MCA SET I

Q1. tan 1° tan 2° tan 3° tan 4°…tan 89° is equal to

(A) 1
(B) 0
(C) ∞
(D) ½

Q2. The minimum value of $3\cos x + 4\sin x + 5$ is

(A) 5
(B) 9
(C) 7
(D) 0

Q3. The equation $\sin x \cos x = 2$ has

(A) One solution
(B) Two solutions
(C) Infinite solutions
(D) No solution

Q4. If the sides of the triangle be 6, 10, and14 then the triangle is:

(A) Obtuse angled
(B) Acute angled
(C) Right angled
(D) Equilateral

Q5. In a Δ ABC, $\sin A : \sin B : \sin C = 1:2:3$. If b = 4 cm, the perimeter of the triangle is

(A) 6 cm
(B) 24 cm
(C) 12 cm
(D) 8 cm

Q6. $1 + cot^2(sin^{-1}x)$ is equal to

(A) $\frac{1}{2x}$

(B) x^2

(C) $\frac{1}{x^2}$

(D) $\frac{2}{x}$

Q7. Angle of elevation of the sun when the shadow of the pole is √3 times the height of the pole is

(A) 60°
(B) 30°
(C) 45°
(D) 15°

Q8. If $a \times b = b \times c \neq 0$ and $a + c \neq 0$, then

(A) $(a + c) \perp b$
(B) $(a + c) \parallel b$
(C) $a + c = b$
(D) None of the above

Q9. If the normals at two points P and Q of a parabola $y^2 = 4ax$ intersect at a third point R on the curve then the product of the ordinates of P and Q is

(A) $4a^2$
(B) $2a^2$
(C) $-4a^2$
(D) $8a^2$

Q10. If retardation produced by air resistance if one tenth of the acceleration due to gravity the time to return from maximum height

(A) Decreases by 9%
(B) Increases by 11%
(C) Decreases by 11%
(D) Increases by 9%

Q11. If the line $y = 2x + k$ is a tangent to the curve $x^2 = 4y$ then k is equal to

(A) 4
(B) 1/2
(C) -4
(D) -1/2

Q12. The latus rectum of the hyperbola $9x^2 - 16y^2 - 18x - 32y - 151 = 0$ is

(A) 9/4
(B) 9
(C) 3/2
(D) 9/2

Q13. The eccentricity of the ellipse $\frac{(x-1)^2}{9} + \frac{(y+1)^2}{25} = 1$ is

(A) 4/5
(B) 3/5
(C) 5/4
(D) Imaginary

Q14. The line $x \cos \alpha + y \sin \alpha = p$ will be a tangent to the conic $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ if

(A) $p^2 = a^2 sin^2 \alpha + b^2 cos^2 \alpha$
(B) $p^2 = a^2 + b^2$
(C) $p^2 = b^2 sin^2 \alpha + a^2 cos^2 \alpha$
(D) None of the above

Q15. Curve $xy = c^2$ is said to be

(A) Parabola
(B) Rectangular hyperbola
(C) Hyperbola
(D) Ellipse

Q16. If you want to kick a football to the maximum distance, the angle at which it should be kicked is (assuming no air resistance)

(A) 45°
(B) 90°
(C) 30°
(D) 60°

Q17. The area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12\, y$ to the ends of its latus rectum is

(A) 12 sq. units
(B) 16 sq. units
(C) 18 sq. units
(D) 24 sq. units

Q18. If the vectors $3i + \lambda j + k$ and $2i - j + 8k$ are perpendicular then λ is

(A) -14
(B) 7
(C) 14
(D) 1/7

Q19. The time taken for a projectile thrown with a velocity v cm/s at an angle α with the horizontal to attain the maximum height is given by

(A) $\frac{v}{g}$

(B) $\frac{v}{\sin\alpha}$

(C) $\frac{v\sin\alpha}{g}$

(D) $(v\sin\alpha)\ g$

Q20. In a city 20% of the population travel by car, 50% travel by bus and 10% travels by both car and bus. Then, persons travelling by car or bus is

A. 80%
B. 40%
C. 60%
D. 70%

Ans (C)

Q21. If A = {2, 4, 5} and B = {7, 8, 9} the $n\ (A \times B)$ is equal to

(A) 6
(B) 9
(C) 3
(D) 0

Q22. In an exam, 70% of students passed in maths, 80% passed in physics, 75% passed in chemistry, 85% passed in Biology, and *x* % passed in all the four subjects. The minimum value of x is:

(A) 10
(B) 12
(C) 15
(D) None of the above

Q23. If A, B and C are any three sets then $A - (B \cup C)$ is equal to :

A. $(A - B) \cup (A - C)$
B. $(A - B) \cap (A - C)$
C. $(A - B) \cup C$
D. $(A - B) \cap C$

Q24. If a, b, c are in AP, then $\frac{(a-c)^2}{(b^2-4ac)}$ is equal to:

A. 1
B. 2
C. 3

D. 4

Q25. The GM of the numbers 3, 3^2, 3^3……3^n is :

A. $3^{2/n}$
B. $3^{(n+1)/2}$
C. $3^{n/2}$
D. $3^{(n-1)/2}$

Q26. If $a^2 + ab^2 + 16c^2 = 2(3ab + 6bc + 4ac)$ where a, b, c are non zero numbers. Then a, b, c are said to be in:

(A) AP
(B) GP
(C) HP
(D) None of the above

Q27. If the arithmetic, geometric and harmonic means between two positive real numbers be A, G, and H, respectively then

(A) $A^2 = GH$
(B) $H^2 = AG$
(C) G = AH
(D) $G^2 = AH$

Q28. If $log_a x$, $log_b x$, $log_c x$ be in HP then a, b, c are in :

A. AP
B. HP
C. GP
D. None of the above

Q29. The number of straight lines that can be formed by joining 20 points no three of which are in same straight line except 4 of them which are in the same line

A. 183
B. 186
C. 197
D. 185

Q30. Number of ways in which any four letters can be selected from the word CORGOO is :

A. 15
B. 11

C. 7
D. None of the above

Q31. The number of divisors of 9600 including 1 and 9600 are:

A. 60
B. 58
C. 48
D. 46

Q32. In how many ways can 5 keys be put in a ring?

A. $\frac{1}{2}4!$
B. $\frac{1}{2}5!$
C. 4!
D. 5!

Q33. Let 'X' be a family of sets and R be a relation on X defined by 'A is disjoint from B'. Then, R is :

(A) Reflexive
(B) Symmetric
(C) Anti-symmetric
(D) Transitive

Q34. R is a relation from {11,12,13} to {8,10,12} defined by y=x-3, then R^{-1} is:

A. {(8,11), (10,13)}
B. {(11,18), (13,10)}
C. {(10,13), (8,11)}
D. None of the above

Q35. Let R be a reflexive relation on a set *A* and *I* be the identity relation on *A.* then,

A. $R \subset I$
B. $I \subset R$
C. R = *I*
D. None of the above

Q36. Let S be the set of all real numbers. Then, the relation R = {(a,b): 1 + ab > 0} on S is :

A. Reflexive and symmetric but not transitive
B. Reflexive and transitive but not symmetric
C. Symmetric, transitive but not reflexive
D. Reflexive, transitive and symmetric

Q37. Let R & S be two non-void relations on a set A. Which of the following statements is false.

A. R & S are transitive $\Rightarrow$ R $\cup$ S is transitive
B. R & S are transitive $\Rightarrow$ R $\cap$ S is transitive
C. R & S are symmetric $\Rightarrow$ R $\cup$ S is symmetric
D. R & S are reflexive $\Rightarrow$R $\cap$ S is reflexive

Q38. Let a relation R be defined by R = { (4,5) , (1,4), (4,6), (7,6), (3,7)} then $R^{-1} o\, R$ is :

A. {(1,1), (4,4), (4,7), (7,4), (7,7), (3,3)}
B. {(1,1), (4,4), (7,7), (3,3)}
C. {(1,5), (1,6), (3,6)}
D. None of the above

Q39. Function f : R $\rightarrow$R, $f(x) = x^2 + x$ is :

A. One-one onto
B. One-one into
C. Many-one onto
D. Many-one into

Q40. Domain of f(x)= log |log x| is:

A. (0, ∞)
B. (1, ∞)
C. (0, 1) $\cup$ (1, ∞)
D. (-∞, 1)

Q41. The domain of definition of the function y(x) given by $2^x + 2^y = 2$ is :

A. (0,1]
B. [0,1]
C. (-∞, 0]
D. (-∞, 1)

Q42. Which of the following function is invertible

(A) $f(x) = 2^x$
(B) $f(x) = x^3 - x$
(C) $f(x) = x^2$
(D) None of the above

Q43. Let $f: (2,3) \rightarrow (0,1)$ be defined by $f(x) = x - [x]$, then $f^{-1}(x)$ equals

(A) $x - 2$
(B) $x + 1$

(C) $x - 1$
(D) $x + 2$

Q44. If a+ b+ c = 0, a ≠ 0, a,b,c ∈ Q, then both the roots of the equation $ax^2 + bx + c = 0$ are:

A. rational
B. non-real
C. irrational
D. zero

Q45. A real root of an equation $log_4 \{log_2 (\sqrt{(x + 8)} - \sqrt{x})\} = 0$ is :

A. 1
B. 2
C. 3
D. 4

Q46. For equation $3x^2 + px + 3 = 0, p > 0$, if one of the roots is square of the other, then p is equal to

A. $\frac{1}{3}$
B. 1
C. 3
D. $\frac{2}{3}$

Q47. The equation of motion of a vehicle is $s = t^2 - 2t$, where '*t*' is measured in hours and 's' in kilometres. When the distance travelled by the vehicle is 15 km, the velocity of the vehicle is :

A. 2 km/h
B. 4 km/h
C. 6 km/h
D. 8 km/h

Q48. The maximum value of $(\frac{1}{x})^x$ is :

A. $(e)^e$
B. $(e)^{\frac{1}{e}}$
C. $(e)^{-e}$
D. $(\frac{1}{e})^e$

Q49. If $f(x) = x + \frac{1}{x}$, $x > 0$, then its greatest value is :

A. -2
B. 0

C. 3
D. None of the above

Q50. The sum of coefficients in the expansion of $(x + 2y + 3z)^8$ is :

A. 3^8
B. 5^8
C. 6^8
D. 7^8

Q51. If the coefficients of r^{th} term and $(r + 4)^{th}$ term are equal in the expansion of $(1 + x)^{20}$, then the value of '*r*' will be

A. 7
B. 8
C. 9
D. 10

Q52. If n ∈ N then x^{2n-1} + y^{2n-1} is divisible by

A. $x + y$
B. $x - y$
C. $x^2 + y^2$
D. $x^2 + xy$

Q53. $\lim_{x\to 0}\left(\frac{x\,(e^x-1)}{1-\cos x}\right)$ is equal to

A. 0
B. ∞
C. -2
D. 2

Q54. If $\lim_{x\to 0} kx\ cosec\ x = \lim_{x\to 0} x\ cosec\ kx$ then '*k*' is equal to

A. 1
B. -1
C. ±1
D. ±2

Q55. The function y = $e^{-|x|}$ is

A. Continuous and differentiable at x = 0
B. Neither continuous nor differentiable at x = 0
C. Continuous but not differentiable at x = 0
D. Not continuous but differentiable at x = 0

Q56. If $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ then A^n is equal to :

A. $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$
B. $\begin{bmatrix} n & n \\ 0 & n \end{bmatrix}$
C. $\begin{bmatrix} n & 1 \\ 0 & n \end{bmatrix}$
D. $\begin{bmatrix} 1 & 1 \\ 0 & n \end{bmatrix}$

Q57. If A and B are square matrices of the same order then,

A. (AB)' =A' B'
B. (AB)' = B'A'
C. AB = 0; if |A| = 0 or $|B| = 0$
D. AB = 0; if A = 1 or B =1

Q58. The derivative of $\sin^{-1}(\frac{2x}{1+x^2})$ with respect to $\cos^{-1}(\frac{1-x^2}{1+x^2})$ is

A. -1
B. 1
C. 2
D. 4

Q59. the derivative of f (x) = x |x| is

A. 2x
B. -2x
C. $2x^2$
D. 2|x|

Q60. $\int \frac{dx}{e^x + e^{-x}}$ is equal to

A. $\tan^{-1}(e^{-x}) + C$
B. $\tan^{-1}(e^{x}) + C$
C. $\log \ (e^x - e^{-x})$ + C
D. $\log \ (e^{x^2} - e^{-x})$ + C

Q61. Value of $\int_0^{\frac{\pi}{2}} \frac{\sin x}{1+ cos^2 x}$dx is

A. $\frac{\pi}{2}$
B. $\frac{\pi}{4}$
C. $\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Q62. Area bounded by the curve $y = x^3$, ‘x’ axis and ordinates $x = 1$ and $x = 4$ is

A. 64 m^2
B. 27 m^2
C. $\frac{127}{4}\ m^2$
D. $\frac{255}{4}\ m^2$

Q63. The order of the differential equation of the family of all the concentric circles centered at (h,k) is

A. 1
B. 2
C. 3
D. 4

Q64. The slope of a curve at any point is the reciprocal of twice the ordinate at the point and it passes through the point (4,3). The equation of curve is

A. $x^2 = y + 5$
B. $y^2 = x - 5$
C. $y^2 = x + 5$
D. $x^2 = y - 5$

Q65. The area of the triangle formed by the lines

7x -2y + 10 = 0, 7x + 2y – 10 = 0, y + 2 = 0

A. 8 sq. units
B. 12 sq. units
C. 14 sq. units
D. None of these

Q66. The equation $(x + y)^2 = (x^2 + y^2) = 0$ represents

A. Circle
B. Two lines
C. Two parallel lines
D. Two mutually perpendicular lines

Q67. If the sum of the slopes of the lines represented by the equation $x^2 - 2xy\tan A - y^2 = 0$ be 4, then ∠A is equal to :

A. 0 degree
B. 45 degree

C. 60 degree
D. $\tan^{-1}(-2)$

Q68. Which the following is false ?

(A) $x^2(1+x) > 0 \Leftrightarrow x > -1$ and $x \neq 0$
(B) $x^3 + y^3 = 0 \Leftrightarrow x = y = 0$
(C) $x = 3$ and $y = 5 \Rightarrow 2x + 4y = 26$
(D) $x = \sqrt{16} \Rightarrow x^2 = 16$

Q69. Consider the statement : ‘If it rains, the wind is blowing’. Which of the following statements does not express the same (with R as the statement that it is raining, and W as the statement that the wind is blowing, $R \Rightarrow W$) ?

(A) A sufficient condition for rain is that the wind is blowing
(B) A sufficient condition for the wind to blow is that it is raining
(C) A necessary condition for rain is that the wind is blowing
(D) If the wind is blowing, there will be no rain

Q70. In a group of 100 students, 25 study economics, 30 study political science and 5 study both subjects. How many students study neither economics nor political science?

(A) 45
(B) Unable to tell
(C) 55
(D) 50

Q71. Given the sets A = $\{2,3,4,5\}$, B = $\{1,2,3,4,7\}$ and C = $\{1,3,6,7\}$, which of the following statements is false?

(A) $(A \setminus B) \cap C = \{2\}$
(B) $A \cap C \subset B$
(C) $(A \cup B) \cap C = \{1,3,7\}$
(D) $2 \in A \cap B$

Q72. If $A = \begin{pmatrix} 0 & 1 \\ 2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -1 \\ 5 & 2 \end{pmatrix}$, which of the following is false?

A. $A + B = \begin{pmatrix} 1 & 0 \\ 7 & 5 \end{pmatrix}$
B. $A^2 = \begin{pmatrix} 0 & 1 \\ 4 & 9 \end{pmatrix}$
C. $AB = \begin{pmatrix} 5 & 2 \\ 17 & 4 \end{pmatrix}$
D. $3A - 4B = \begin{pmatrix} -4 & 7 \\ -14 & 1 \end{pmatrix}$

Q73. If A, B and C are n X n matrices, which of the following equalities is invalid? Note: D' is the transpose of D

(A) (ABC) ' = C' B' A'
(B) (A + A)' = 2A'
(C) $((AB)^2)' = (B')^2 (A')^2$
(D) (A + A + 2B)' = 2B' + 2A'

Q74. Which of the following statements is correct?

A. A linear system with more equations than unknowns cannot have solutions
B. It is possible to construct a linear system with exactly 5 different solutions
C. Suppose **A** is n X n, **x** is n X 1, and **Ax** = 0 has only the trivial solution. Then **Ax = b** has solutions for any n x 1, vector **b**
D. A linear system can only have an infinite number of solutions if there are more variables than equations

Q75. For which values of ***t*** does the following linear equation system have infinitely many solutions

$tx + y = 1$
$6x + (t + 1) y = 3$

A. $t = -3$
B. $t = 2$
C. $t = 2$ and $t = -3$
D. The system does not have infinitely many solutions for any value of t

Q76. Using Gaussian eliminations, the solutions of: $x + y + z = c$, $x + 2y + az = 2c$ and $x + 2y + bz = 2$ can be deduced from the augmented matrix

$$\begin{pmatrix} 1 & 1 & 1 & c \\ 0 & 1 & a-1 & c \\ 0 & 0 & b-a & 2(1-c) \end{pmatrix}$$

For which values of a, b, and c are there infinitely many solutions?

(A) If $a \neq b$
(B) If a = b and c= 1
(C) If c = 1
(D) Never

Q77. The straight line in R^3 through the point (-1,3,3) pointing in the direction of the vector (1,2,3) hits the $x_1 x_2$ - plane at the point:

A. (1, 3, 0)
B. Never
C. (2, -1, 0)
D. (-2, 1, 0)

Q78. Let ***L*** denote the line passing through the points (0,5) and (4,3). Which of the following points also lies on ***L*** ?

A. (8, 0)
B. (12, -1)
C. (11,0)
D. (-4, 6)

Q79. Which of the following formulas is false (x, y, and z are positive)?

(A) $(\ln x)^4 = 4 \ln x$
(B) $\ln[(x+y)^{1/5} z^{2/3}]^{15} = 3\ln(x+y) + \ln z$
(C) $\ln x^5 - \ln x^3 = 2 \ln x$
(D) $2 \ln \frac{x}{y} + \ln \frac{y^2}{x^2} = 0$

Q80. If f(x) = ln x, x > 0, and g(x) = $4-x^2$, $x \in R$ what is the range of f(g (x))?

(A) $(-\infty, \ln 4)$
(B) $(-\infty, 0)$
(C) $(0, \infty)$
(D) $(0, \ln 4)$

Q81. $\frac{(3^{100}+3^{98})}{(3^{100}-3^{98})}$ is equal to

A. 3^{196}
B. 99
C. $\frac{3+3}{3-3}$
D. 5/4

Q82. If $x = a - b$ makes $x^2 - 2ax + m$ equal to 0, then m is

A. a + b
B. $a^2 - b^2$
C. $a^2 + b^2$
D. a –b

Q83. Which of the following factorizations is incorrect?

A. $2a^2 - 5ab - 3b^2 = (2a + b)(a - 3b)$
B. $x^6 - y^6 = (x^3 + y^3)(x^3 - y^3)$
C. $25a^2 + 1 = (5a + 1)(5a - 1)$
D. $a - 2\sqrt{ab} + b = (\sqrt{a} - \sqrt{b})^2$

Q84. If $p \in (0,1)$, then:

A. $p > 1/p$
B. $p^3 > p^2$
C. $p > \sqrt{p}$
D. $1/p > \sqrt{p}$

Q85. Which of the following statements is incorrect?

(A) $\sqrt{a^2} = |a|$
(B) $|a + b| \leq |a| + |b|$
(C) $|a - b| \leq |a| - |b|$
(D) $|a| - |b| \leq |a + b|$

Q86. In a sports league where no drawn games are possible, a team had 10 more wins than twice its losses. It played a total of 52 matches. How many did it lose?

(A) 12
(B) 10
(C) 14
(D) 16

Q87. The solution (s) of the equation $\frac{x^2-3x-10}{\sqrt{x-5}}$ = 0 is / are :

(A) Only x = 5
(B) No solution
(C) Only x= -2
(D) x= -2 and x = 5

Q88. Solving $\frac{1}{p}+\frac{1}{q}= \frac{1}{T}$ for ‘q’ you get :

(A) $\frac{pT}{p+T}$
(B) T – p
(C) $\frac{pT}{p-T}$
(D) $\frac{1}{T}-\frac{1}{p}$

Q89. If $z = F\ (x, y) = x^2 - y^3$ and $x = t^2, y = 1 - t$, then $\left\{\frac{dz}{dt}\right\}_{t=0}$ is :

(A) 3
(B) 0
(C) -3
(D) 2

Q90. The function $z = xy^2 - y^3 + 2x^2y$ satisfies the equation $xz'x + yz'x = kz\ for\ k =$

(A)2
(B)3
(C)4
(D)For no value of k

Q91. Which of the following statements about systems of equations is correct?

(A) Three equations with two unknowns never have a solution.
(B) Three linear equations with three unknowns never have exactly two solutions.
(C) Three linear equations with three unknowns always have a unique solution
(D) Two equations with three unknowns always have a solution

Q92. Ogives for more than type and less than type distributions intersect at:

(A) mean

(B) median

(C) mode

(D) origin

Q93. If A and A^C are complementary events in a sample space S, then :

(A) $P(A) + P(A^C) = 0$

(B) $P(A) - P(A^C) = 0$

(C) $P(A) + P(A^C) = 1$

(D) $P(A) - P(A^C) = 1$

Q94. If mean of n observations is 'a'. If one observation 'b' is added, mean continues to remain 'a', then the value of 'b' is:

(A) 0

(B) 1

(C) n

(D) a

Q95. Let there be two data sets I and II of size 80 and 20 respectively. The combined arithmetic mean of the two data sets is 500. If the arithmetic mean of the data set I is 520, then the arithmetic mean of data set II is :

(A) 480

(B) 490

(C) 450

(D) 420

Q96. The mean of 50 observation is 40 and standard deviation (s.d.) 8. If 4 is added to each observation, then the new mean and standard deviation (s.d.) are :

(A) mean = 40, s.d. = 8

(B) mean = 44, s.d. = 12

(C) mean = 44, s.d. = 8

(D) mean = 40, s.d. = 12

Q97. Let f (x) = $\int_1^x \sqrt{2 \quad - t^2\, dt}$ then real roots of the equation x2 –f′ (x) = 0 are

A. ± 1
B. $\pm\frac{1}{\sqrt{2}}$
C. $\pm\frac{1}{2}$
D. 0 and 1

Q98. Which of the following is false?

(A) If A = $(1 + p/100)^t$, then p = $100(A^{1/t} - 1)$
(B) $\sqrt{2x + 3}$ = x has only the solution x = 3
(C) $X^2 - rx - \delta(r + \delta) = 0$ has the solutions x = -δ and x = r + δ
(D) $(p^{1/3}+1) = 27$ implies p = ± δ

Q99. Which of the following functions are not homogenous of any degree?

(A) $5(x+y)^5 + 5$
(B) $e^{\frac{x^2}{y^2}}$
(C) $\frac{x+y}{x^2 + y^2}$
(D) $3x^2y - y^3$

Q100. If$4^{40} + 4^{40} = x$, then x is:

A. 82
B. 80
C. 81
D. 160