

**Consortium of Medical Engineering and Dental
Colleges of Karnataka
(COMEDK-2004)**

MATHEMATICS

1. If $\frac{\text{Log } x}{a-b} = \frac{\text{Log } y}{b-c} = \frac{\text{Log } z}{c-a}$ then $xyz =$
1) 0
2) 1
3) -1
4) 2
 2. The last digit in 7^{300} is
1) 7
2) 9
3) 1
4) 3
 3. How many numbers of 6 digits can be formed from the digits of the number 112233 ?
1) 30
2) 60
3) 90
4) 120
 4. The number of solutions for the equation $x^2 - 5|x| + 6 = 0$ is
1) 4
2) 3
3) 2
4) 1
 5. $0.5737373 \dots =$
1) $\frac{284}{497}$
2) $\frac{284}{495}$
3) $\frac{568}{999}$
4) $\frac{567}{990}$
-

6. If $ax^2 - y^2 + 4x - y = 0$ represents a pair of lines then $a = \dots\dots\dots$
- | | |
|--------|-------|
| 1) -16 | 2) 16 |
| 3) 4 | 4) -4 |
7. What is the equation of the locus of a point which moves such that 4 times its distance from the x -axis is the square of its distance from the origin?
- | | |
|-------------------------|---------------------------|
| 1) $x^2 + y^2 - 4y = 0$ | 2) $x^2 + y^2 - 4 y = 0$ |
| 3) $x^2 + y^2 - 4x = 0$ | 4) $x^2 + y^2 - 4 x = 0$ |
8. Equation of the straight line making equal intercepts on the axes and passing through the point (2, 4) is $\dots\dots\dots$
- | | |
|---------------------|----------------------|
| 1) $4x - y - 4 = 0$ | 2) $2x + y - 8 = 0$ |
| 3) $x + y - 6 = 0$ | 4) $x + 2y - 10 = 0$ |
9. If the area of the triangle with vertices $(x, 0)$, $(1, 1)$ and $(0, 2)$ is 4 square units then a value of x is $\dots\dots\dots$
- | | |
|-------|-------|
| 1) -2 | 2) -4 |
| 3) -6 | 4) 8 |
10. $\lim_{\theta \rightarrow \frac{\pi}{2}} \frac{\frac{\pi}{2} - \theta}{\cot \theta} =$
- | | |
|------|-------------|
| 1) 0 | 2) -1 |
| 3) 1 | 4) ∞ |

(Space for Rough Work)

11. $\lim_{x \rightarrow \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1} =$

1) e^{12}

2) e^{-12}

3) e^4

4) e^3

12. If $A + B + C = 180^\circ$ then $\sum \tan \frac{A}{2} \tan \frac{B}{2} =$

1) 0

2) 1

3) 2

4) 3

13. In a triangle ABC if $b = 2$, $B = 30^\circ$ then the area of the circumcircle of triangle ABC in square units is

1) π

2) 2π

3) 4π

4) 6π

14. If $\sin x + \sin^2 x = 1$ then, $\cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x =$

1) 1

2) 2

3) 3

4) 0

15. If R denotes the set of all real numbers then the function $f : R \rightarrow R$ defined by $f(x) = |x|$ is

1) one - one only

2) onto only

3) both one-one and onto

4) neither one-one nor onto

(Space for Rough Work)

16. Which of the following is the inverse of the proposition : "If a number is a prime then it is odd" ?

- 1) If a number is not a prime then it is odd.
- 2) If a number is not a prime then it is not odd.
- 3) If a number is not odd then it is not a prime.
- 4) If a number is odd then it is a prime.

17. $\sim p \wedge q$ is logically equivalent to

- 1) $p \rightarrow q$
- 2) $q \rightarrow p$
- 3) $\sim (p \rightarrow q)$
- 4) $\sim (q \rightarrow p)$

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

- 1) $\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$
- 2) $\begin{bmatrix} 1 & -3 \\ 2 & -1 \end{bmatrix}$
- 3) $\begin{bmatrix} 2 & 6 \\ 4 & -2 \end{bmatrix}$
- 4) $\begin{bmatrix} 2 & -6 \\ 4 & -2 \end{bmatrix}$

19. The value of $\begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ b+c & c+a & a+b \end{vmatrix}$ is

- 1) 1
- 2) 0
- 3) $(a-b)(b-c)(c-a)$
- 4) $(a+b)(b+c)(c+a)$

20. The value of $\begin{vmatrix} 441 & 442 & 443 \\ 445 & 446 & 447 \\ 449 & 450 & 451 \end{vmatrix}$ is

- 1) $441 \times 446 \times 451$
- 2) 0
- 3) -1
- 4) 1

(Space for Rough Work)

21. Inverse of the matrix $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$ is

1) $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

2) $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{bmatrix}$

3) $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

4) $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

22. If $|\vec{a}| = 3$, $|\vec{b}| = 4$ then a value of λ for which $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{a} - \lambda\vec{b}$ is

1) $\frac{9}{16}$

2) $\frac{3}{4}$

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

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

23. $(\vec{a} \cdot \hat{i})\hat{i} + (\vec{a} \cdot \hat{j})\hat{j} + (\vec{a} \cdot \hat{k})\hat{k} =$

1) \vec{a}

2) $2\vec{a}$

3) $3\vec{a}$

4) $\vec{0}$

24. The projection of $\vec{a} = 2\hat{i} + 3\hat{j} - 2\hat{k}$ on $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ is

1) $\frac{1}{\sqrt{14}}$

2) $\frac{2}{\sqrt{14}}$

3) $\sqrt{14}$

4) $\frac{-2}{\sqrt{14}}$

25. In the group $\{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7, $2^{-1} \times 4 =$

1) 1

2) 4

3) 2

4) 3

(Space for Rough Work)

26. If Q_1 is the set of all rationals other than 1 with the binary operation $*$ defined by $a * b = a + b - ab$ for all a, b in Q_1 then the identity in Q_1 w.r.t. $*$ is
- 1) 1
 - 2) 0
 - 3) -1
 - 4) 2
27. Which of the following is true ?
- 1) The set of all fourth roots of unity is a multiplicative group.
 - 2) The set of all cube roots of unity is an additive group.
 - 3) $(ab)^{-1} = a^{-1}b^{-1}$ for all a, b in any group G .
 - 4) If $(ab)^2 = a^2b^2$ for all a, b in any group G , then the group G is nonabelian.
28. The set of all integral multiples of 5 is a subgroup of
- 1) The set of all rational numbers under multiplication.
 - 2) The set of all integers under multiplication.
 - 3) The set of all nonzero rational numbers under multiplication.
 - 4) The set of all integers under addition.
29. The circle $x^2 + y^2 - 8x + 4y + 4 = 0$ touches
- 1) x - axis
 - 2) y - axis
 - 3) both axes
 - 4) neither x - axis nor y - axis
30. The value of k so that $x^2 + y^2 + kx + 4y + 2 = 0$ and $2(x^2 + y^2) - 4x - 3y + k = 0$ cut orthogonally is
- 1) $\frac{10}{3}$
 - 2) $\frac{-8}{3}$
 - 3) $\frac{-10}{3}$
 - 4) $\frac{8}{3}$

(Space for Rough Work)

31. The coaxal system of circles given by $x^2 + y^2 + 2gx + c = 0$ for $c < 0$ represents.
- 1) intersecting circles
 - 2) non intersecting circles
 - 3) touching circles
 - 4) touching or non intersecting circles
32. The radius of the circle passing through the point (6, 2) and two of whose diameters are $x + y = 6$ and $x + 2y = 4$ is.
- 1) 4
 - 2) 6
 - 3) 20
 - 4) $\sqrt{20}$
33. If (0, 6) and (0, 3) are respectively the vertex and focus of a parabola then its equation is
- 1) $x^2 + 12y = 72$
 - 2) $x^2 - 12y = 72$
 - 3) $y^2 - 12x = 72$
 - 4) $y^2 + 12x = 72$
34. For the ellipse $25x^2 + 9y^2 - 150x - 90y + 225 = 0$ the eccentricity, $e =$
- 1) $\frac{2}{5}$
 - 2) $\frac{3}{5}$
 - 3) $\frac{4}{5}$
 - 4) $\frac{1}{5}$
35. If the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide then the value of b^2 is
- 1) 1
 - 2) 7
 - 3) 5
 - 4) 9

(Space for Rough Work)

36. The equation of the director circle of the hyperbola $\frac{x^2}{16} - \frac{y^2}{4} = 1$ is given by

1) $x^2 + y^2 = 16$

2) $x^2 + y^2 = 4$

3) $x^2 + y^2 = 20$

4) $x^2 + y^2 = 12$

37. If $0 \leq x \leq \pi$ and $81^{\sin^2 x} + 81^{\cos^2 x} = 30$ then $x =$

1) $\frac{\pi}{6}$

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

3) $\frac{\pi}{4}$

4) $\frac{3\pi}{4}$

38. If $\sin^{-1} \frac{x}{5} + \operatorname{Cosec}^{-1} \frac{5}{4} = \frac{\pi}{2}$ then $x =$

1) 1

2) 4

3) 3

4) 5

39. If $\cos^{-1} p + \cos^{-1} q + \cos^{-1} r = \pi$ then $p^2 + q^2 + r^2 + 2pqr =$

1) 3

2) 1

3) 2

4) -1

40. The smallest positive integer n for which $(1+i)^{2n} = (1-i)^{2n}$ is

1) 1

2) 2

3) 3

4) 4

(Space for Rough Work)

46. If $x = a \left(t - \frac{1}{t} \right)$, $y = a \left(t + \frac{1}{t} \right)$ then $\frac{dy}{dx} =$

1) $\frac{y}{x}$

2) $\frac{-y}{x}$

3) $\frac{x}{y}$

4) $\frac{-x}{y}$

47. If $x = A \cos 4t + B \sin 4t$ then $\frac{d^2x}{dt^2} =$

1) $-16x$

2) $16x$

3) x

4) $-x$

48. For the curve $y^n = a^{n-1}x$ if the subnormal at any point is a constant then $n =$

1) 1

2) 2

3) -2

4) -1

49. If the distance 's' metres traversed by a particle in 't' seconds is given by $s = t^3 - 3t^2$, then the velocity of the particle when the acceleration is zero, in metres/sec is

1) 3

2) -2

3) -3

4) 2

50. The maximum of the function $3 \cos x - 4 \sin x$ is

1) 2

2) 3

3) 4

4) 5

(Space for Rough Work)

56. $\int_0^{\pi/2} \frac{\cos x - \sin x}{1 + \cos x \sin x} dx =$

1) 0

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

3) $\frac{\pi}{4}$

4) $\frac{\pi}{6}$

57. $\int_0^{\pi/8} \cos^3 4\theta d\theta =$

1) $\frac{2}{3}$

2) $\frac{1}{4}$

3) $\frac{1}{3}$

4) $\frac{1}{6}$

58. The area enclosed between the curves $y = x^3$ and $y = \sqrt{x}$ is, in square units

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

2) $\frac{5}{4}$

3) $\frac{5}{12}$

4) $\frac{12}{5}$

59. The degree of the differential equation $\left(1 + \left(\frac{dy}{dx}\right)^2\right)^{3/4} = \left(\frac{d^2y}{dx^2}\right)^{1/3}$ is

1) $\frac{1}{3}$

2) 4

3) 9

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

60. The general solution of the differential equation $\frac{dy}{dx} + \frac{1 + \cos 2y}{1 - \cos 2x} = 0$ is given by

1) $\tan y + \cot x = c$

2) $\tan y - \cot x = c$

3) $\tan x - \cot y = c$

4) $\tan x + \cot y = c$

(Space for Rough Work)