# Consortium of Medical Engineering and Dental Colleges of Karnataka (COMEDK-2007) 

## MATHEMATICS

1. $7^{2 L o g}{ }_{7}^{5}$ is equal to
1) 5
2) $\log _{7} 35$
3) $\log _{7} 25$
4) 25
2. In the group $\left(G \otimes_{15}\right)$, 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) $120^{0}$
3) $30^{0}$
4) $90^{0}$
5. $\begin{gathered}3 x^{2}+1 \\ x^{2}-6 x+8\end{gathered}$ is equal to
1) $\begin{array}{cc}49 & 13 \\ 2(x-4) & 2(x-2)\end{array}$
2) $\begin{array}{cc}3+ & 49 \\ 2(x-4) & 13 \\ 2(x-2)\end{array}$
3) $\begin{gathered}49 \\ 2(x-4)\end{gathered}+\begin{gathered}13 \\ 2(x-2)\end{gathered}$
4) $\begin{gathered}-49 \\ 2(x-4)\end{gathered}+\begin{gathered}13 \\ 2(x-2)\end{gathered}$
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. $\quad \overrightarrow{O A}$ and $\overrightarrow{B O}$ are two vectors of magnitudes 5 and 6 respectively. If $\left\lfloor B O A=60^{\circ}\right.$, then $\overrightarrow{O A} \cdot \overrightarrow{O B}$ 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. $\frac{1}{2.5}+\frac{1}{5.8}+\frac{1}{8.11}+\ldots \ldots \ldots \ldots \ldots\left(\begin{array}{c}1 \\ (3 n-1)(3 n+2)\end{array}=\right.$
1) $\begin{gathered}n \\ 6 n+3\end{gathered}$
2) $\begin{gathered}n \\ 6 n-4\end{gathered}$
3) $\begin{gathered}n+1 \\ 6 n+4\end{gathered}$
4) $6 n+4$
10. The ninth term of the expansion $\left(3 x-\frac{1}{2 x}\right)^{8}$ is
1) $\begin{gathered}-1 \\ 512 x^{9}\end{gathered}$
2) $\frac{1}{512 x^{9}}$
3) $\begin{gathered}1 \\ 256 \cdot x^{8}\end{gathered}$
4) $\frac{-1}{256 \cdot x^{8}}$
11. If $A=\left[\begin{array}{ccc}1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1\end{array}\right], 10 B=\left[\begin{array}{ccc}4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3\end{array}\right]$ and $B$ is the inverse of $A$, then the value of $\alpha$ is
1) 0
2) 2
3) 4
4) 5
12. If $A=\left[\begin{array}{ccc}0 & x & 16 \\ x & 5 & 7 \\ 0 & 9 & x\end{array}\right]$ is singular, then the possible values of $x$ are
1) $0,1,-1$
2) $0,+12,-12$
3) $0,5,-5$
4) $0,4,-4$
13. If $A=\left[\begin{array}{ccc}1 & -2 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4\end{array}\right]$, then $A \operatorname{adj}(A)$ is equal to
1) $\left[\begin{array}{lll}5 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 5\end{array}\right]$
2) $\left[\begin{array}{lll}5 & 1 & 1 \\ 1 & 5 & 1 \\ 1 & 1 & 5\end{array}\right]$
3) $\left[\begin{array}{lll}0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0\end{array}\right]$
4) $\left[\begin{array}{lll}8 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 8\end{array}\right]$
14. If $f: R \rightarrow R$ is defined by $f(x)=|x|$, then,
1) $f^{-1}(x)=\begin{gathered}1 \\ |x|\end{gathered}$
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 $\left|\begin{array}{lll}x & p & q \\ p & x & q \\ p & q & x\end{array}\right|$ is
1) $(x-p)(x-q)(x+p+q)$
2) $x(x-p)(x-q)$
3) $p q(x-p)(x-q)$
4) $(p-q)(x-q)(x-p)$
16. The number of common tangents to the circles $x^{2}+y^{2}=4$ and $x^{2}+y^{2}-6 x-8 y-24=0$ is,
1) 4
2) 3
3) 1
4) 2
17. If $3 x+y+k=0$ 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) $x^{2}+y^{2} \pm 6 x-10 y+9=0$
2) $x^{2}+y^{2} \pm 10 x-6 y+9=0$
3) $x^{2}+y^{2}+10 x \pm 6 y+9=0$
4) $x^{2}+y^{2}-8 x \pm 10 y+9=0$
20. The orthocentre of the triangle with vertices $A(0,0), B(0,3 / 2), C(-5,0)$ is
1) $(-5 / 2,3 / 4)$
2) $(5 / 2,3 / 4)$
3) $(0,0)$
4) $(-5,3 / 2)$
21. $x^{2}+y^{2}-6 x-6 y+4=0, x^{2}+y^{2}-2 x-4 y+3=0, x^{2}+y^{2}+2 k x+2 y+1=0$ 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 $x^{2}+y^{2}-2 x-2 y-7=0$ and $x^{2}+y^{2}+4 x+2 y+k=0$ cut orthogenally, then the length of the common chord of the circles is
1) 2
2) $12 / \sqrt{13}$
3) 8
4) 5
23. The co-ordinates of the foot of the perpendicular drawn from the point $(3,4)$ on the line $2 x+y-7=0$ is
1) $(1,5)$
2) $\left(\frac{9}{5}, \frac{17}{5}\right)$
3) $(1,-5)$
4) $(-5,1)$
24. The area enclosed by the pair of lines $x y=0$, 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) $\begin{gathered}\sqrt{3} \\ 2\end{gathered}$
2) $\begin{gathered}1 \\ \sqrt{2}\end{gathered}$
3) $\begin{aligned} & 1 \\ & 2\end{aligned}$
4) $\begin{gathered}1 \\ \sqrt{3}\end{gathered}$
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 $S^{\prime}$ are the foci, then $P S+P S^{\prime}=$
1) 8
2) 4
3) 12
4) 10
28. The value of $\operatorname{Sin}\left[2 \operatorname{Cos}^{-1} \frac{\sqrt{5}}{3}\right]$ is
1) $\begin{gathered}2 \sqrt{5} \\ 3\end{gathered}$
2) $\begin{gathered}\sqrt{5} \\ 3\end{gathered}$
3) $\begin{gathered}2 \sqrt{5} \\ 9\end{gathered}$
4). $\begin{gathered}4 \sqrt{5} \\ 9\end{gathered}$
29. If ${ }_{36}^{x^{2}}-\frac{y^{2}}{k^{2}}=1$ 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) $\left(\frac{1}{3}, \frac{-3}{2}\right)$
2) $\left(\frac{-1}{3}, \frac{3}{2}\right)$
3) $\left(\frac{1}{3},-12\right)$
4) $\left(\frac{1}{3}, \frac{3}{2}\right)$
31. The solution of $\operatorname{Tan}^{-1} x+2 \operatorname{Cot}^{-1} x=\frac{2 \pi}{3}$ is
1) $\quad \begin{gathered}1 \\ \sqrt{3}\end{gathered}$
2) $-\frac{1}{\sqrt{3}}$
3) $\sqrt{3}$
4) $-\sqrt{3}$
32. $\operatorname{Sin}^{2} 17.5^{0}+\operatorname{Sin}^{2} 72.5^{0}$ is equal to
1) $\operatorname{Tan}^{2} 45^{0}$
2) $\operatorname{Cos}^{2} 90^{0}$
3) $\operatorname{Sin}^{2} 45^{0}$
4) $\operatorname{Cos}^{2} 30^{0}$
33. The conjugate of the complex number $\begin{gathered}(1+i)^{2} \\ 1-i\end{gathered}$ is
1) $1+i$
2) $1-i$
3) $-1-i$
4) $-1+i$
34. $A B C$ is a triangle with $\left\lfloor A=30^{\circ} \quad B C=10 \mathrm{cms}\right.$ The area of the circum-circle of the triangle is

1) $5 \mathrm{sq} . \mathrm{cms}$.
2) $100 \pi \mathrm{sq} \mathrm{cms}$.
3) $\frac{100 \pi}{3}$ sq. cms.
4) $25 \mathrm{sq} . \mathrm{cms}$.
35. If $\operatorname{Sin} 3 \theta=\operatorname{Sin} \theta$, 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
2) -1
3) 2
37. The amplitude of $(1+i)^{5}$ is
1) $\frac{-3 \pi}{4}$
2) $\frac{3 \pi}{4}$
3) $\frac{5 \pi}{4}$
4) $\frac{-5 \pi}{4}$
38. $A B C$ is a tringle. $G$ is the centroid. $D$ is the mid point of $B C$. If $A=(2,3)$ and $G=(7,5)$, then the point $D$ is
1) $\left(\frac{19}{2}, 6\right)$
2) $\left(\frac{9}{2}, 4\right)$
3) $\left(8, \frac{13}{2}\right)$
4) $\left(\begin{array}{cc}11 & 11 \\ 2 & 2\end{array}\right)$
39. $\operatorname{Lim}_{x \rightarrow 1} \frac{\operatorname{Tan}\left(x^{2}-1\right)}{x-1}$ is equal to
1) 2
2) 2
3) -1
4) -2
40. If $y=2^{\log x}$, then $\frac{d y}{d x}$ is
1) $2^{\log x} \cdot \log 2$
2) 

$2^{\log x}$
Log 2
3) $\underline{2^{\log x} \cdot \log 2}$
4) $\begin{gathered}2^{\log x} \\ x\end{gathered}$
41. If $\operatorname{Sec}^{-1}\left(\frac{1+x}{1-y}\right)=a$, then $\frac{d y}{d x}$ is

1) $\frac{y+1}{x-1}$
2) $\frac{y-1}{x+1}$
3) $\begin{aligned} & x-1 \\ & y+1\end{aligned}$
4) $\begin{aligned} & x-1 \\ & y-1\end{aligned}$
42. If $y=\operatorname{Cos}^{2} \frac{3 x}{2}-\operatorname{Sin}^{2} \frac{3 x}{2}$, then $\frac{d^{2} y}{d x^{2}}$ is
1) $9 y$
2) $-3 \sqrt{1}-y^{2}$
3) $3 \sqrt{1-y^{2}}$
4) $-9 y$
43. If the function $f(x)=\left\{\begin{array}{ll}\frac{1-\operatorname{Cos} x}{x^{2}} & \text { for } x \neq 0 \\ k & \text { for } x=0\end{array}\right.$ 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 $(1+w)\left(1+w^{2}\right)\left(1+w^{4}\right)\left(1+w^{8}\right)$ is equal to
1) 0
2) 1
3) $w$
4) $w^{2}$
45. If $x^{x}=y^{y}$ then $\frac{d y}{d x}$ is
1) $\begin{aligned} & x \\ & y\end{aligned}$
2) $-\underline{y}$
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 $45^{\circ}$ with $X$-axis is
1) $(1 / 2,1 / 4)$
2) $(1 / 4,1 / 2)$
3) $(1 / 2,1 / 2)$
4) $(1 / 2,-1 / 2)$
47. The length of the subtangent to the curve $x^{2} y^{2}=a^{4}$ at $(-a, a)$ is
1) $2 a$
2) $a / 2$
3) $a / 3$
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 $y=-x^{2}+6 x-3$ is increasing is
1) $x>3$
2) $x<3$
3) $5<x<6$
4) $7<x<8$
52. The value of the integral $\int_{0}^{\pi / 2}\left(\operatorname{Sin}^{100} x-\operatorname{Cos}^{100} x\right) d x$ is
1) $\frac{100!}{(100)^{100}}$
2) 0
53. $O A$ and $O B$ are tw o roads enclosing an angle of $120^{\circ} . X$ and $Y$ start from ' $O$ ' at the same time. $X$ travels along $O A$ with a speed of $4 \mathrm{~km} /$ hour and $Y$ travels along $O B$ with a speed of $3 \mathrm{~km} /$ hour. The rate at which the shortest distance between $X$ and $Y$ is increasing after 1 hour is
1) $37 \mathrm{~km} / \mathrm{hour}$
2) $\sqrt{37} \mathrm{~km} / \mathrm{hour}$
3) $\sqrt{13} \mathrm{~km} /$ hour
4) $13 \mathrm{~km} /$ hour
54. If $\quad k \int_{0}^{1} x \cdot f(3 x) d x=\int_{0}^{3} t \cdot f(t) d t$, then the value of $k$ is
1) 3
2) 9
3) $1 / 3$
4) $1 / 9$
55. The value of $\int \frac{1}{1+\operatorname{Cos} 8 x} d x$ is
1) $\operatorname{Tan}_{8} 8 x+C$
2) $\operatorname{Tan} 2 x_{8}+C$
3) $\tan 4 x+C$
4) $\operatorname{Tan}_{4} 4 x+C$
56. The value of $\int e^{x}\left(x^{5}+5 x^{4}+1\right) \cdot d x$ is
1) $e^{x} \cdot x^{5}+e^{x}+C$
2) $e^{x} \cdot x^{5}$
3) $5 x^{4} \cdot e^{x}$
4) $e^{x+1} \cdot x^{5}+C$
57. The value of $\int \frac{x^{2}+1}{x^{2}-1} d x$ is
1) $\log \left(\frac{x+1}{x-1}\right)+C$
2) $\log \left(\frac{x-1}{x+1}\right)+C$
3) $\log \left(x^{2}-1\right)+C$
4) $x+\log \left(\frac{x}{x+1} \frac{1}{x}\right)+C$
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) $(x+1) \frac{d y}{d x}+y=0$
2) $(x+1) \frac{d y}{d x}-y=0$
3) $\frac{d y}{d x}=\frac{x+1}{y+1}$
4) $\frac{d y}{d x}-\frac{x-1}{y-1}$
60. The order and degree of the differential equation $\left[1+\left(\frac{d y}{d x}\right)^{5}\right]^{-\overline{3}}=\frac{d^{2} y}{d x^{2}}$ are respectively
1) 2,1
2) 1,5
3) 2,3
4) 2,5
