# Test Paper-IV

**1.** The value of $\cos\frac{2\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{6\pi}{7}$ is

(a) 0 (b) 1

(c) $\frac{1}{2}$ (d) $-\frac{1}{2}$.

**2.** The value of

$\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{8}$

(c) $\frac{1}{16}$ (d) none of these

**3.** If $x + \frac{1}{x} = 2\cos\theta$ then $x^n + \frac{1}{x^n}$ is equal to

(a) $2\sin n\theta$ (b) $\cos n\theta$

(c) $\sin n\theta$ (d) $2\cos n\theta$, $n \in Z^+$

**4.** The ratio of the greatest value of $2 - \cos x + \sin^2 x$ to its least value is

(a) $\frac{1}{4}$ (b) $\frac{9}{4}$

(c) $\frac{13}{4}$ (d) none of these

**5.** The value of $\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{14\pi}{15}$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{8}$

(c) $\frac{1}{16}$ (d) none of these

**6.** If $\tan\theta = n\tan\phi$ $(n > 0)$, then

(a) $\tan^2(\theta-\phi) > \frac{(n-1)^2}{4n}$

(b) $\tan^2(\theta-\phi) \geq \frac{(n-1)^2}{4n}$

(c) $\tan^2(\theta-\phi) \leq \frac{(n-1)^2}{4n}$

(d) none of these

**7.** Let $n$ be a fixed positive integer such that

$\sin\left(\frac{\pi}{2n}\right)+\cos\left(\frac{\pi}{2n}\right) = \frac{\sqrt{n}}{2}$, then

(a) $n = 4$ (b) $n = 5$

(c) $n = 6$ (d) none of these

**8.** If $4\cos^2\theta + \sqrt{3} = 2(\sqrt{3}+1)\cos\theta$, then $\theta =$

(a) $2n\pi \pm \frac{\pi}{3}$ (b) $2n\pi \pm \frac{\pi}{4}$

(c) $2n\pi \pm \frac{\pi}{6}$ (d) none of these

**9.** From the identity $\sin 3x = 3\sin x - 4\sin^3 x$, it follows that if $x$ is real and $|x| < 1$, then

(a) $(3x-4x^3) > 1$ (b) $(3x-4x^3) \leq 1$

(c) $(3x-4x^3) < 1$

(d) Nothing can be said about $3x - 4x^3$

**10.** The set of all $x$ in the interval $[0, \pi]$ for which $2\sin^2 x - 3\sin x + 1 \geq 0$ is

(a) $\{\pi/2\}$ (b) $\phi$

(c) $\{x : 0 \leq x \leq \pi/4\}$

(d) $\{x : 0 \leq x \leq \pi/6, \pi/2, 5\pi/6 \leq x \leq \pi\}$

**11.** One root of the equation $\cos - x + \frac{1}{2} = 0$ lies in the interval

(a) $\left[0, \frac{\pi}{2}\right]$ (b) $\left[-\frac{\pi}{2}, 0\right]$

(c) $\left[\frac{\pi}{2}, \pi\right]$ (d) $\left[\pi, \frac{3\pi}{2}\right]$

**12.** $2\left(\tan^{-1}1+\sin^{-1}\left(\frac{2}{\sqrt{5}}\right)+\tan^{-1}3\right)$ is equal to

(a) $\pi$ (b) $4\pi$

(c) $\frac{\pi}{2}$ (d) none of these

**13.** The value of

$\tan^{-1}\left(\frac{1}{2}(\tan 2A)+\tan^{-1}(\cot A)+\tan^{-1}(\cot^3 A)\right)$ is

(a) 0 if $\frac{\pi}{4} < A < \frac{\pi}{2}$ (b) $p$, if $0 < A < \frac{\pi}{4}$

(c) both (a) and (b) (d) none of these

**14.** If $2\tan^{-1}\left[\sqrt{\frac{a-b}{a+b}}\tan\left(\frac{\theta}{2}\right)\right] = \cos^{-1}\left[\frac{2a+3b}{3a+2b}\right]$, then $\cos\theta$ is equal to

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $\frac{2a}{3b}$

**15.** If $\sin\left(\sin^{-1}\frac{1}{5}+\cos^{-1}x\right) = 1$ then $x$ is equal to

(a) 1 (b) 0

(c) $\frac{4}{5}$ (d) $\frac{1}{5}$

**16.** If the lengths of the sides of a triangle are 3, 4 and 5 units then $R$ is

(a) 3.5 (b) 3.0

(c) 2.0 (d) 2.5

**17.** In any $\Delta ABC$, $rr_1 + r_2 r_3 =$

(a) $ab$ (b) $ac$

(c) $bc$ (d) none of these

**18.** If in a triangle $ABC$, $\tan\frac{A}{2}$, $\tan\frac{B}{2}$, $\tan\frac{C}{2}$ are in H.P., then the sides $a$, $b$, $c$ are in

(a) A.P. (b) G.P.

(c) H.P. (d) None of these

**19.** The value $\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}+\frac{1}{r^2}$ is equal to

(a) 0 (b) $\frac{a^2+b^2+c^2}{\Delta^2}$

(c) $\frac{\Delta^2}{a^2+b^2+c^2}$ (d) $\frac{a^2+b^2+c^2}{\Delta}$

**20.** If upper part of a tree broken over by the wind makes an angle of 30º with the ground, and the distance from the root to the point where the top of the tree touches the ground is 10m, the height of the tree is

(a) $20\sqrt{3}$m (b) $10\sqrt{3}$m

(c) $15\sqrt{3}$m (d) none of these

**21.** A ballon is observed simultaneously from three points $A$, $B$ and $C$ on a straight road directly under it. The angular elevation at $B$ is twice and at $C$ is thrice that of $A$. If the distance between $A$ and $B$ is 200 metres and the distance between $B$ and $C$ is 100 metres, then the height of balloon between $B$ and $C$ is 100 meters, then the height of balloon is given by

(a) 50 metres (b) $50\sqrt{3}$ metres

(c) $50\sqrt{2}$ metres (d) none of these

**22.** A tower stands at the top of a hill whose height is 3 times the height of the tower. The tower is found to sutend at a point 3 km away on the horizontal through the foot of the hill, an angle $\theta$ where $\tan\theta = \frac{1}{9}$.The height of the tower is

(a) 12 (b) 3

(c) $\frac{9\pm\sqrt{33}}{8}$ (d) none of these

**23.** A person is standing on a tower of height $15(\sqrt{3}+1)\,m$ and observing a car coming towards the tower. He observed that angle of depression changes from 30º to 45º in 3 *sec*. What is the speed of the car

(a) 36 *km*/*hr* (b) 72 *km*/*hr*

(c) 18 *km*/*hr* (d) 30 *km*/*hr*

**24.** If a triangle has its orthocentre at (1, 1) and circumcentre at $\left(\frac{3}{2},\frac{3}{4}\right)$, then the coordinates of the centroid of the triangle are

(a) $\left(\frac{4}{3},-\frac{5}{6}\right)$ (b) $\left(\frac{4}{3},\frac{5}{6}\right)$

(c) $\left(-\frac{4}{3},\frac{5}{6}\right)$ (d) $\left(-\frac{4}{3},-\frac{5}{6}\right)$

**25.** A line joining two points $A$ (2, 0) and $B$ (3, 1) is rotated about $A$ in anticlockwise direction through an angle 15º. If $B$ goes to $C$ in the new position, then the coordinates of $C$ are

(a) $\left(2,\sqrt{\frac{3}{2}}\right)$ (b) $\left(2,-\sqrt{\frac{3}{2}}\right)$

(c) $\left(2+\frac{1}{\sqrt{2}},\sqrt{\frac{3}{2}}\right)$ (d) none of these

**26.** $P$ (3, 1), $Q$ (6, 5) and $R$ ($x$, $y$) are three points such that the angle $RPQ$ is a right angle and the area of $\Delta RPQ = 7$, then the number of such points $R$ is

(a) 0 (b) 1

(c) 2 (d) 4

**27.** If $a$, $b$, $c$ are in H.P. then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c} = 0$ always passes through a fixed point, that point is

(a) (– 1, – 2) (b) (– 1, 2)

(c) (1, – 2) (d) $\left(1,-\frac{1}{2}\right)$

**28.** The figure formed by the lines $x^2 + 4xy + y^2 = 0$ and $x - y = 4$, is

(a) A right angled triangle

(b) An isosceles triangle

(c) An equilateral triangle

(d) none of these

**29.** The value of $\lambda$ for which the equation $12x^2 - 10xy + 2y^2 + 11x - 5y + \lambda = 0$ represents two straight lines is

(a) 1 (b) 2

(c) – 1 (d) – 2

**30.** The pair of lines which join the origin to the points of intersection of the line $y = mx + c$ with the curve $x^2 + y^2 = a^2$ are at right angles, if

(a) $c^2 = a^2(1 + m^2)$ (b) $2c^2 = a^2(1 + m^2)$

(c) $2c^2 = a^2(1 - m^2)$ (d) none of these

**31.** If the equation $2x^2 - 2hxy + 2y^2 = 0$ represents two congruent lines through origin, then $h$ =

(a) $\pm 2$ (b) $\pm 3$
(c) $\pm 6$ (d) $\pm 4$

**32.** The sides of a square are $x = 2$, $x = 3$, $y = 1$ and $y = 2$. The equation of the circle drawn on the diagonals of the square as its diameter, is

(a) $x^2 + y^2 - 5x - 3y + 8 = 0$
(b) $x^2 + y^2 + 5x - 3y + 8 = 0$
(c) $x^2 + y^2 + 5x + 3y - 8 = 0$
(d) none of these

**33.** The circles $x^2 + y^2 - 10x + 16 = 0$ and $x^2 + y^2 = r^2$ intersect each other in two distinct points if

(a) $r < 2$ (b) $r > 8$
(c) $2 < r < 8$ (d) $2 \le r \le 8$

**34.** The two circles $x^2 + y^2 - 2x - 4y = 0$ and $x^2 + y^2 - 8y - 4 = 0$

(a) touch externally (b) touch internally
(c) intersect (d) do not touch

**35.** The number of points on the circle $x^2 + y^2 - 4x - 10y + 13 = 0$ which are at a distance 1 from the point $(-3, 2)$ is

(a) 1 (b) 2
(c) 3 (d) none of these

**36.** The equation of the normal to the parabola $y^2 = 4x$ which is parallel to the line $y - 2x + 5 = 0$ is

(a) $2x + y - 12 = 0$ (b) $2x - y - 12 = 0$
(c) $x + 2y - 12 = 0$ (d) none of these

**37.** If the tangent to the parabola $y^2 = 4ax$ meets the axis in $T$ and tangent at the vertex $A$ in $Y$ and the rectangle TAYG is completed, then the locus of $G$ is

(a) $y^2 + 2ax = 0$ (b) $y^2 + ax = 0$
(c) $x^2 + ay = 0$ (d) none of these

**38.** If the parabola $x^2 = ay$ makes an intercept of length $\sqrt{40}$ on the line $y - 2x = 1$, then $a$ is equal to

(a) 1 (b) $-2$
(c) $-1$ (d) 2

**39.** If $PSQ$ is the focal chord of the parabola $y^2 = 8x$ such that $SP = 6$, then the length $SQ$ is

(a) 6 (b) 4
(c) 3 (d) none of these

**40.** The domain of the function

$$f(x) = {}^{24-x}C_{3x-1} + {}^{40-6x}C_{8x-10}$$ is,

(a) $\{2, 3\}$ (b) $\{1, 2, 3\}$
(c) $\{1, 2, 3, 4\}$ (d) none of these

**41.** The domain of the function

$$f(x) = \cos^{-1}\left(\frac{2-|x|}{4}\right) + [\log(3-x)]^{-1}$$ is

(a) $[-6, 3)\backslash\{2\}$ (b) $[-6, 2) \cup (2, 3]$
(c) $[-6, 3]$ (d) $[-6, 3)$

**42.** The domain of the function $f(x) = \dfrac{1}{\sqrt{|\sin x| + \sin x}}$ is

(a) $(-2n\pi, 2n\pi)$
(b) $(2n\pi, (2n+1)\pi)$
(c) $\left((4n-1)\frac{\pi}{2}, (4n+1)\frac{\pi}{2}\right)$
(d) none of these

**43.** The domain of the function

$$f(x) = \log_3\left[-\log_{1/2}\left(1 + \frac{1}{x^{1/5}}\right) - 1\right]$$ is

(a) $(-\infty, 1)$ (b) $(0, 1)$
(c) $(1, \infty)$ (d) none of these

**44.** If $f(2) = 2$ and $f'(2) = 1$ then $\lim\limits_{x\to 2} \dfrac{2x^2 - 4f(x)}{x - 2}$ is equal to

(a) 4 (b) $-4$
(c) 2 (d) $-2$

**45.** $\lim\limits_{n\to\infty}\left(\cos\frac{x}{2}\cos\frac{x}{4}\cos\frac{x}{8}\ldots\cos\frac{x}{2^n}\right) =$

(a) $\dfrac{x}{\sin x}$ (b) $\dfrac{\sin x}{x}$
(c) 0 (d) none of these

**46.** $\lim\limits_{n\to\infty}\prod\limits_{4=3}^{n}\left(\dfrac{r^3-1}{r^3+1}\right)$

(a) $\dfrac{1}{3}$ (b) $\dfrac{6}{7}$
(c) $-\dfrac{2}{3}$ (d) none of these

**47.** $\lim\limits_{x\to a}\left(\dfrac{\sin x}{\sin a}\right)^{\frac{1}{x-a}}$, $a \ne n\pi$, $n$ is an integer, equals

(a) $e^{\cot a}$ (b) $e^{\tan a}$
(c) $e^{\sin a}$ (d) $e^{\cos a}$

**48.** If $f(x) = \begin{cases} \dfrac{[x]-1}{x-1}, & x \ne 1 \\ 0, & x = 1 \end{cases}$, then $f(x)$ is

(a) continuous as well as differentiable at $x = 1$
(b) differentiable but not continuous at $x = 1$
(c) continuous but not differentiable at $x = 1$
(d) neither continuous nor differentiable at $x = 1$

**49.** Let $f(x) = \begin{cases} \dfrac{x^4 - 5x^2 + 4}{|(x-1)(x-2)|}, & x \neq 1, 2 \\ 6 & , x = 1 \\ 12 & , x = 2 \end{cases}$. Then $f(x)$ is continuous on the set

(a) $R \setminus \{2\}$ (b) $R \setminus \{1, 2\}$
(c) $R$ (d) $R \setminus \{1\}$

**50.** The function $f(x) = (1 + x)^{\cot x}$ is not defined at $x = 0$. The value of $f(0)$ so that $f(x)$ becomes continuous at $x = 0$, is

(a) 1 (b) 0
(c) $e$ (d) none of these

**51.** Let $f(x) = [2x^3 - 5]$, where [ ] denotes the greatest integer function. Then the number of points in (1, 2), where the function is discontinuous is

(a) 0 (b) 13
(c) 15 (d) 11

**52.** If $y = (\sin^{-1}x)^2$, then $(1 - x^2)\dfrac{d^2y}{dx^2}$ is equal to

(a) $x\dfrac{dy}{dx} + 2$ (b) $x\dfrac{dy}{dx} - 2$
(c) $-x\dfrac{dy}{dx} + 2$ (d) none of these

**53.** If $f(x) = \log\left(\dfrac{m(x)}{n(x)}\right)$, $m(1) = n(1) = 1$ and $m'(1) = n'(1) = 2$, then $f'(1)$ is equal to

(a) 0 (b) 1
(c) $-1$ (d) none of these

**54.** The differential coefficient of $\tan^{-1}\dfrac{2x\sqrt{1-x^2}}{1-2x^2}$ w.r.t. $\sec^{-1}\dfrac{1}{2x^2-1}$ at $x = \dfrac{1}{2}$ is equal to

(a) $\dfrac{1}{2}$ (b) $-\dfrac{1}{2}$
(c) $-1$ (d) none of these

**55.** If $x^2 + y^2 = 1$, then

(a) $yy'' - 2(y')^2 + 1 = 0$ (b) $yy'' + (y')^2 + 1 = 0$
(c) $yy'' + (y')^2 - 1 = 0$ (d) $yy'' + 2(y')^2 + 1 = 0$

**56.** If the normal at the point "$t_1$" on the curve $xy = c^2$ meets the curve again at "$t_2$", then

(a) $t_1^3 t_2 = 1$ (b) $t_1^3 t_2 = -1$
(c) $t_1 t_2^3 = -1$ (d) $t_1 t_2^3 = 1$.

**57.** The minimum value of $\log_a x + \log_x a$, $0 < x < a$, is

(a) 1 (b) 2
(c) $-2$ (d) none of these

**58.** The function $f(x) = \dfrac{\ln(\pi + x)}{\ln(e + x)}$ is

(a) increasing on $(0, \infty)$
(b) decreasing on $(0, \infty)$
(c) increasing on $(0, \pi/e)$, decreasing on $(\pi/e, \infty)$
(d) decreasing on $(0, \pi/e)$, increasing on $(\pi/e, \infty)$

**59.** For the curve $x = t^2 - 1$, $y = t^2 - t$, the tangent is parallel to $x$-axis where

(a) $t = \dfrac{1}{\sqrt{3}}$ (b) $t = -\dfrac{1}{\sqrt{3}}$
(c) $t = 0$ (d) $t = \dfrac{1}{2}$

**60.** $\displaystyle\int \frac{\cot x}{\sqrt{\sin x}}\, dx$ is equal to

(a) $2\sqrt{\sin x} + C$ (b) $\dfrac{1}{2\sqrt{\sin x}} + C$
(c) $\dfrac{-2}{\sqrt{\sin x}} + C$ (d) $\dfrac{2}{\sqrt{\sin x}} + C$

**61.** $\displaystyle\int \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}}\, dx$ is equal to

(a) $2\left[\sqrt{1-x} + \cos^{-1}\sqrt{x} + \sqrt{x - x^2}\right] + C$
(b) $2\left[\sqrt{1-x} - \cos^{-1}\sqrt{x} + \sqrt{x - x^2}\right] + C$
(c) $-2\left[\sqrt{1-x} + \cos^{-1}\sqrt{x} + \sqrt{x - x^2}\right] + C$
(d) none of these

**62.** If $\displaystyle\int \frac{\sqrt{\cot x}}{\sin x \cos x}\, dx = P\sqrt{\cot x} + Q$, then $P$ equals

(a) 1 (b) 2
(c) $-1$ (d) $-2$

**63.** $\displaystyle\int \frac{d^2}{dx^2}(\tan^{-1}x)\, dx$ is equal to

(a) $\dfrac{1}{1+x^2} + C$ (b) $\tan^{-1}x + C$
(c) $x\tan^{-1}x - \dfrac{1}{2}\log(1 + x^2) + C$
(d) none of these

**64.** $\displaystyle\int_0^{\pi/2} (\tan x + \cot x)\, dx$ is equal to

(a) $\dfrac{\pi}{2}\log 2$ (b) $-\dfrac{\pi}{2}\log 2$
(c) $\pi \log 2$ (d) none of these

**65.** The value of the integral $\displaystyle\int_0^{\pi} \frac{x^2 \sin x}{(2x - \pi)(1 + \cos^2 x)}\, dx$ is

(a) $\frac{\pi^2}{4}$ (b) $\frac{\pi^2}{2}$

(c) $\frac{\pi^2}{6}$ (d) none of these

**66.** $\int_0^{1.5} [x^2]\, dx$, where [.] denotes the greatest in integer function, is equal to

(a) $\sqrt{2} - 2$ (b) $2 - \sqrt{2}$

(c) $2 + \sqrt{2}$ (d) none of these

**67.** $\int_0^{\pi} |\sin x + \cos x|\, dx$ is equal to

(a) $\sqrt{2}$ (b) $2\sqrt{2}$

(c) $3\sqrt{2}$ (d) none of these

**68.** The general solution of the differential equation $\frac{dy}{dx} = y \tan x - y^2 \sec x$ is

(a) $\tan x = (c + \sec x)\, y$ (b) $\sec y = (c + \tan y)\, x$

(c) $\sec x = (c + \tan x)\, y$ (d) none of these

**69.** Solution of the equation $x\, dy = \left( y + x \frac{f(y/x)}{f'(y/x)} \right) dx$ is

(a) $f\left(\frac{x}{y}\right) = cy$ (b) $f\left(\frac{y}{x}\right) = cx$

(c) $f\left(\frac{y}{x}\right) = cxy$ (d) none of these

**70.** The degree of the differential equation

$$\left(\frac{d^4y}{dx^4}\right)^{3/5} - 5\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 5 = 0 \text{ is}$$

(a) 2 (b) 3

(c) 4 (d) 5

**71.** The differential equation that represents all parabolas each of which has a latus rectum $4a$ and whose axes are parallel to $x$-axis, is

(a) $a\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 = 0$

(b) $2a\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 = 0$

(c) $2a\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^3 = 0$ (d) none of these

**72.** The complex number $z = x + iy$ which satisfy the equation $\left|\frac{z - 5i}{z + 5i}\right| = 1$ lie on

(a) the $x$-axis (b) the line $y = 5$

(c) a circle through the origin

(d) none of these

**73.** The value of $\left(\frac{1+i}{\sqrt{2}}\right)^8 + \left(\frac{1-i}{\sqrt{2}}\right)^8$ is equal to

(a) 4 (b) 6

(c) 8 (d) 2

**74.** If 1, $\omega$, $\omega^2$ are the three cube roots of unity, then $(1 - \omega + \omega^2)(1 - \omega^2 + \omega^4)(1 - \omega^4 + \omega^8)$ ... to $2n$ factors =

(a) $2^n$ (b) $2^{2n}$

(c) $2^{4n}$ (d) none of these

**75.** The complex number $z$ satisfying the equations $|z - i| = |z + 1| = 1$ is

(a) 0 (b) $1 + i$

(c) $-1 + i$ (d) $1 - i$

**76.** In the series 3, 7, 11, 15, ... and 2, 5, 8, ... each continued to 100 terms, the number of terms that are identical is

(a) 21 (b) 27

(c) 25 (d) none of these

**77.** The sum of positive terms of the series

$10 + 9\frac{4}{7} + 9\frac{1}{7} + \ldots$ is

(a) $\frac{352}{7}$ (b) $\frac{437}{7}$

(c) $\frac{852}{7}$ (d) none of these

**78.** If $S_1$ is the sum of an arithmetic series of '$n$' odd number of terms and $S_2$, the sum of the terms of the series in odd places, then $\frac{S_1}{S_2}$ =

(a) $\frac{2n}{n+1}$ (b) $\frac{n}{n+1}$

(c) $\frac{n+1}{2n}$ (d) $\frac{n+1}{n}$

**79.** The sum of $n$ terms of m A.P.s are $S_1, S_2, S_3, \ldots, S_m$. If the first term and common difference are 1, 2, 3, ..., $m$ respectively, then $S_1 + S_2 + S_3 + \ldots + S_m$ =

(a) $\frac{1}{4} mn(m+1)(n+1)$

(b) $\frac{1}{2} mn(m+1)(n+1)$

(c) $mn(m+1)(n+1)$

(d) none of these

**80.** If $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ has equal roots, then $a$, $b$, $c$ are in

(a) A.P. (b) G.P.

(c) H.P. (d) none of these

**81.** The equation

$\sqrt{x + 3 - 4\sqrt{x - 1}} + \sqrt{x + 8 - 6\sqrt{x - 1}} = 1$ has

(a) no solution (b) one solution

(c) two solutions (d) more than two solutions

**82.** If the sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the reciprocals of their squares, then $bc^2$, $ca^2$ and $ab^2$ are in

(a) A.P. (b) G.P.

(c) H.P. (d) none of these

**83.** In copying a quadratic equation of the form $x^2 + px + q = 0$, a student wrote the coefficient of $x$ incorrectly and the roots were found to be 3 and 10; another student wrote the same equation but he wrote the constant term incorrectly and thus he found the roots to be 4 and 7. The roots of the correct equation are

(a) 5, 6 (b) 4, 6
(c) 4, 5 (d) none of these

**84.** The number of positive terms in the sequence

$$x_n = \frac{195}{4\,{}^nP_n} - \frac{{}^{n+3}P_3}{{}^{n+1}P_{n+1}},\ n \in N \text{ is}$$

(a) 2 (b) 3
(c) 4 (d) none of these

**85.** The number of ways in which the letters of the word "STRANGE" can be arranged so that the vowels may appear in the odd places, is

(a) 1440 (b) 1470
(c) 1370 (d) none of these

**86.** The number of ways in which 7 people can be arranged at a round table so that 2 particular persons may be together, is

(a) 132 (b) 148
(c) 240 (d) none of these

**87.** The number of ways in which a committee of 3 ladies and 4 gentlemen can be appointed from a meeting consisting of 8 ladies and 7 gentlemen, if Mrs $X$ refuses to serve in a committee if Mr. $Y$ is a member is

(a) 1960 (b) 1540
(c) 3240 (d) none of these

**88.** The 7th term in $\left(\frac{1}{y} + y^2\right)^{10}$, when expanded in descending power of $y$, is

(a) $\frac{210}{y^2}$ (b) $\frac{y^2}{210}$
(c) $210y^2$ (d) none of these

**89.** The coefficient of $x^{30}$ in the expansion of $(1 + 3x + 3x^2 + x^3)^{15}$ is

(a) ${}^{45}C_{15}$ (b) ${}^{45}C_{25}$
(c) ${}^{45}C_{30}$ (d) ${}^{15}C_{11}$

**90.** The coefficient of $x^5$ in the expansion of $(1 + x^2)^5 (1 + x)^4$ is

(a) 40 (b) 50
(c) –50 (d) 60

**91.** In the expansion of $(x + a)^n$ if the sum of odd terms be $P$ and the sum of even terms be $Q$, then $4PQ =$

(a) $(x + a)^n - (x - a)^n$ (b) $(x + a)^n + (x - a)^n$
(c) $(x + a)^{2n} - (x - a)^{2n}$ (d) none of these

**92.** The sum of the series $\frac{2}{1!} + \frac{4}{3!} + \frac{6}{5!} + \ldots\infty$ is

(a) $e$ (b) $2e$
(c) $3e$ (d) $4e$

**93.** The sum of the series $1 + \frac{1}{2!} + \frac{1\cdot3}{4!} + \frac{1\cdot3\cdot5}{6!} + \ldots$ is

(a) $\sqrt{e}$ (b) $e^{3/2}$
(c) $e^{-1/2}$ (d) $e$

**94.** The value of $(1+3)\log_e 3 + \frac{(1+3^2)}{2!}(\log_e 3)^2 + \frac{(1+3^3)}{3!}(\log_e 3)^3 + \ldots\infty$ is

(a) 18 (b) 28
(c) 36 (d) none of these

**95.** The value of $(x+y)(x-y) + \frac{1}{2!}(x+y)(x-y)(x^2+y^2) + \frac{1}{3!}(x+y)(x-y)(x^4+y^4+x^2y^2) + \ldots\infty$ is

(a) $e^{x^2} + e^{y^2}$ (b) $e^{x^2 - y^2}$
(c) $e^{x^2} - e^{y^2}$ (d) none of these

**96.** If $X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, the value of $X^n$ is

(a) $\begin{bmatrix} 3n & -4n \\ n & -n \end{bmatrix}$ (b) $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$
(c) $\begin{bmatrix} 3^n & (-4)^n \\ 1^n & (-1)^n \end{bmatrix}$ (d) none of these

**97.** If $A$ is $3 \times 4$ matrix and $B$ is a matrix such that $A'B$ and $BA'$ are both defined. Then $B$ is of the type

(a) $3 \times 4$ (b) $3 \times 3$
(c) $4 \times 4$ (d) $4 \times 3$

**98.** If $B$ is a non-singular matrix and $A$ is a square matrix, then $\det(B^{-1}AB)$ is equal to

(a) $\det(A^{-1})$ (b) $\det(B^{-1})$
(c) $\det(A)$ (d) $\det(B)$

**99.** If $A$ and $B$ are two matrices such that $A + B$ and $AB$ are both defined, then:

(a) $A$ and $B$ are two matrices not necessarily of same order
(b) $A$ and $B$ are square matrices of same order.
(c) number of columns of $A$ = number of rows of $B$
(d) none of the above.

**100.** If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}, I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$$A^{-1} = \frac{1}{6}\left[A^2 + CA + dI\right]$$

where $c, d \in R$, the pair of values $(c, d)$ are

(a) (6, 11) (b) (6, –11)
(c) (– 6, 11) (d) (– 6, –11)

# Answer keys

| | | | | | |
|---|---|---|---|---|---|
| 1. (d) | 2. (b) | 3. (d) | 4. (c) | 5. (c) | 6. (c) |
| 7. (b, c) | 8. (c) | 9. (c) | 10. (d) | 11. (b, c) | 12. (c) |
| 13. (b) | 14. (c, d) | 15. (d) | 16. (b) | 17. (c) | 18. (a) |
| 19. (a) | 20. (a) | 21. (a) | 22. (a) | 23. (a) | 24. (b) |
| 25. (c) | 26. (c) | 27. (c) | 28. (c) | 29. (b) | 30. (c) |
| 31. (c) | 32. (a) | 33. (c) | 34. (b) | 35. (d) | 36. (b) |
| 37. (b) | 38. (a, b) | 39. (c) | 40. (a) | 41. (a) | 42. (b) |
| 43. (b) | 44. (a) | 45. (b) | 46. (b) | 47. (a) | 48. (a) |
| 49. (a) | 50. (d) | 51. (a) | 52. (b) | 53. (a) | 54. (c) |
| 55. (a) | 56. (b) | 57. (b) | 58. (b) | 59. (b) | 60. (a) |
| 61. (a) | 62. (c) | 63. (b) | 64. (c) | 65. (a) | 66. (b) |
| 67. (b) | 68. (c) | 69. (b) | 70. (b) | 71. (b) | 72. (a) |
| 73. (b) | 74. (b) | 75. (a, c) | 76. (c) | 77. (c) | 78. (a) |
| 79. (a) | 80. (c) | 81. (d) | 82. (a) | 83. (a) | 84. (c) |
| 85. (a) | 86. (c) | 87. (d) | 88. (c) | 89. (c) | 90. (d) |
| 91. (c) | 92. (a) | 93. (a) | 94. (b) | 95. (c) | 96. (d) |
| 97. (a) | 98. (c) | 99. (b) | 100. (c) | | |