

Studentpad

MHT-CET-XI MATHEMATICS 2022-23

Time : 150 Min

Maths : Full Portion Paper

Marks : 100

01) Suppose $r^n \rightarrow 0$ as $n \rightarrow \infty$, when $|r| < 1$, then

calculate $\lim_{n \rightarrow \infty} \frac{\sin(a/2^n)}{\sin(b/2^{n+1})}$.

- A) $\frac{a}{b}$
- B) 0
- C) $\frac{2a}{b}$
- D) $\frac{a}{2b}$

02) Suppose $y = \frac{x^{2/3} - x^{-1/3}}{x^{2/3} + x^{-1/3}}$, then evaluate

- $(x+1)^2 y_1$.
- A) $-1/3$
 - B) -3
 - C) 2
 - D) $2/3$

03) If $a^2 + b^2 = 1$, then evaluate $\frac{1+b+ia}{1+b-ia}$.

- A) 2
- B) 1
- C) $a+ib$
- D) $b+ia$

04) What is the sum of the coefficients of even powers of x in the expansion of

$$(1+x+x^2+x^2+x^3)^5?$$

- A) 512
- B) 510
- C) 506
- D) 508

05) Evaluate the values of a so that the function f

defined by $f(x) = \begin{cases} \frac{\sin^2 ax}{x^2}, & x \neq 0 \\ 1, & x = 0 \end{cases}$ is continuous at

- $x=0$.
- A) 0
 - B) ± 2
 - C) 3
 - D) ± 1

06) If x, y and θ are real numbers such that

$$\sin^2 \theta = \frac{x^2 + y^2}{2xy}, \text{ then } \dots$$

- A) $x=y$
- B) $x>y$
- C) $x<y$
- D) none of these

07) A line is equally inclined to the axes and the length of perpendicular from the origin upon the line is $\sqrt{2}$. What is the possible equation of the line?

- A) $y = \sqrt{2}x + 2$
- B) $y = x + \sqrt{2}$
- C) $y = x + 1$
- D) $x + y = 2$

08) What is the equation of median passing through A of $\triangle ABC$, where $A \equiv (-1, 6)$,

$B \equiv (-3, -9)$ and $C \equiv (5, -8)$?

- A) $29x + 4y + 5 = 0$
- B) $29x - 4y - 5 = 0$
- C) $13x - 14y - 47 = 0$
- D) $13x + 14y + 47 = 0$

09) Find how many numbers, greater than 23000, can be formed from the digits 1, 2, 3, 4, 5. When repetition is not allowed?

- A) 90
- B) 72
- C) 18
- D) None of these

10) Find : $2\log_b a^4 \cdot \log b^3 \cdot \log_a c^5$

- A) 30
- B) 120
- C) 60
- D) 60

11) Identify the not invertible function.

- A) $f: \mathbb{R}^+ \rightarrow \mathbb{R}, f(x) = \frac{1}{x^3}$
- B) $f: \mathbb{R} \rightarrow [0, \infty), f(x) = x^2$
- C) $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = 3x + 1$
- D) none of these

12) A and B are two events such that

$P(B) = \frac{3}{5}, P(A/B) = \frac{1}{2}$ and $P(A \cup B) = \frac{4}{5}$, then find $P(B/A')$.

- A) $\frac{1}{5}$
- B) $\frac{1}{2}$
- C) $\frac{3}{10}$

D) $\frac{3}{5}$

13) Suppose ${}^{2n}P_3 = 2({}^nP_4)$, then evaluate n.

- A) 12
B) 8
C) 6
D) 4

14) If x, y, z are in A.P., then: find out e^{-x} , e^{-y} , e^{-z} are in.

- A) G.P.
B) A. P.
C) H.P.
D) No definite sequence

15) In Class XI of a school 40% of the students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, calculate the probability that he will be studying Mathematics or Biology.

- A) 0.6
B) 0.4
C) 0.3
D) 0.1

16) In a circle of diameter 40 cm, the length of a chord is 20 cm. What is the length of minor arc of the chord?

- A) $\frac{10\pi}{3}$ cm
B) $\frac{20\pi}{3}$ cm
C) 20π cm
D) 10π cm

17) If $\{a_n\}$ is an A.P. of non-zero terms, thencalculate $\frac{1}{a_1 \cdot a_n} + \frac{1}{a_2 \cdot a_{n-1}} + \frac{1}{a_3 \cdot a_{n-2}} + \dots + \frac{1}{a_n \cdot a_1} = \dots$

- A) $\frac{a_n - a_1}{2} \left(\frac{1}{a_1} - \frac{1}{a_2} + \frac{1}{a_3} - \dots \right)$
B) $\frac{2}{a_n - a_1} \left(\frac{1}{a_1} - \frac{1}{a_2} + \frac{1}{a_3} - \dots \right)$
C) $\frac{a_1 + a_n}{2} \left(\frac{1}{a_1} + \frac{1}{a_2} + \dots + \frac{1}{a_n} \right)$
D) $\frac{2}{a_1 + a_n} \left(\frac{1}{a_1} + \frac{1}{a_2} + \dots + \frac{1}{a_n} \right)$

18) There are m A. M.'s between 1 and 31. If the ratio of the 7^{th} and $(m-1)^{\text{th}}$ means is 5 : 9, then find m.

- A) 16
B) 14
C) 12
D) 10

19) If the points (3, -2), (1, 0), (-1, -2) and (1, -4) are concyclic, then determine the radius of the circle.

- A) 2

- B) 1
C) 4
D) 16

20) If AB is a zero matrix, then

- A) $A = O$ or $B = O$
B) $A = O$ and $B = O$
C) It is not necessary that either $A = O$ or $B = O$
D) $A + B = O$

21)
$$\lim_{x \rightarrow 0} \frac{8}{x^8} \left[1 - \cos \frac{x^2}{2} - \cos \frac{x^2}{4} + \cos \frac{x^2}{2} \cos \frac{x^2}{4} \right] =$$

- A) $\frac{1}{32}$
B) $-\frac{1}{32}$
C) $\frac{1}{16}$
D) $-\frac{1}{16}$

22) If α , β are roots of $2x^2 - 35x + 2 = 0$,Then: $(2\alpha - 35)^3 \cdot (2\beta - 35)^3 =$

- A) 1
B) 64
C) 8
D) None of these

23) If $f(x) = \begin{vmatrix} x-3 & 2x^2-18 & 3x^3-81 \\ x-5 & 2x^2-50 & 4x^3-500 \\ 1 & 2 & 3 \end{vmatrix}$, then

calculate the value of $f(1) \cdot f(3) + f(3) \cdot f(5) + f(5) \cdot f(1)$.

- A) $f(3)$
B) $f(1) + f(5)$
C) $f(1)$
D) $f(1) + f(3)$

24) If $\sin \theta + \sin^2 \theta = 1$, then $\cos^2 \theta + \cos^4 \theta =$

- A) 0
B) 1
C) 2
D) 3

25) The tangent at point P on the parabola

 $y^2 = 4ax$ meets the y-axis in Q. If S is the focus, then what is the angle between SP and SQ?

- A) 30°
B) 45°
C) 90°
D) 0°

26) Find the equation of the circle passing through the point (2, 3) touching the line $2x + 3y = 4$ at point (2, 0).

- A) $x^2 + y^2 + 6x - 3y + 8 = 0$
B) $x^2 + y^2 + 6x + 3y + 8 = 0$

C) $x^2 + y^2 - 6x + 3y + 8 = 0$

D) $x^2 + y^2 - 6x - 3y + 8 = 0$

27) $\frac{d}{dx} \left(\frac{7x^2 - 2x + 4}{x^5} \right) =$

A) $21x^{-4} - 8x^{-5} + 20x^{-6}$

B) $21x^{-4} - 8x^{-5} + 20x^{-6}$

C) $-21x^{-4} - 8x^{-5} + 20x^{-6}$

D) $-(21x^{-4} - 8x^{-5} + 20x^{-6})$

28) If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ and $n \in \mathbb{N}$, then find the value of

A^n .

A) $2nA$

B) nA

C) $2^{n-1}A$

D) 2^nA

29) What is the value of

$\sin^2 0 + \sin^2 \left(\frac{\pi}{6} \right)^c + \sin^2 \left(\frac{\pi}{3} \right)^c + \sin^2 \left(\frac{\pi}{2} \right)^c ?$

A) 3

B) 4

C) 2

D) None of these

30) The variance of the numbers 2, 3, 11 and x is $\frac{49}{4}$. Evaluate x .

A) $6, \frac{14}{3}$

B) $6, \frac{16}{3}$

C) $6, \frac{14}{5}$

D) none of these

31) If $f(x) = \begin{cases} \frac{3\sin\pi x}{5x}, & x \neq 0 \\ 2k, & x = 0 \end{cases}$ is continuous at $x=0$,

then the value of k is equal to

A) $\frac{\pi}{10}$

B) $\frac{3\pi}{5}$

C) $\frac{3\pi}{10}$

D) $\frac{3\pi}{2}$

32) Let $(x, y) \rightarrow (1, 0)$ along the line $y = x - 1$, then

calculate $(x, y) \xrightarrow{\lim} (1, 0) \frac{y^3}{x^3 - y^2 - 1}$.

A) 0

B) -1

C) 1

D) ∞

33) Find the value of

$\sin 70^\circ \cos 10^\circ - \cos 70^\circ \sin 10^\circ ?$

A) $\frac{\sqrt{3}}{16}$

B) $\frac{\sqrt{3}}{8}$

C) $\frac{\sqrt{3}}{4}$

D) $\frac{\sqrt{3}}{2}$

34) What will be the coefficient of x^{-7} in theexpansion of $\left[ax - \frac{1}{bx^2} \right]^{11}$?

A) $\frac{-462a^6}{b^5}$

B) $\frac{462}{b^5} a^6$

C) $\frac{-462a^5}{b^6}$

D) $\frac{462a^5}{b^6}$

35) If $n \in \mathbb{N}$, then calculate ${}^{4n}C_{2n} \cdot {}^{2n}C_n$.

A) $\frac{[1.3.5...(2n-1)]^2}{1.3.5...(4n-1)}$

B) $\frac{[1.3.5...(4n-1)]^2}{1.3.5...(2n-1)}$

C) $\frac{1.3.5...(4n-1)}{[1.3.5...(2n-1)]^2}$

D) None of these

36) The value of p for which the function

$$f(x) = \begin{cases} \frac{(4^x - 1)^3}{\sin\left(\frac{x}{p}\right) \log\left(1 + \frac{x^2}{3}\right)}, & x \neq 0 \\ (12)(\log 4)^3, & x = 0 \end{cases}$$
 may be

continuous at $x = 0$, is

A) 4

B) 3

C) 2

D) 1

37) Coefficient of x^{-7} in the expansion of

$\left(ax - \frac{1}{bx^2} \right)^{11}$ is

A) $\frac{462a^6}{b^5}$

B) $\frac{462a^5}{b^6}$

C) $\frac{-462a^5}{b^6}$

D) $\frac{-462a^6}{b^5}$

38) If $\frac{\log a}{x+y-2z} = \frac{\log b}{y+z-2x} = \frac{\log c}{z+x-2y}$, then find out abc.

- A) 1
B) -1
C) 0
D) $\log abc$

39) $A \times B = B \times A$ iff

- A) $B \subset A$
B) $A \subset B$
C) $A = B$
D) None of these

40) Let $A = \{a, b, c\}$ and $f = \{(a, c), (b, a), (c, b)\}$ be a functions from A to A. Then find f^{-1} .

- A) $\{(c, a), (a, b), (b, c)\}$
B) $\{(a, c), (b, a), (c, b)\}$
C) $\{(a, a), (b, b), (c, c)\}$
D) none of these

41) If : $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = \tan^2 \theta + \cot^2 \theta + k$, then : K=

- A) 7
B) 1
C) 3
D) 5

42) If $\begin{vmatrix} x+1 & x+2 & x+3 \\ x+2 & x+3 & x+4 \\ x+a & x+b & x+c \end{vmatrix} = 0$, then a,b,c will be in

- A) G.P.
B) H.P.
C) A.P.
D) None of these

43) If the tangents at P and Q on a parabola (whose focus is S) meet at the point T, then SP, ST and SQ are in

- A) GP
B) A.P.
C) H.P.
D) none of these

44) The mean and standard deviations of two brands of watches are given below:

	Brand-I	Brand-II
Mean	36 months	48 months
S.D.	8 months	10 months

Find the correct statement.

- A) C.V. of Brand I < C.V. of Brand II
B) C.V. of Brand I = C.V. of Brand II
C) Brand II shows more variability
D) Brand I shows more variability

45) If $\cos x = -\frac{1}{3}$ and x lies in Quadrant III, then

what is $\sin \frac{x}{2}$?

- A) $\frac{\sqrt{6}}{3}$
B) $\frac{-\sqrt{6}}{3}$
C) $\frac{2\sqrt{3}}{3}$
D) $\frac{2}{\sqrt{3}}$

46) If 1 coin is tossed 3 times, then find the probability that at least one head occurs.

- A) $\frac{1}{2}$
B) $\frac{3}{8}$
C) $\frac{7}{8}$
D) $\frac{1}{8}$

47) ΔPQR is an equilateral triangle with side 18 cm. A circle is drawn on segment QR as diameter. What is the length of an arc of this circle intercepted within the triangle?

- A) 3π cm
B) 9π cm
C) 6π cm
D) 27π cm

48) Let $y = e^{1+\log x}$, then evaluate $\frac{dy}{dx}$.

- A) 1
B) e
C) $\log x \cdot e^{\log x}$
D) 0

49) If the roots of the equation $x^2 + kx + 24 = 0$ are in the ratio 2:3, then evaluate k.

- A) ± 10
B) ± 6
C) ± 4
D) None of these

50) The coefficient of the middle term in the binomial expansion in powers of x of $(1+ax)^4$ and of $(-1-ax)^6$ is the same if α is

- A) $-\frac{5}{3}$
B) $-\frac{3}{10}$
C) $\frac{10}{3}$
D) $\frac{3}{5}$