

15 - TRIGONOMETRY
(Answers at the end of all questions)

(1) In triangle PQR, $\angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of the equation $ax^2 + bx + c = 0$, $a \neq 0$, then
(a) $a = b + c$ (b) $c = a + b$ (c) $b = c$ (d) $b = a + c$ [AIEEE 2005]

(2) In triangle ABC, let $\angle C = \frac{\pi}{2}$. If r is the inradius and R is the circumradius of the triangle ABC, then $2(r + R)$ equals
(a) $b + c$ (b) $a + b$ (c) $a + b + c$ (d) $c + a$ [AIEEE 2005]

(3) If $\cos^{-1} x - \cos^{-1} \frac{y}{2} = \alpha$, then $4x^2 - 4xy \cos \alpha + y^2$ is equal to
(a) $2 \sin 2\alpha$ (b) 4 (c) $4 \sin^2 \alpha$ (d) $-4 \sin^2 \alpha$ [AIEEE 2005]

(4) If in triangle ABC, the altitudes from the vertices A, B, C on opposite sides are in H.P., then $\sin A, \sin B, \sin C$ are in
(a) G.P. (b) A.P. (c) Arithmetic-Geometric Progression (d) H.P. [AIEEE 2005]

(5) Let α, β be such that $\pi < \alpha - \beta < 3\pi$. If $\sin \alpha + \sin \beta = -\frac{21}{65}$, then the value of $\cos \frac{\alpha - \beta}{2}$ is
(a) $-\frac{3}{\sqrt{130}}$ (b) $\frac{3}{\sqrt{130}}$ (c) $\frac{6}{65}$ (d) $-\frac{6}{65}$ [AIEEE 2004]

(6) If $u = \sin \sqrt{a^2 \cos^2 \theta + b^2 \sin^2 \theta} + \sqrt{a^2 \sin^2 \theta + b^2 \cos^2 \theta}$, then difference between the maximum and minimum values of u^2 is given by
(a) $2(a^2 + b^2)$ (b) $2\sqrt{a^2 + b^2}$ (c) $(a + b)^2$ (d) $(a - b)^2$ [AIEEE 2004]

(7) The sides of a triangle are $\sin \alpha, \cos \alpha$ and $\sqrt{1 + \sin \alpha \cos \alpha}$ for some $0 < \alpha < \frac{\pi}{2}$. Then the greatest angle of the triangle is
(a) 60° (b) 90° (c) 120° (d) 150° [AIEEE 2004]

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(8) A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of a river is 60° and when he retires 40 m away from the tree, the angle of elevation becomes 30° . The breadth of the river is

- (a) 20 m (b) 30 m (c) 40 m (d) 60 m [AIEEE 2004]

(9) If in a triangle $a \cos^2 \left(\frac{C}{2} \right) + c \cos^2 \left(\frac{A}{2} \right) = \frac{3b}{2}$, then the sides a, b and c are

- (a) in A. P. (b) in G. P. (c) in H. P. (d) satisfy $a + b = c$ [AIEEE 2003]

(10) The sum of the radii of inscribed and circumscribed circles, for an n sided regular polygon of side a, is

- (a) $a \cot \left(\frac{\pi}{2n} \right)$ (b) $b \cot \left(\frac{\pi}{n} \right)$ (c) $\frac{a}{2} \cot \left(\frac{\pi}{2n} \right)$ (d) $\frac{a}{4} \cot \left(\frac{\pi}{2n} \right)$ [AIEEE 2003]

(11) The upper $\frac{3}{4}$ th portion of a vertical pole subtends an angle $\tan^{-1} \left(\frac{3}{5} \right)$ at a point in the horizontal plane through its foot and at a distance 40 m from the foot. The height of the vertical pole is

- (a) 20 m (b) 40 m (c) 60 m (d) 80 m [AIEEE 2003]

(12) The value of $\cos^2 \alpha + \cos^2 (\alpha + 120^\circ) + \cos^2 (\alpha - 120^\circ)$ is

- (a) $\frac{3}{2}$ (b) $\frac{1}{2}$ (c) 1 (d) 0 [AIEEE 2003]

(13) The trigonometric equation $\sin^{-1} x = 2 \sin^{-1} a$ has a solution for

- (a) $|a| < \frac{1}{\sqrt{2}}$ (b) $|a| \geq \frac{1}{\sqrt{2}}$ (c) $\frac{1}{2} < |a| < \frac{1}{\sqrt{2}}$ (d) all real values of a

[AIEEE 2003]

(14) If $\sin \theta + \sin \phi = a$ and $\cos \theta + \cos \phi = b$, then the value of $\tan \left(\frac{\theta - \phi}{2} \right)$ is

- (a) $\sqrt{\frac{a^2 + b^2}{4 - a^2 - b^2}}$ (b) $\sqrt{\frac{4 - a^2 - b^2}{a^2 + b^2}}$
(c) $\sqrt{\frac{a^2 + b^2}{4 + a^2 + b^2}}$ (d) $\sqrt{\frac{4 + a^2 + b^2}{a^2 + b^2}}$ [AIEEE 2002]

(15) If $\tan^{-1}(x) + 2 \cot^{-1}(x) = \frac{2\pi}{3}$, then the value of x is

- (a) $\sqrt{2}$ (b) 3 (c) $\sqrt{3}$ (d) $\frac{\sqrt{3} - 1}{\sqrt{3} + 1}$ [AIEEE 2002]

(16) The value of $\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) + \dots + \tan^{-1}\left(\frac{1}{n^2 + n + 1}\right)$ is

- (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) $\frac{2\pi}{3}$ (d) 0 [AIEEE 2002]

(17) The angles of elevation of the top of a tower (A) from the top (B) and bottom (D) at a building of height a are 30° and 45° respectively. If the tower and the building stand at the same level, then the height of the tower is

- (a) $a\sqrt{3}$ (b) $\frac{a\sqrt{3}}{\sqrt{3} - 1}$ (c) $\frac{a(3 + \sqrt{3})}{2}$ (d) $a(\sqrt{3} - 1)$ [AIEEE 2002]

(18) If $\cos(\alpha - \beta) = 1$ and $\cos(\alpha + \beta) = \frac{1}{e}$, $-\pi \leq \alpha, \beta \leq \pi$, then the number of ordered pairs $(\alpha, \beta) =$

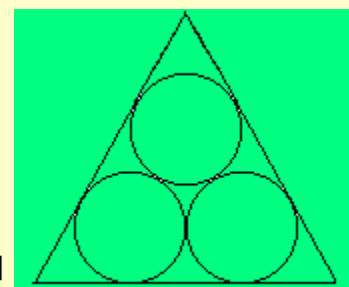
- (a) 0 (b) 1 (c) 2 (d) 4 [IIT 2005]

(19) Which of the following is correct for triangle ABC having sides a, b, c opposite to the angles A, B, C respectively

- (a) $a \sin\left(\frac{B - C}{2}\right) = (b - c) \cos \frac{A}{2}$ (b) $a \sin\left(\frac{B + C}{2}\right) = (b + c) \cos \frac{A}{2}$
(c) $(b + c) \sin\left(\frac{B + C}{2}\right) = a \cos \frac{A}{2}$ (d) $\sin\left(\frac{B - C}{2}\right) = a \cos \frac{A}{2}$ [IIT 2005]

(20) Three circles of unit radii are inscribed in an equilateral triangle touching the sides of the triangle as shown in the figure. Then, the area of the triangle is

- (a) $6 + 4\sqrt{3}$ (b) $12 + 8\sqrt{3}$
(c) $7 + 4\sqrt{3}$ (d) $4 + \frac{7}{2}\sqrt{3}$



[IIT 2005]

(21) If θ and ϕ are acute angles such that $\sin \theta = \frac{1}{2}$ and $\cos \theta = \frac{1}{3}$, then θ and ϕ lies in
(a) $\left] \frac{\pi}{3}, \frac{\pi}{2} \right[$ (b) $\left] \frac{\pi}{2}, \frac{2\pi}{3} \right[$ (c) $\left] \frac{2\pi}{3}, \frac{5\pi}{3} \right[$ (d) $\left] \frac{5\pi}{6}, \pi \right[$ [IIT 2004]

(22) For which value of x , $\sin [\cot^{-1}(x+1)] = \cos (\tan^{-1} x)$?
(a) $\frac{1}{2}$ (b) 0 (c) 1 (d) $-\frac{1}{2}$ [IIT 2004]

(23) If a, b, c are the sides of a triangle such that $a : b : c = \sqrt{3} : 2 : 2$, then $A : B : C$ is
(a) 3 : 2 : 1 (b) 3 : 1 : 2 (c) 1 : 3 : 2 (d) 1 : 2 : 3 [IIT 2004]

(24) Value of $\sqrt{x^2 + x} + \frac{\tan^2 \alpha}{\sqrt{x^2 + x}}$, $x > 0$, $\alpha \in \left(0, \frac{\pi}{2}\right)$ is always greater than or equal to
(a) 2 (b) $\frac{5}{2}$ (c) $2 \tan \alpha$ (d) $\sec \alpha$ [IIT 2003]

(25) If the angles of a triangle are in the ratio 4 : 1 : 1, then the ratio of the largest side to the perimeter is equal to
(a) $1 : 1 + \sqrt{3}$ (b) 2 : 3 (c) $\sqrt{3} : 2 + \sqrt{3}$ (d) $1 : 2 + \sqrt{3}$ [IIT 2003]

(26) The natural domain of $\sqrt{\sin^{-1}(2x) + \frac{\pi}{6}}$ for all $x \in \mathbb{R}$, is
(a) $\left[-\frac{1}{4}, \frac{1}{2}\right]$ (b) $\left[-\frac{1}{4}, \frac{1}{4}\right]$ (c) $\left[-\frac{1}{2}, \frac{1}{2}\right]$ (d) $\left[-\frac{1}{2}, \frac{1}{4}\right]$ [IIT 2003]

(27) The length of a longest interval in which the function $3 \sin x - 4 \sin^3 x$ is increasing is
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{2}$ (d) π [IIT 2002]

(28) Which of the following pieces of data does NOT uniquely determine an acute-angled triangle ABC (R being the radius of the circumcircle)?
(a) $a \sin A, \sin B$ (b) a, b, c (c) $a, \sin B, R$ (d) $a, \sin A, R$ [IIT 2002]

- (29) The number of integral values of k for which the equation $7 \cos x + 5 \sin x = 2k + 1$ has a solution is
- (a) 4 (b) 8 (c) 10 (d) 12
- [IIT 2002]

- (30) Let $0 < \alpha < \frac{\pi}{2}$ be a fixed angle. If $P = (\cos \theta, \sin \theta)$ and $Q = [\cos(\alpha - \theta), \sin(\alpha - \theta)]$, then Q is obtained from P by
- (a) clockwise rotation around origin through an angle α
(b) anticlockwise rotation around origin through an angle α
(c) reflection in the line through origin with slope $\tan \alpha$
(d) reflection in the line through origin with slope $\tan \frac{\alpha}{2}$
- [IIT 2002]

- (31) Let PQ and RS be tangents at the extremities of the diameter PR of a circle of radius r . If PS and RQ intersect at a point X on the circumference of the circle, then $2r$ equals
- (a) $\sqrt{PQ \cdot RS}$ (b) $\frac{PQ + RS}{2}$ (c) $\frac{2PQ \cdot RS}{PQ + RS}$ (d) $\sqrt{\frac{PQ^2 + RS^2}{2}}$
- [IIT 2001]

- (32) A man from the top of a 100 metres high tower sees a car moving towards the tower at an angle of depression of 30° . After some time, the angle of depression becomes 60° . The distance n (metres) traveled by the car during this time is
- (a) $100\sqrt{3}$ (b) $\frac{200\sqrt{3}}{3}$ (c) $\frac{100\sqrt{3}}{3}$ (d) $200\sqrt{3}$
- [IIT 2001]

- (33) $\alpha + \beta = \frac{\pi}{2}$ and $\beta + \gamma = \alpha$, then $\tan \alpha$ equals
- (a) $2(\tan \beta + \tan \gamma)$ (b) $\tan \beta + \tan \gamma$
(c) $\tan \beta + 2\tan \gamma$ (d) $2\tan \beta + \tan \gamma$
- [IIT 2001]

- (34) If $\sin^{-1}\left(x - \frac{x^2}{2} + \frac{x^3}{4} - \dots\right) + \cos^{-1}\left(x^2 - \frac{x^4}{2} + \frac{x^6}{4} - \dots\right) = \frac{\pi}{2}$ for $0 < |x| < \sqrt{2}$, then x equals
- (a) $\frac{1}{2}$ (b) 1 (c) $-\frac{1}{2}$ (d) -1
- [IIT 2001]

(35) The maximum value of $(\cos \alpha_1) \cdot (\cos \alpha_2) \dots (\cos \alpha_n)$, under the restrictions $0 \leq \alpha_1, \alpha_2, \dots, \alpha_n \leq \frac{\pi}{2}$ and $(\cos \alpha_1) \cdot (\cos \alpha_2) \dots (\cos \alpha_n) = 1$ is

- (a) $\frac{1}{2^{n/2}}$ (b) $\frac{1}{2^n}$ (c) $\frac{1}{2n}$ (d) 1 [IIT 2001]

(36) The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval

$$-\frac{\pi}{4} \leq x \leq \frac{\pi}{4} \text{ is}$$

- (a) 0 (b) 2 (c) 1 (d) 3 [IIT 2001]

(37) If $f(\theta) = \sin \theta (\sin \theta + \sin 3\theta)$, then $f(\theta)$

- (a) ≥ 0 only when $\theta \geq 0$ (b) ≤ 0 for all real θ
(c) ≥ 0 for all real θ (d) ≤ 0 only when $\theta \leq 0$ [IIT 2000]

(38) In a triangle ABC, $2ac \sin \frac{A}{2} (A - B + C) =$

- (a) $a^2 + b^2 - c^2$ (b) $-a^2 + a^2 - b^2$ (c) $b^2 - c^2 - a^2$ (d) $c^2 - a^2 - b^2$ [IIT 2000]

(39) In a triangle ABC, if $\angle C = \frac{\pi}{2}$, $r =$ inradius and $R =$ circum-radius, then $2(r + R) =$

- (a) $a + b$ (b) $b + c$ (c) $c + a$ (d) $a + b + c$ [IIT 2000]

(40) A pole stands vertically inside a triangular park ΔABC . If the angle of elevation of the top of the pole from each corner of the park is same, then in ΔABC , the foot of the pole is at the

- (a) centroid (b) circumcentre (c) incentre (d) orthocentre [IIT 2000]

(48) Let n be an odd integer. If $\sin n\theta = \sum_{r=0}^n b_r \sin^r \theta$, for every value of θ , then b_0 and b_1 respectively are

- (a) 1, 3 (b) 0, n (c) -1, n (d) 0, $n^2 - 3n + 3$ [IIT 1998]

(49) The parameter, on which the value of the determinant

$$\begin{vmatrix} 1 & a & a^2 \\ \cos(p-d)x & \cos px & \cos(p+d)x \\ \sin(p-d)x & \sin px & \sin(p+d)x \end{vmatrix}$$
 does not depend upon is

- (a) a (b) p (c) d (d) x [IIT 1997]

(50) The graph of the function $\cos x \cos(x-2) - \cos^2(x+1)$ is

- (a) a straight line passing through the point $\left(\frac{\pi}{2}, -\sin^2 1\right)$ and parallel to the X-axis
 (b) a straight line passing through $(0, -\sin^2 1)$ with slope 2
 (c) a straight line passing through $(0, 0)$
 (d) a parabola with vertex $(1, -\sin^2 1)$ [IIT 1997]

(51) If $A_0 A_1 A_2 A_3 A_4 A_5$ be a regular hexagon inscribed in a circle of unit radius, then the product of the lengths of the line segments $A_0 A_1$, $A_0 A_2$ and $A_0 A_4$ is

- (a) $\frac{3}{4}$ (b) $3\sqrt{3}$ (c) 3 (d) $\frac{3\sqrt{3}}{2}$ [IIT 1998]

(52) $\sec^2 \theta = \frac{4xy}{(x+y)^2}$ is true if and only if

- (a) $x + y \neq 0$ (b) $x = y, x \neq 0$ (c) $x = y$ (d) $x \neq 0, y \neq 0$ [IIT 1996]

(53) The minimum value of the expression $\sin \alpha + \sin \beta + \sin \gamma$, where α, β, γ are the real numbers satisfying $\alpha + \beta + \gamma = \pi$ is

- (a) positive (b) zero (c) negative (D) -3 [IIT 1995]

(54) In a triangle ABC, $\angle B = \frac{\pi}{3}$ and $\angle C = \frac{\pi}{4}$. If D divides \overline{BC} internally in the ratio 1 : 3, then $\frac{\sin \angle BAD}{\sin \angle CAD}$ equals

- (a) $\frac{1}{\sqrt{6}}$ (b) $\frac{1}{3}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\sqrt{\frac{2}{3}}$ [IIT 1995]

(55) Number of solutions of the equation $\tan x + \sec x = 2 \cos x$ lying in the interval $[0, 2\pi]$, is

- (a) 0 (b) 1 (c) 2 (d) 3 [IIT 1993]

(56) If $x = \sum_{n=0}^{\infty} \cos^{2n} \phi$, $y = \sum_{n=0}^{\infty} \sin^{2n} \phi$, $z = \sum_{n=0}^{\infty} \cos^{2n} \phi \sin^{2n} \phi$, for $0 < \phi < \frac{\pi}{2}$, then

- (a) $xyz = xz + y$ (b) $xyz = xy + z$
(c) $xyz = x + y + z$ (d) $xyz = yz + x$ [IIT 1993]

(57) If $f(x) = \cos [\pi [x]] \cos [-\pi^2] x$, where $[x]$ stands for the greatest integer function, then

- (a) $f\left(\frac{\pi}{2}\right) = -1$ (b) $f(\pi) = 1$ (c) $f(-\pi) = 0$ (d) $f\left(\frac{\pi}{4}\right) = 2$ [IIT 1991]

(58) The equation $(\cos p - 1)x^2 + (\cos p)x + \sin p = 0$ in the variable x has real roots. Then p can take any value in the interval

- (a) $(0, 2\pi)$ (b) $(-\pi, 0)$ (c) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (d) $(0, \pi)$ [IIT 1990]

(59) In a triangle ABC, angle A is greater than angle B. If the measures of angles A and B satisfy the equation $3 \sin x - 4 \sin^3 x - k = 0$, $0 < k < 1$, then the measure of angle C is

- (a) $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$ (c) $\frac{2\pi}{3}$ (d) $\frac{5\pi}{6}$ [IIT 1990]

(60) The number of real solutions of the equation $\sin(e^x) = 5^x + 5^{-x}$ is

- (a) 0 (b) 1 (c) 2 (d) infinitely many [IIT 1990]

(61) The general solution of $\sin x - 3 \sin 2x + \sin 3x = \cos x - \cos 2x + \cos 3x$ is

- (a) $n\pi + \frac{\pi}{8}$ (b) $\frac{n\pi}{2} + \frac{\pi}{8}$
(c) $(-1)^n \frac{n\pi}{2} + \frac{\pi}{8}$ (d) $2n\pi + \cos^{-1} \frac{3}{2}$ [IIT 1989]

(62) The value of the expression $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ$ is equal to

- (a) 2 (b) 4 (c) $\frac{2 \sin 20^\circ}{\sin 40^\circ}$ (d) $\frac{4 \sin 20^\circ}{\sin 40^\circ}$ [IIT 1988]

(63) The values of θ lying between $\theta = 0$ and $\theta = \frac{\pi}{2}$ and satisfying the equation

- $$\begin{vmatrix} 1 + \sin^2 \theta & \cos^2 \theta & 4 \sin 4\theta \\ \sin^2 \theta & 1 + \cos^2 \theta & 4 \sin 4\theta \\ \sin^2 \theta & \cos^2 \theta & 1 - 4 \sin 4\theta \end{vmatrix} = 0$$
- are
- (a) $\frac{7\pi}{24}$ (b) $\frac{5\pi}{24}$ (c) $\frac{11\pi}{24}$ (d) $\frac{\pi}{24}$ [IIT 1988]

(64) In a triangle, the lengths of the two larger sides are 10 and 9 respectively. If the angle a is in A.P., then the lengths of the third side can be

- (a) $5 - \sqrt{6}$ (b) $3\sqrt{3}$ (c) 5 (d) $5 + \sqrt{6}$ [IIT 1987]

(65) The smallest positive root of the equation $\tan x = x$ lies in

- (a) $\left(0, \frac{\pi}{2}\right)$ (b) $\left(\frac{\pi}{2}, \pi\right)$ (c) $\left(\pi, \frac{3\pi}{2}\right)$ (d) $\left(\pi, \frac{3\pi}{2}\right)$ [IIT 1987]

(66) The number of all triplets (a_1, a_2, a_3) such that $a_1 + a_2 \cos 2x + a_3 \sin^2 x = 0$ for all x is

- (a) 0 (b) 1 (c) 3 (d) infinite (e) none of these [IIT 1987]

(67) The principal value of $\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$ is

- (a) $-\frac{2\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) $\frac{4\pi}{3}$ (d) $\frac{5\pi}{3}$ (e) none of these [IIT 1986]

(68) The expression

$$3\left[\sin^4\left(\frac{3\pi}{2} - \alpha\right) + \sin^4(3\pi + \alpha)\right] - 2\left[\sin^6\left(\frac{\pi}{2} + \alpha\right) + \sin^6(5\pi - \alpha)\right]$$
 is equal to

- (a) 0 (b) 1 (c) 3 (d) $\sin 4\alpha + \cos 4\alpha$ (e) none of these [IIT 1986]

(69) There exists a triangle ABC satisfying the conditions

- (a) $b \sin A = a$, $A < \frac{\pi}{2}$ (b) $b \sin A > a$, $A > \frac{\pi}{2}$
(c) $b \sin A > a$, $A < \frac{\pi}{2}$ (d) $b \sin A < a$, $A < \frac{\pi}{2}$, $b > a$
(e) $b \sin A < a$, $A > \frac{\pi}{2}$, $b = a$ [IIT 1986]

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

- (a) $\frac{1}{2}$ (b) $\cos\frac{\pi}{8}$ (c) $\frac{1}{8}$ (d) $\frac{1 + \sqrt{2}}{2\sqrt{2}}$ [IIT 1984]

(71) From the top of a light-house 60 m high with its base at the sea-level, the angle of depression of a boat is 15° . The distance of the boat from the foot of the lighthouse is

- (a) $\left(\frac{\sqrt{3} - 1}{\sqrt{3} + 1}\right) 60$ metres (b) $\left(\frac{\sqrt{3} + 1}{\sqrt{3} - 1}\right)^2$ metres
(c) $\left(\frac{\sqrt{3} + 1}{\sqrt{3} - 1}\right) 60$ metres (d) None of these [IIT 1983]

(72) The value of $\tan\left[\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{2}{3}\right)\right]$ is

- (a) $\frac{6}{17}$ (b) $\frac{7}{16}$ (c) $\frac{16}{7}$ (d) None of these [IIT 1983]

(73) If $f(x) = \cos(\ln x)$, then $f(x)f(y) - \frac{1}{2} \left[f\left(\frac{x}{y}\right) + f(xy) \right]$ has the value

- (a) -1 (b) $\frac{1}{2}$ (c) -2 (d) none of these [IIT 1983]

(74) The general solution of the trigonometric equation $\sin x + \cos x = 1$ is given by

- (a) $x = 2n\pi, n = 0, \pm 1, \pm 2, \dots$ (b) $x = 2n\pi + \frac{\pi}{2}, n = 0, \pm 1, \pm 2, \dots$
(c) $x = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}, n = 0, \pm 1, \pm 2, \dots$ (d) none of these [IIT 1981]

(75) If $A = \sin^2 \theta + \cos^4 \theta$, then for all real values of θ

- (a) $1 \leq A \leq 2$ (b) $\frac{3}{4} \leq A \leq 1$
(c) $\frac{13}{16} \leq A \leq 1$ (d) $\frac{3}{4} \leq A \leq \frac{1}{16}$ [IIT 1980]

(76) The equation $2 \cos^2\left(\frac{1}{2}x\right) \sin^2 x = x^2 + x^{-2}, 0 < x \leq \frac{\pi}{2}$ has

- (a) no real solution (b) one real solution
(c) more than one real solution [IIT 1980]

(77) If $\tan \theta = \frac{-4}{3}$, then $\sin \theta$ is

- (a) $\frac{-4}{5}$ or not $\frac{4}{5}$ (b) $\frac{-4}{5}$ or $\frac{4}{5}$
(c) $\frac{4}{5}$ but not $\frac{-4}{5}$ (d) none of these [IIT 1979]

(78) If $\alpha + \beta + \gamma = 2\pi$, then

- (a) $\tan \frac{\gamma}{2} + \tan \frac{\beta}{2} + \tan \frac{\alpha}{2} = \tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
(b) $\tan \frac{\alpha}{2} \tan \frac{\beta}{2} + \tan \frac{\beta}{2} \tan \frac{\gamma}{2} + \tan \frac{\gamma}{2} \tan \frac{\alpha}{2} = 1$
(c) $\tan \frac{\gamma}{2} + \tan \frac{\beta}{2} + \tan \frac{\alpha}{2} = -\tan \frac{\alpha}{2} \tan \frac{\beta}{2} \tan \frac{\gamma}{2}$
(d) none of these [IIT 1979]

15 - TRIGONOMETRY
(Answers at the end of all questions)

Answers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	b	c	b	a	d	c	a	a	c	b	a	a	b	c	b	c	d	a	a
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
b	d	d	c	c	a	a	d	b	d	a	b	c	b	a	c	c	b	a	b
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
a	c	a	a,b,c,d	d	c	c	b	b	a	c	b	c	a	d	b	a,c	b	c	0
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
b	b	a,c	a,c	a	d	e	b	a,d	c	c	d	c	b	a	a	a			

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