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

Q 9.

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

Q 13.

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 $y^2 \leq x\ is\ \frac{2}{3}$. because

Statement-2

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

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, $\cos 2A + \cos 2B - \cos 2C \leq \frac{3}{2}$. because

Statement-2:

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

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, $\left|\vec{O}H\right| = R\sqrt{1 - 8\cos A cos\, B cos C}$

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:

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

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