CET – MATHEMATICS – 2012

1. The length of the sub-tangent, ordinate and the sub-normal are in
   a) Arithmetico geometric progression
   b) A.P.
   c) H.P
   d) G.P.

Ans: (d)

2. The maximum value of xe^{-x} is

   a) $-\frac{1}{e}$ b) e c) $\frac{1}{e}$ d) –e

Ans (c)

3. If [x] is the greatest integer function not greater than x, then

   $\int_{x}^{11} [x]\, dx =$

   a) 55 b) 45 c) 66 d) 35

Ans: (a)

4. If $n \in N$ and $I_n = \int (\log x)^n dx$, then $I_n + nI_{n-1} =$

   a) $\frac{(\log x)^n n}{n}$ b) $\frac{(\log x)^{n+1}}{n+1}$ c) $x(\log x)^n + c$ d) $(\log x)^{n-1}$

Ans: (c)

5. Solution of $e^{\frac{dy}{dx}} = x$ when x = 1 and y = 0 is

   a) y = x (log x – 1) + 1 b) y = x (log x – 1) + 4
   c) y = x (log x – 1) + 3 d) y = x (log x + 1) + 1

Ans: (a)

6. If $f(x) = \begin{cases} \frac{x^2 - (a+2)x + a}{x-2} & x \neq 2 \\ 2 & x = 2 \end{cases}$ is continuous at x = 2, then the value of a is

   a) – 1 b) – 6 c) 0 d) 1

Ans: (c)

7. If $\log_2 (9^{x-1} + 7) - \log_2(3^{x-1} + 1) = 2$, then x values are

   a) 1, 2 b) 0, 2 c) 0, 1 d) 1, 4

Ans: (a)

8. If x – 1 is a factor of $x^5 - 4x^3 + 2x^2 - 3x + k = 0$, then k is

   a) 3 b) 4 c) -4 d) 2

Ans: (b)

9. If A and B have n elements in common, then the number of elements common to A x B and B x A is

a) 0 b) n c) 2n d) n^2

Ans: (d)

10. The 13^{th} term in the expansion of $\left(x^2 + \frac{2}{x}\right)^n$ is independent of x then the sum of the divisors of n is

a) 39 b) 36 c) 37 d) 38

Ans: (a)

11. If one of the slopes of the pair of lines $ax^2 + 2hxy + by^2 = 0$ is n times the other thennnn

a) $4ab = (n + 1)^2 h$ b) $4(n + 1)^2 ab = nab$

c) $4h^2 = (n + 1)^2 ab$ d) $4nh^2 = (n + 1)^2 ab$

Ans: (d)

12. If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & x \end{vmatrix}$ then $\underset{x \to 0}{Lt} \frac{f(x)}{x^2} =$

a) 1 b) 0 c) 3 d) 2

Ans: (a)

13. The number of solutions of the equation $z^2 + \bar{z} = 0$ where $x \in C$ are

a) 6 b) 1 c) 4 d) 5

Ans: (c)

14. The least and the greatest distances of the point (10, 7) from the circle $x^2 + y^2 - 4x - 2y - 20 = 0$ are

a) 5, 15 b) 10, 5 c) 15, 20 d) 12, 16

Ans: (a)

15. Which of the following is incorrect?

If $a \equiv b \pmod m$ and x is an integer, then

a) $(a \div x) \equiv (b \div x) \pmod m$ b) $(a + x) \equiv (b + x) \pmod m$

c) $(a - x) \equiv (b - x) \pmod m$ d) $ax \equiv bx \pmod m$

Ans: (a)

16. Inverse of a diagonal non-singular matrix is

a) diagonal matrix b) scalar matrix

c) skew symmetric matrix d) zero matrix

Ans: (a)

17. If $ax^4 + bx^3 + cx^2 + dx + e = \begin{vmatrix} x^3 + 3x & x - 1 & x + 3 \\ x + 1 & -2x & x - 4 \\ x - 3 & x + 4 & 3x \end{vmatrix}$, then e =

a) -1 b) 1 c) 0 d) 2

Ans: (c)

18. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three non-coplanar vectors and $\vec{p}$, $\vec{q}$ and $\vec{r}$ are vectors defined by

$\vec{p} = \frac{\vec{b} \times \vec{c}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}$, $\vec{q} = \frac{\vec{c} \times \vec{a}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}$ and $\vec{r} = \frac{\vec{a} \times \vec{b}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}$, then the value of

$(\vec{a} + \vec{b}).\vec{p} + (\vec{b} + \vec{c}).\vec{q} + (\vec{c} + \vec{a}).\vec{r} =$

a) 3 b) 0 c) 1 d) 2

Ans (a)

19. If $(\vec{a} \times \vec{b})^2 + (\vec{a}.\vec{b})^2 = 144$ and $|\vec{a}| = 4$, the $|\vec{b}| =$

a) 12 b) 16 c) 8 d) 3

Ans (d)

20. Which of the following is false?

a) Set of even integers is a group under usual addition

b) (N, .) is a group

c) (N, +) is a semi-group

d) (Z, +) is a group

Ans (b)

21. $2\cos^{-1} x = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$ is valid for all values of x satisfying

a) $0 \le x \le \frac{1}{\sqrt{2}}$ b) $-1 \le x \le 1$ c) $0 \le x \le 1$ d) $\frac{1}{\sqrt{2}} \le x \le 1$

Ans: (d)

22. If α is a complex number such that $\alpha^2 - \alpha + 1 = 0$, then $\alpha^{2011} =$

a) 1 b) $-\alpha$ c) α^2 d) α

Ans: (d)

23. If $\cos\alpha + 2\cos\beta + \cos\gamma = 0$, $\sin\alpha + 2\sin\beta + 3\sin\gamma = 0$ and $\alpha + \beta + \gamma = \pi$, then $\sin 3\alpha + 8\sin 3\beta + 27\sin 3\gamma =$

a) 9 b) – 18 c) 0 d) 3

Ans: (c)

24. If the conjugate of $(x + iy)(1 - 2i)$ is $1 + i$, then

a) $x = -\frac{1}{5}$ b) $x - iy = \frac{1+i}{1-2i}$ c) $x + iy = \frac{1-i}{1-2i}$ d) $x = \frac{1}{5}$

Ans: (c)

25. If the straight line $3x + 4y = k$ touches the circle $x^2 + y^2 = 16x$, then the value of k is

a) 16, - 64 b) 16, 64 c) -16, - 64 d) -16, 64

Ans: (d)

26. The locus of the point of intersection of perpendicular tangents to the ellipse is called

a) director circle b) hyperbola c) ellipse d) auxiliary circle

Ans: (a)

27. If $m \sin^{-1} x = \log_e y$, then $(1 - x^2)\, y_{II} - xy' =$

a) $-2y$ b) $m^2 y$ c) $-m^2 y$ d) $2y$

Ans: (b)

28. If $y = e^{\log_e [1 + x + x^2 + ..]}$, then $\frac{dy}{dx} =$

a) $\frac{-1}{(1-x)^2}$ b) $\frac{1}{(1+x)^2}$ c) $\frac{1}{(1-x)^2}$ d) $\frac{-1}{(1+x)^2}$

Ans: (c)

29. Length of the subtangent at (x_1, y_1) on $x^n y^m = a^{m+n}$, m, n > 0, is

a) $\frac{n}{m} |x_1|$ b) $\frac{n}{m} x_1$ c) $\frac{m}{n} |x_1|$ d) $\frac{n}{m} |y_1|$

Ans: (c)

30. If a ball is thrown vertically upwards and the height 's' reached in time 't' is given by $s = 22t - 11 t^2$, then the total distance traveled by the ball is

a) 22 units b) 44 units c) 33 units d) 11 units

Ans: (a)

31. The sum of two positive numbers is given. If the sum of their cubes is minimum, then

a) one is thrice the other b) they are equal

c) one is twice the other d) they are unequal

Ans: (b)

32. $\int_{\pi/6}^{\pi/3} \frac{\sin^3 x}{\sin^3 x + \cos^3 x}\, dx =$

a) $\frac{\pi}{6}$ b) $\frac{\pi}{2}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{12}$

Ans: (d)

33. $\underset{x \to 0}{\text{Lt}} \frac{x\, 2^x - x}{1 - \cos x} =$

a) $\frac{1}{2}$ b) 2 log 2 c) log 2 d) $\frac{1}{2}$ log 2

Ans: (b)

34. If $\frac{3x+1}{(x-1)(x+3)} = \frac{A}{x-1} + \frac{B}{x+3}$, then $\sin^{-1} \frac{A}{B} =$

a) $\frac{\pi}{4}$ b) $\frac{\pi}{2}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{6}$

Ans: (d)

35. If α, β, γ are the roots of the equation $x^3 + 4x + 2 = 0$, then $\alpha^3 + \beta^3 + \gamma^3 =$

a) -6 b) 2 c) 6 d) -2

Ans: (a)

36. The value of ${}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 + ... + {}^{10}C_9$ is

a) $2^{10} - 1$ b) 2^{10} c) 2^{11} d) $2^{10} - 2$

Ans: (d)

37. $p \rightarrow \sim q$ can also be written as

a) $\sim q \rightarrow \sim p$ b) $p \rightarrow q$ c) $\sim p \vee \sim q$ d) $q \rightarrow p$

Ans: (c)

38. If f: R $\rightarrow$R is defined by f (x) = 2x + 3, then f^{-1} (x)

a) does not exist because 'f' is not surjective

b) is given by $\frac{x-3}{2}$

c) is given by $\frac{1}{2x+3}$

d) does not exist because 'f' is not injective

Ans: (b)

39. $\frac{\sin 70^0 + \cos 40^0}{\cos 70^0 + \sin 40^0}$ =

a) 1 b) $\frac{1}{\sqrt{3}}$ c) $\sqrt{3}$ d) $\frac{1}{2}$

Ans: (c)

40. The points (11, 9), (2, 1) and (2, -1) are the midpoints of the sides of the triangle. Then the centroid is

a) (5, 3) b) (-5, -3) c) (5, - 3) d) (3, 5)

Ans: (a)

41. The reflection of the point (1, 1) along the line y = -x is

a) (1, -1) b) (0, 0) c) (-1, 1) d) (-1, -1)

Ans: (d)

42. The number of circles that touch the co-ordinate axes and the line whose slope is -1 and y-intercept is 1, is

a) 3 b) 1 c) 4 d) 2

Ans: (d)

43. If f (x) is an even function, then f' (x) is

a) nothing can be said b) an odd function

c) an even function d) may be even or may be odd

Ans: (b)

44. The perimeter of a sector is a constant. If its area is to be maximum, then the sectorial angle is

a) 2^c b) $\frac{\pi^c}{6}$ c) $\frac{\pi^c}{4}$ d) 4^c

Ans: (a)

45. The last digit of number 7^{886} is

a) 1 b) 9 c) 7 d) 3

Ans: (b)

46. If (24, 92) = 24 m + 92 n, then (m, n) is

a) (-4, 3) b) (-1, 4) c) (4, -1) d) (4, -3)

Ans: (c)

47. The characteristic equation of a matrix A is $\lambda^3 - 5\lambda^2 - 3\lambda + 2 = 0$ then $|\text{adj } (A)|$

a) 4 b) 9 c) 25 d) $\frac{1}{2}$

Ans: (a)

48. If $\hat{i} + \hat{j} - \hat{k}$ and $2\hat{i} - 3\hat{j} + \hat{k}$ are adjacent sides of a parallelogram, then the lengths of its diagonals are

a) $\sqrt{21}, \sqrt{13}$ b) $\sqrt{3}, \sqrt{14}$ c) $\sqrt{13}, \sqrt{14}$ d) $\sqrt{21}, \sqrt{3}$

Ans: (a)

49. If the volume of the parallelepiped formed by three non-coplanar vectors $\vec{a}, \vec{b}$ and $\vec{c}$ is 4 cubic units, then $\left[\vec{a} \times \vec{b} \;\; \vec{b} \times \vec{c} \;\; \vec{c} \times \vec{a}\right] =$

a) 8 b) 64 c) 16 d) 4

Ans: (c)

50. Which of the following is a subgroup of the group $G = \{2^n | n \in Z\}$ under multiplication?

a) $\{4^n | n \in Z\}$ b) $\{4^n | n \in N\}$ c) $\{3^n | n \in Z\}$ d) $\{6^n | n \in Z\}$

Ans: (b)

51. In the group $G = \{1, 2, 3, 4, 5, 6\}$ under $\otimes_7$, the solution of $4 \otimes_7 x = 5$ is

a) 5 b) 3 c) 2 d) 4

Ans: (b)

52. The number of real solutions of the equation $\tan^{-1}\sqrt{x(x+1)} + \sin^{-1}\sqrt{x^2 + x + 1} = \frac{\pi}{2}$ is

a) infinitely many b) one c) four d) two

Ans: (d)

53. If $\sin 2x = 4 \cos x$, then x =

a) $2n\pi \pm \frac{\pi}{2}, n \in Z$ b) $n\frac{\pi}{2} \pm \frac{\pi}{4}, n \in Z$ c) no value d) $n\pi + (-1)^n \frac{\pi}{4} n \in Z$

Ans: (a)

54. If α and β are different complex numbers with $|\beta| = 1$, then $\left|\frac{\beta - \alpha}{1 - \bar{\alpha}\beta}\right|$ is equal to

a) 2 b) $\frac{1}{2}$ c) 1 d) $\frac{1}{3}$

Ans: (c)

55. The equations of the two tangents from (-5, -4) to the circle $x^2 + y^2 + 4x + 6y + 8 = 0$ are

a) $x - 7y = 23, 6x + 13y = 4$

b) $x + 2y + 13 = 0, 2x - y + 6 = 0$

c) $2x + y + 13 = 0, x - 2y = 6$

d) $3x + 2y + 23 = 0, 2x - 3y + 4 = 0$

Ans: (b)

56. If $x = t^2 + 2$ and $y = 2t$ represent the parametric equation of the parabola

a) $(x - 2)^2 = 4y$ b) $x^2 = 4(y - 2)$ c) $(y - 2)^2 = 4x$ d) $y^2 = 4(x - 2)$

Ans: (d)

57. If $x - y = 1$ is a tangent to the hyperbola $\frac{x^2}{4} - \frac{y^2}{3} = 1$, the point of contact is

a) (5, 4) b) (4, 3) c) (3, 4) d) (2, 1)

Ans: (b)

58. If $y = \tan^{-1}\left(\frac{1}{1+x+x^2}\right) + \tan^{-1}\left(\frac{1}{x^2+2x+3}\right) + \tan^{-1}\left(\frac{1}{x^2+5x+7}\right) + \ldots..$ n terms, then y' (0) is

a) $-\frac{n^2}{1+n^2}$ b) $\frac{\pi}{2}$ c) $\frac{2n}{1+n^2}$ d) $\frac{n^2}{1+n^2}$

Ans: (a)

59. If $f(x) = \sin[\pi^2]x + \cos[-\pi^2]x$ then f' (x) is, here $[\pi^2]$ and $[-\pi^2]$ greatest integer function not greater than its value

a) -1 b) sin 9x + cos 9x

c) 9 cos 9x – 10 sin 10 x d) 0

Ans: (c)

60. The tangent to the curve xy = 25 at any point on it cuts the coordinate axes at A B, then the area of the triangle OAB is

a) 100 sq. units b) 50 sq. units c) 25 sq. units d) 75 sq. units

Ans: (b)