Consortium of Medical Engineering and Dental Colleges of Karnataka

(COMEDK-2007)

MATHEMATICS

1.	7^{2Log7}	is equal to	

1) 5

2) Log₇35

3) Log₇25

4) 25

2. In the group $(G \otimes_{15})$, where $G = \{3, 6, 9, 12\}$, \otimes_{15} is multiplication modulo 15, the identity element is

1) 6

2) 3

3) 9

4) 12

3. A group (G *) has 10 elements. The minimum number of elements of G, which are their own inverses is

1) 1

2) 2

3) 0

4) 9

4. If \vec{a} and \vec{b} are vectors such that $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then the angle between \vec{a} and \vec{b} is

1) 60^{0}

2) 120⁰

3) 300

4) 90⁰

5. $\frac{3x^2 + 1}{x^2 - 6x + 8}$ is equal to

1) 2(x-4) 2(x-2)

2) $3 + \frac{49}{2(x-4)}$ 2(x-2)

3) $2(x-4) + 13 \\ 2(x-2)$

- **6.** If $\vec{a} = 2\hat{i} + 3\hat{j} \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} 5\hat{k}$, $\vec{c} = 3\hat{i} + 5\hat{j} \hat{k}$, then a vector perpendicular to \vec{a} and in the plane containing \vec{b} and \vec{c} is
 - 1) $17 \hat{i} + 21 \hat{j} 123 \hat{k}$

2) $-17\hat{i} + 21\hat{j} - 97\hat{k}$

- 3) $-17\hat{i} 21\hat{j} 97\hat{k}$
- 4) $-17\hat{i} 21\hat{j} + 97\hat{k}$
- 7. \overrightarrow{OA} and \overrightarrow{BO} are two vectors of magnitudes 5 and 6 respectively. If $|BOA| = 60^{\circ}$, then $\overrightarrow{OA} \cdot \overrightarrow{OB}$ is equal to
 - 1) 15

2) 0

3) $15\sqrt{3}$

- 4) -15
- 8. A vector perpendicular to the plane containing the points A(1, -1, 2), B(2, 0, -1), C(0, 2, 1) is
 - 1) $8\hat{i} + 4\hat{j} + 4\hat{k}$

2) $4\hat{i} + 8\hat{j} - 4\hat{k}$

3) $\hat{i} + \hat{j} - \hat{k}$

- 4) $3\hat{i} + \hat{j} + 2\hat{k}$
- 9. $\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \dots + \frac{1}{(3n-1)(3n+2)} =$
 - 1) $n \\ 6n+3$

 $\binom{n}{6n-4}$

3) $n+1 \\ 6n+4$

- 4) 6n + 4
- 10. The ninth term of the expansion $\left(3x \frac{1}{2x}\right)^8$ is
 - 1) $\frac{-1}{512x^9}$

2) $\frac{1}{512x^9}$

 $\frac{1}{3}$ 256 · r^8

 $4) \quad \frac{-1}{256 \cdot x^8}$

11. If
$$A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$$
, 1

11. If
$$A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$$
, $10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$ and B is the inverse of A , then the value of α is

3) 4

4) 5

12. If
$$A = \begin{bmatrix} 0 & x & 16 \\ x & 5 & 7 \\ 0 & 9 & x \end{bmatrix}$$
 is singular, then the possible values of x are

1) 0, 1, -1

2) 0, +12, -12 4) 0, 4, -4

3) 0, 5, -5

13. If
$$A = \begin{bmatrix} 1 & -2 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$$
, then $A \text{ adj}(A)$ is equal to

 $\begin{bmatrix}
5 & 0 & 0 \\
0 & 5 & 0 \\
0 & 0 & 5
\end{bmatrix}$

14. If
$$f: R \to R$$
 is defined by $f(x) = |x|$, then,

1) $f^{-1}(x) = \frac{1}{|x|}$

2) $f^{-1}(x) = -x$

3) $f^{-1}(x) = \frac{1}{x}$

4) The function $f^{-1}(x)$ does not exist.

15. The value of
$$\begin{vmatrix} x & p & q \\ p & x & q \\ p & q & x \end{vmatrix}$$
 is

1)
$$(x-p)(x-q)(x+p+q)$$

$$2) \quad x(x-p)(x-q)$$

3)
$$pq(x-p)(x-q)$$

4)
$$(p-q)(x-q)(x-p)$$

16. The number of common tangents to the circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 6x - 8y - 24 = 0$ is,

1) 4

2) 3

3) 1

4) 2

17. If 3x + y + k = 0 is a tangent to the circle $x^2 + y^2 = 10$, the values of k are,

 $1) \pm 5$

 $2) \pm 7$

 $3) \pm 9$

 $4) \pm 10$

18. The negation of the proposition "If 2 is prime, then 3 is odd" is

1) 2 is prime and 3 is not odd

2) If 2 is not prime then 3 is not odd

3) If 2 is not prime then 3 is odd

4) 2 is not prime and 3 is odd.

19. The equation to two circles which touch the Y-axis at (0, 3) and make an intercept of 8 units on X-axis are

1) $x^2 + y^2 \pm 6x - 10y + 9 = 0$

2) $x^2 + y^2 \pm 10x - 6y + 9 = 0$

3) $x^2 + y^2 + 10x \pm 6y + 9 = 0$

4) $x^2 + y^2 - 8x \pm 10y + 9 = 0$

20. The orthocentre of the triangle with vertices A(0, 0), $B(0, \frac{3}{2})$, C(-5, 0) is

1) $\left(-\frac{5}{2}, \frac{3}{4}\right)$

2) $(\frac{5}{2}, \frac{3}{4})$

3) (0, 0)

4) (-5, 3/2)

- 21. $x^2 + y^2 6x 6y + 4 = 0$, $x^2 + y^2 2x 4y + 3 = 0$, $x^2 + y^2 + 2kx + 2y + 1 = 0$ If the Radical centre of the above three circles exists, then which of the following cannot be the value of k?
 - 1) 1

2) 2

3) 4

- 4) 5
- 22. If the circles $x^2 + y^2 2x 2y 7 = 0$ and $x^2 + y^2 + 4x + 2y + k = 0$ cut orthogenally, then the length of the common chord of the circles is
 - 1) 2

2) $\sqrt[12]{\sqrt{13}}$

3) 8

- 4) {
- 23. The co-ordinates of the foot of the perpendicular drawn from the point (3, 4) on the line 2x + y 7 = 0 is
 - 1) (1, 5)

 $2) \quad \left(\frac{9}{5}, \frac{17}{5}\right)$

3) (1, -5)

- 4) (-5, 1)
- 24. The area enclosed by the pair of lines xy = 0, the line x 4 = 0 and y + 5 = 0 is
 - 1) 10 sq. units.

2) 20 sq. units

3) 0 sq. units.

- 4) $\frac{5}{4}$ sq. units.
- 25. If the area of the auxillary circle of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 (a > b)$ is twice the area of the ellipse, then the eccentricity of the ellipse is
 - 1) $\frac{\sqrt{3}}{2}$

 $\begin{array}{cc} & 1 \\ 2) & \sqrt{2} \end{array}$

3) 1 2

4) $\sqrt{3}$

- **26.** A graph G has 'm' vertices of odd degree and 'n' vertices of even degree. Then which of the following statements is necessarily true?
 - 1) m + n is an even number
- 2) m + n is an odd number
- 3) m + 1 is an odd number
- 4) n+1 is an even number
- 27. If p is any point on the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$, and S and S' are the foci, then PS + PS' =
 - 1) 8

2) 4

3) 12

- 4) 10
- 28. The value of $Sin\left[2Cos^{-1}\frac{\sqrt{5}}{3}\right]$ is
 - 1) $\frac{2\sqrt{5}}{3}$

2) $\sqrt{5}$

3) $\frac{2\sqrt{5}}{9}$

- 4) $\frac{4\sqrt{5}}{9}$
- 29. If $\frac{x^2}{36} \frac{y^2}{k^2} = 1$ is a hyperbola, then which of the following statements can be true?
 - 1) (3, 1) lies on the hyperbola
- 2) (-3, 1) lies on the hyperbola
- 3) (5, 2) lies on the hyperbola
- 4) (10, 4) lies on the hyperbola

- 30. The focus of the parabola is
 - $1) \quad \left(\frac{1}{3}, \, \frac{-3}{2}\right)$

 $2) \quad \left(\frac{-1}{3}, \frac{3}{2}\right)$

 $3) \quad \left(\frac{1}{3}, \frac{-1}{2}\right)$

 $4) \quad \left(\frac{1}{3}, \frac{3}{2}\right)$

- 31. The solution of $Tan^{-1}x + 2Cot^{-1}x = \frac{2\pi}{3}$ is
 - 1) $\sqrt{3}$

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

3) $\sqrt{3}$

- **4**) −√3
- 32. $Sin^217.5^0 + Sin^272.5^0$ is equal to
 - 1) $Tan^2 45^0$

2) $Cos^2 90^0$

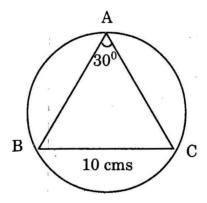
3) $Sin^2 45^0$

- 4) $Cos^2 30^0$
- 33. The conjugate of the complex number $\frac{(1+i)^2}{1-i}$ is
 - 1) 1+i

2) 1-i

3) -1-i

- 4) -1+i
- **34.** ABC is a triangle with $\underline{A} = 30^0$ BC = 10 cms. The area of the circum-circle of the triangle is



1) 5 sq. cms.

2) 100π sq. cms.

3) $\frac{100\,\pi}{3}$ sq. cms.

- 4) 25 sq. cms.
- **35.** If $Sin 3\theta = Sin \theta$, how many solutions exist such that $-2\pi < \theta < 2\pi$?
 - 1) 9

2) 8

3) 7

4) 5

- **36.** The imaginary part of i^i is
 - 1) 1

.2) 0

3) -1

4) 2

- 37. The amplitude of $(1+i)^5$ is
 - 1) $\frac{-3\pi}{4}$

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

3) $\frac{5\pi}{4}$

- 4) $\frac{-5\pi}{4}$
- **38.** ABC is a tringle. G is the centroid. D is the mid point of BC. If A = (2, 3) and G = (7, 5), then the point D is
 - 1) $\left(\frac{19}{2}, 6\right)$

 $2) \quad \left(\frac{9}{2}, \ 4\right)$

3) $\left(8, \frac{13}{2}\right)$

- 4) $\begin{pmatrix} 11 & 11 \\ 2 & 2 \end{pmatrix}$
- 39. $\lim_{x \to 1} \frac{Tan(x^2-1)}{x-1}$ is equal to
 - 1)

2) 2

3) -1

4) -2

- **40.** If $y = 2^{Log x}$, then $\frac{dy}{dx}$ is
 - 1) $2^{Log x} \cdot Log 2$

 $\begin{array}{c}
2^{Log x} \\
2) & Log 2
\end{array}$

3) $\frac{2^{Log x} \cdot Log 2}{}$

 $4) \quad 2^{\text{Log } x}$

41. If
$$Sec^{-1}\left(\frac{1+x}{1-y}\right) = a$$
, then $\frac{dy}{dx}$ is

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

$$2) \quad \frac{y-1}{x+1}$$

3)
$$x-1$$
 $y+1$

4)
$$x-1$$

42. If
$$y = \cos^2 \frac{3x}{2} - \sin^2 \frac{3x}{2}$$
, then $\frac{d^2y}{dx^2}$ is

2)
$$-3\sqrt{1-y^2}$$

3)
$$3\sqrt{1-y^2}$$

43. If the function
$$f(x) = \begin{cases} \frac{1 - \cos x}{x^2} & \text{for } x \neq 0 \\ k & \text{for } x = 0 \end{cases}$$
 is continuous at $x = 0$, then the value

of k is

1) 0

2) 1

3) -1

4) 1/2

44. If 1, w,
$$w^2$$
 are the cube roots of unity then $(1+w)(1+w^2)(1+w^4)(1+w^8)$ is equal to

1) 0

2)

3) w

4) w^2

45. If
$$x^x = y^y$$
 then $\frac{dy}{dx}$ is

1) x

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

3) $\frac{1 + Log x}{1 + Log y}$

4) $1 + Log\left(\frac{x}{y}\right)$

46.	The point on the curve $y^2 = x$,	the tangent at which makes an angle 45^0 with X-axis is
	1) $(\frac{1}{2}, \frac{1}{4})$	2) $\left(\frac{1}{4}, \frac{1}{2}\right)$

3)
$$\begin{pmatrix} \frac{1}{2}, & \frac{1}{2} \end{pmatrix}$$

4)
$$\left(\frac{1}{2}, -\frac{1}{2}\right)$$

47. The length of the subtangent to the curve $x^2y^2 = a^4$ at (-a, a) is

1) 2 a

 $2) \quad \frac{a}{2}$

3) $\frac{a}{3}$

4) a

48. The number of positive divisors of 252 is

1) 5

2) 9

3) 10

4) 18

49. The remainder obtained when 5^{124} is divided by 124 is

1) 0

2) 5

3) 1

4) 2

50. Which of the following is not a group with respect to the given operation?

- 1) The set of odd integers under additon.
- 2) The set of even integers under addition.
- 3) $\{1, -1\}$ under multiplication.
- 4) $\{0\}$ under addition.

- 51. The range in which $y = -x^2 + 6x 3$ is increasing is
 - 1) x > 3

2) x < 3

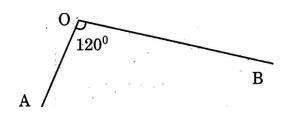
3) 5 < x < 6

- 4) 7 < x < 8
- **52.** The value of the integral $\int_{0}^{\pi/2} \left(\sin^{100} x \cos^{100} x \right) dx$ is
 - 1) $\frac{100!}{(100)^{100}}$

2) 100

3) 0

- 4) 100
- of 120°. X and Y start from 'O' at the same time. X travels along OA with a speed of 4 km/hour and Y travels along OB with a speed of 3 km/hour. The rate at which the shortest distance between X and Y is increasing after 1 hour is



1) 37 km/hour

2) $\sqrt{37}$ km/hour

3) $\sqrt{13}$ km/hour

- 4) 13 km/hour
- **54.** If $k \int_{0}^{1} x \cdot f(3x) dx = \int_{0}^{3} t \cdot f(t) dt$, then the value of k is
 - 1) 3

2) 9

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

- 4) 1/9
- **55.** The value of $\int_{1+\cos 8x}^{1} dx$ is
 - $1) \quad \frac{Tan\,8\,x}{8} + C$

2) $\frac{Tan 2x}{8} + C$

3) Tan 4x + C

4) $\frac{Tan\,4x}{4} + C$

- **56.** The value of $\int e^x \left(x^5 + 5x^4 + 1\right) \cdot dx$ is
 - 1) $e^x \cdot x^5 + e^x + C$

2) $e^x \cdot x^5$

3) $5x^4 \cdot e^x$

4) $e^{x+1} \cdot x^5 + C$

- 57. The value of $\int \frac{x^2+1}{x^2-1} dx$ is
 - 1) $Log\left(\frac{x+1}{x-1}\right)+C$

2) $Log\left(\frac{x-1}{x+1}\right)+C$

3) $Log(x^2-1)+C$

- 4) $x + Log\left(\frac{x-1}{x+1}\right) + C$
- 58. The area bounded by the curve $x = 4 y^2$ and the Y-axis is
 - 1) 32 sq. units

2) 16 sq. units

3) $\frac{16}{3}$ sq. units

- 4) $\frac{32}{3}$ sq. units
- 59. The differential equation of the family of straight lines whose slope is equal to y-intercept is
 - $1) \quad \left(x+1\right)\frac{dy}{dx} + y = 0$

 $(x+1)\frac{dy}{dx} - y = 0$

 $3) \quad \frac{dy}{dx} = \frac{x+1}{y+1}$

- $4) \quad \frac{dy}{dx} \frac{x-1}{y-1}$
- 60. The order and degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^5\right]^{\frac{3}{3}}=\frac{d^2y}{dx^2}$ are respectively
 - 1) 2, 1

2) 1, 5

3) 2, 3

4) 2, 5