) 90°

14) $lim_{x\to 0}\frac{xe^x - sin\,x}{x}$ is

(a) 1 (b) 2 (c) 3 (d) 0

15) If $y = \frac{1}{a-z}$, then $\frac{dz}{dy}$ is

(a) $(a-z)^2$ (b) $-(z-a)^2$ (c) $(z+a)^2$ (d) $-(z+a)^2$

16) If $y = \frac{(1-x)^2}{x^2}$, then $\frac{dy}{dx}$ is

(a) $\frac{2}{x^2} + \frac{2}{x^3}$ (b) $-\frac{2}{x^2} + \frac{2}{x^3}$ (c) $-\frac{2}{x^2} - \frac{2}{x^3}$ (d) $-\frac{2}{x^3} + \frac{2}{x^2}$

17) If $\int f(x)dx = g(x) + c$, then $\int f(x)g'(x)dx$

(a) $\int (f(x))^2 dx$ (b) $\int f(x)g(x)dx$ (c) $\int f'(x)g(x)dx$ (d) $\int (g(x))^2 dx$

18) $\int x^2 e^{\frac{x}{2}} dx$ is

(a) $x^2e^{\frac{x}{2}} - 4xe^{\frac{x}{2}} - 8e^{\frac{x}{2}} + c$ (b) $2x^2e^{\frac{x}{2}} - 8xe^{\frac{x}{2}} - 16e^{\frac{x}{2}} + c$ (c) $2x^2e^{\frac{x}{2}} - 8xe^{\frac{x}{2}} + 16e^{\frac{x}{2}} + c$

(d) $x^2\frac{e^{\frac{x}{2}}}{2} - \frac{xe^{\frac{x}{2}}}{4} + \frac{e^{\frac{x}{2}}}{8} + c$

19) A, B, and C try to hit a target simultaneously but independently. Their respective probabilities of hitting the target are $\frac{3}{4}, \frac{1}{2}, \frac{5}{8}$. The probability that the target is hit by A or B but not by C is

(a) $\frac{21}{64}$ (b) $\frac{7}{32}$ (c) $\frac{9}{64}$ (d) $\frac{7}{8}$

20) If m is a number such that $m \leq 5$, then the probability that quadratic equation $2x^2 + 2mx + m + 1 = 0$ has real roots is

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{4}{5}$

II. ANSWER ANY SEVEN (QUESTION NUMBER 30 COMPULSORY) $7 \times 2 = 14$

21) Write the following in roster form.
$\{x \in N : x^2 < 121$ and x is a prime$\}$

22) Solve $|2x - 17| = 3$ for x.

23) Write the n^{th} term of the following sequences
$\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \frac{9}{10}$

24) If p (r, c) is mid - point of a line segment between the axes, then show that $\frac{x}{r} + \frac{y}{c} = 2$

25) If the area of the triangle with vertices (- 3, 0), (3, 0) and (0, k) is 9 square units, find the values of k.

26) Find the value λ for which the vectors $\vec{a}$ and $\vec{b}$ are perpendicular, where $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$

27) Find the projection of the vector $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$.

28) Calculate $lim_{x \to \infty} \frac{x^3+2x+3}{(5x^2+1)}$.

29) Find $\frac{dy}{dx}$ if $x = a(t - \sin t)$, $y = a(1 - \cos t)$.

30) If for two events A and B, $P(A) = \frac{3}{4}$, $P(B) = \frac{2}{5}$ and $A \cup B = S$ (sample space), find the conditional probability P(A/B).

$\frac{\pi}{6}$ $\frac{\pi}{4}$ $\frac{\pi}{3}$ $\frac{\pi}{2}$
$\sqrt{\frac{0}{4}}$ $\sqrt{\frac{1}{4}}$ $\sqrt{\frac{2}{4}}$ $\sqrt{\frac{3}{4}}$ $\sqrt{\frac{4}{4}}$
0 $\frac{1}{2}$ $\frac{1}{\sqrt{2}}$ $\frac{\sqrt{3}}{2}$ 1
1 $\frac{\sqrt{3}}{2}$ $\frac{1}{\sqrt{2}}$ $\frac{1}{2}$ 0

III. ANSWER ANY SEVEN (QUESTION NUMBER 40 COMPULSORY) $7 \times 3 = 21$

31) Find the domain of $f(x) = \frac{1}{1-2\cos x}$.

32) Prove $log\frac{a^2}{bc} + log\frac{b^2}{ca} + log\frac{c^2}{ab} = 0$

33) Find the value of cosec (-1410°).

34) If ${}^nP_r = 720$. If ${}^nC_r = 120$, find n, r = ?

35) Find the equations of a parallel line and a perpendicular line passing through the point (1, 2) to the line 3x + 4y = 7.

36) For what value of x, the matrix A = $\begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & x^3 \\ 2 & -3 & 0 \end{bmatrix}$ is skew-symmetric.

37) Verify that | AB | = | A | | B | if A= $\begin{bmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{bmatrix}$ and B = $\begin{bmatrix} cos\theta & sin\theta \\ -sin\theta & cos\theta \end{bmatrix}$

$6 \times 5 \times 4 \times 3 \times 2 \times 1$
$\frac{126 \times 6}{720}$

38) Find the angle between the vectors $\hat{i} - \hat{j}$ and $\hat{j} - \hat{k}$.

39) Find the derivatives of the following functions with respect to corresponding independent variables : $y = e^x \sin x$

40) Find the integrals of the following : $\frac{1}{(x+1)^2-25}$

IV. ANSWER THE FOLLOWING $7 \times 5 = 35$

41) a) Let f, g: $R \to R$ be defined as f (x) = 2x - |x| and g(x) = 2x + |x|. find f o g.

(OR)

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

42) a) By the principle of mathematical induction, prove that, for all integers $n \geq 1$, $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$.

(OR)

b) Integrate the following with respect to x : $\int \frac{2x+4}{x^2+4x+6} dx$

43) a) Compute the sum of first n terms of the following series 6 + 66 + 666 + ...

(OR)

b) Prove by vector method,The medians of a triangle are concurrent.

44) 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) Show that the vectors $5\hat{i} + 6\hat{j} + 7\hat{k}, 7\hat{i} - 8\hat{j} + 9\hat{k}, 3\hat{i} + 20\hat{j} + 5\hat{k}$ are coplanar.

45) a) If $y = \frac{\sin^{-1}x}{\sqrt{1-x^2}}$, Show that $(1 - x^2) y_2 - 3x y_1 - y = 0$.

(OR)

b) A construction company employs 2 executive engineers. Engineer-1 does the work for 60% of jobs of the company. Engineer-2 does the work for 40% of jobs of the company. It is known from the past experience that the probability of an error when engineer-1 does the work is 0.03, whereas the probability of an error in the work of engineer-2 is 0.04. Suppose a serious error occurs in the work, which engineer would you guess did the work?

46) a) If $A + B + C = \frac{\pi}{2}$, prove the following sin 2A + sin 2B + sin 2C = 4 cos A cos B cos C

(OR)

b) Show that $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix}$ = (x - y)(y - z)(z - x).Using factor method.

47) a) Resolve into partial fractions: $\frac{x}{(x+3)(x-4)}$

(OR)

b) Evaluate the following limits :

$lim_{x \to 0} \frac{\sqrt{x^2+1}-1}{\sqrt{x^2+16}-4}$

160
40
220

16
18
34

5×220
1160

9×20
180

164×7
1148

2/5
7/8
?
8

7×20
40

4×164
48