Practice Paper-5

Section-I

Section Objective Type

Q 1.

The sum of the series $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + \ldots - 100^2$ is

a. – 10100

b. – 5050

c. – 2525

d. None of these

Q 2.

$\lim_{n\to\infty}\left[\frac{1}{1.3}+\frac{1}{2.4}+\frac{1}{3.5}+\ldots+\frac{1}{n(n+2)}\right]$ is

a. 0

b. 3/2

c. 1/2

d. 3/4

Q 3.

The equation $x^2y - 2xy + 2y = 0$ represents

a. a straight line

b. a circle

c. a hyperbola

d. None of the above

Q 4.

Two equal sides of an isosceles triangle are given by the equation $y = 7x \ and \ y = -x$ and its third side

passes through (1, - 10). Then the equation of the third side is

a. $3x + y + 7 = 0 \ or \ x - 3y - 31 = 0$

b. $x + 3y + 29 = 0 \ or - 3x + y + 13 = 0$

c. $3x + y + 7 = 0 \ or \ x + 3y + 29 = 0$

d. $x - 3y - 31 = 0 \ or - 3x + y + 13 = 0$

Q 5.

If then $\theta + \cot\theta = 4$, then θ, for some integer n, is

a. $\frac{n\pi}{2} + (-1)^n \frac{\pi}{12}$

b. $n\pi + (-1)^n \frac{\pi}{12}$

c. $n\pi + \frac{\pi}{12}$

d. $n\pi - \frac{\pi}{12}$

Q 6.

$\lim_{x\to 0} x \tan\frac{1}{x}$

a. equal 0

b. equal 1

c. equal ∞

d. does not exist

Q 7.

the value of the integral $\int_0^{\pi} |1 + 2\cos x|\, dx$ is

a. $\frac{\pi}{3} + \sqrt{3}$

b. $\frac{\pi}{3} + 2\sqrt{3}$

c. $\frac{\pi}{3} + 4\sqrt{3}$

d. $\frac{2\pi}{3} + 4\sqrt{3}$

Q 8.

If A and B are symmetric matrices, then $AB - BA$ is a

a. symmetric matrix

b. skew symmetric matrix

c. diagonal matrix

d. null matrix

Q9.

If three six faced fair dice are thrown together, the probability that the sum of the numbers appearing on the dice is 16 is

a. 1/36

b. 1/11

c. 1/12

d. 5/36

Section-II

Multiple Objective Type

Q 10.

Which of the following functions have their periods as rational numbers.

a. $\sin\frac{\pi x}{3} + \cos\frac{\pi x}{4}$

b. $\sin\frac{x}{3} + \cos\frac{x}{4}$

c. $5x - [5x]$

d. $\cos x + \cos \pi x$

Q 11.

which of the following functions have their second derivatives positive for all x

a. $y = x^4 + 5x^3 + 6x^2 - 3x + 11$

b. $x^4 - 2x^2 + 5$

c. $y = \frac{x}{1+x^2}$

d. $3x^2 - 2\sin x + 3\cos x - \frac{1}{8} sin2x$

Q 12.

Which of the following pairs of curves are orthogonal

a. $x^2 = 4(x - 2008), (x - 2008)^2 = 4y$

b. $x^2 + y^2 = 2x, x^2 + y^2 = 1$

c. $x^2 - y^2 = 5$

d. $x^2 + y^2 = 8, y^2 = 2x, \frac{x^2}{18} + \frac{y^2}{8} = 1$

Q13.

which of the following can be common tangent to the circles $x^2 + y^2 - 22x + 4y + 100 = 0$,

$x^2 + y^2 - 22x - 4y - 100 = 0$

a. $7x - 24y = 250$

b. $y + 1 = 2\left(x - \frac{11}{2}\right)$

c. $x = 0$

d. $3x + 4y = 50$

Q 14.

The equation $x^2 - 4x - 6 = \sqrt{2x^2 - 8x + 12}$

a. has two real roots

b. has two integer roots

c. has two rational roots

d. has no real roots.

Q 15.

Given three vectors $\vec{a} = 5i + 3j, \vec{b} = 2i, \vec{e} = 4i + 2j$ if $\propto, \beta, \lambda$ are real numbers such that $\propto^2 + \beta^2 +$

$\lambda^2 \neq 0$ but $\propto \vec{a} + \beta\vec{b} + \lambda\vec{c} = 0$ and c $B = 1$

a. $\propto = 2$

b. $\propto = -2$

c. $\lambda = -3$

d. $\lambda = 0$

Q 16.

The probability that a random arrangement of letters $i, i, i; n, n: 0, a, x$ will form the word invitation must be

a. 1/10

b. greater than ½

c. less than $\frac{1}{1500}$

d. $\frac{1}{15120}$

Q 17.

The value of the integral $S\int_{\frac{\pi}{6}}^{\frac{\pi}{3}}\left[1-\frac{1}{1-sin\left(2x+\frac{3\pi}{2}\right)}\right]dx$

a. must be rational

b. must be irrational

c. must be $\frac{1}{3}$

d. must be $\frac{1}{\sqrt{3}}$.

Section-III

Assertion-Reason Type

Q 18.

Statement-1:

Two real numbers x and y are chosen from the interval [0, 1] the probability that $y^2 \le x\ is\ \frac{2}{3}$. because

Statement-2

The area of the region within the square $0 \le x \le 1; 0 \le y \le 1$ satisfying $y^2 \le x\ is\ \frac{2}{3}$.

a. Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

b. Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1

c. Statement-1 is True, Statement-2 is False

d. Statement-1 is True, Statement-2 is True

Q 19.

Statement-1:

In any triangle, $\cos 2A + \cos 2B - \cos 2C \le \frac{3}{2}$. because

Statement-2:

$cos\ 2A + cos2B - cos2C \le 1 + \frac{1}{2}cos^2(A-b)$

a. Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

b. Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1

c. Statement-1 is True, Statement-2 is False

d. Statement-1 is True, Statement-2 is True

Q 20.

Statement-1:

If O and H be circumcenter and orthocenter of a triangle ABC and Q be any other point in the plane of the triangle then $\vec{Q}A + \vec{Q}B + \vec{Q}C - \vec{Q}H = 2\vec{Q}O$ because

Statement-2:

In any triangle, $|\vec{O}H| = R\sqrt{1 - 8\cos A\cos B\cos C}$

a. Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

b. Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1

c. Statement-1 is True, Statement-2 is False

d. Statement-1 is True, Statement-2 is True

Q 21.

Statement-1:

Over $\left[0, \frac{\pi}{2}\right]$the minimum and maximum values of $\frac{\sin 2x}{\sin(x+\pi/4)}$ are 1 and $\sqrt{2}$ respectively. because

Statement-2:

$sin\ x + cos\ x \in [1, \sqrt{2}]$ if $x \in \left[0, \frac{\pi}{2}\right]$

a. Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

b. Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1

c. Statement-1 is True, Statement-2 is False

d. Statement-1 is True, Statement-2 is True

Section-IV

Linked Comprehension Type

$M_{22\text{-}24}$: Paragraph for Question Nos. 22 to 24 *Consider the equation* $\frac{1}{sin\ x} + \frac{1}{1-sin\ x}$ *= a, where x is a real variable and a is a real parameter. Answer the following questions:*

Q 22.

All the values of x for which the equation is defined are

a. $x \neq n\pi$, $x \neq (2n + 1)\ \pi/2$

b. $x \neq n\pi$, $x \neq (4n + 1)\ \pi/2$

c. $x \neq n\pi$, $x \neq (4n - 1)\ \pi/2$

d. None of these

Q 23.

The least value of a for which the given equation has a solution in (0, π/2

a. 6

b. 7

c. 8

d. 9

Q 24.

If a = 10 then the number of solutions in $\left(0,\frac{\pi}{2}\right)\cup\left(\frac{\pi}{2},\pi\right)$must be

a. one

b. two

c. three

d. four

$M_{25\text{-}25}$: Paragraph for Question Nos. 22 to 24

Consider the biquadratic equation $x^4 + (n - 1)x^3 + x^2 + (n - 1)x + 1 = 0$, where h is a real parameter.

Answer the following questions:

Q 25.

If a non-zero complex β is a solution of the given equation then all the values of h for which $\beta + \frac{1}{\beta}$ is real lie in the interval

a. $(-\infty, 0) \cup (0, \infty)$

b. $(2, \infty)$

c. $(-\infty, -2)$

d. $(-\infty, \infty)$

Q 26.

The given equation has four real roots if

a. $h \leq -\frac{1}{2}$

b. $h \geq \frac{5}{2}$

c. $h \in \left[-\frac{1}{2}, -\frac{5}{2}\right]$

d. None of these

Q 27.

The given equation has two distinct negative roots if

a. $h \leq -\frac{1}{2}$

b. $h \leq -\frac{5}{2}$

c. $h \geq \frac{5}{2}$

d. None of these