Question Booklet Series: **A** *Question Booklet Serial No.:* **151310**

CET (UG) – 2019

Important: *Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.*

Roll No. ***(In Figure)*** ***(In Words)***

O.M.R. Answer Sheet Serial No.

Signature of Candidate: _____ *Signature of Invigilator:* _____

SUBJECT: MATHEMATICS

Time: 70 Minutes **Number of Questions: 60** **Maximum Marks: 120**

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.

INSTRUCTIONS:

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. The medium of examination shall be **English** only.
5. Please check that this Question Booklet contains **60** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
6. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen.**
7. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
9. **Negative marking will be adopted for evaluation i.e. 1/4th of the marks of the question will be deducted for each wrong answer. A wrong answer means incorrect answer or wrong filling of bubble.**
10. For calculations, use of simple log tables is permitted. Borrowing of log tables and any other material is not allowed.
11. For rough work only the blank sheet at the end of the Question Booklet be used.
12. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
15. **20 minutes** extra should be given to the visually handicapped/Person with Disability (PwD) for each paper.
16. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistant or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
17. **Tele-communication equipment such as Cellular phones, pager, wireless, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
18. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

(MATHS-A)

1. The least value of $2\sin^2\theta + 3\cos^2\theta$ is

   (A) 1 (B) 2 (C) 3 (D) 5

2. If $f(x) = \cos^2 x + \sec^2 x$, its value always is

   (A) $f(x) \le 1$ (B) $f(x) = 1$ (C) $1 < f(x) < 2$ (D) $f(x) \ge 2$

3. The value of $\cos 10^0 - \sin 10^0$ is

   (A) Positive (B) Negative (C) 0 (D) 1

4. The value of $\cot\left(\frac{\pi}{4} + \theta\right)\cot\left(\frac{\pi}{4} - \theta\right)$ is

   (A) -1 (B) 0 (C) 1 (D) ∞

5. If $\tan x = b/a$ then $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$ is equal to

   (A) $\frac{2\sin x}{\sqrt{\sin 2x}}$ (B) $\frac{2\cos x}{\sqrt{\cos 2x}}$ (C) $\frac{2\cos x}{\sqrt{\sin 2x}}$ (D) $\frac{2\sin x}{\sqrt{\cos 2x}}$

6. The equation $\cos x + \sin x = 2$ has

   (A) Only one solution (B) Two solutions
   (C) No solution (D) Infinite number of solutions

7. If $\sin 5x + \sin 3x + \sin x = 0$, the value of x other than 0, lying in the interval $[0, \pi/2]$ is

   (A) $\pi/6$ (B) $\pi/12$ (C) $\pi/3$ (D) $\pi/4$

8. The value of $\sin^{-1}x + \cos^{-1}x$, $(|x| \le 1)$ is

   (A) 1 (B) π (C) $\pi/2$ (D) $-\pi/2$

9. If A and B are the points $(-3, 4)$ and $(2, 1)$, then the coordinates of the point C on AB produced such that $AC = 2BC$ are

   (A) $(2, 4)$ (B) $(3, 7)$ (C) $(7, -2)$ (D) $(-1/2, 5/2)$

10. The straight lines $x + y = 0$, $3x + y = 4$ and $x + 3y = 4$ form a triangle which is

    (A) Isosceles (B) Equilateral
    (C) Right angled (D) None of these

11. The equation of the circle passing through (4, 5) having centre at (2, 2) is

    (A) $x^2 + y^2 + 4x + 4y - 5 = 0$ (B) $x^2 + y^2 - 4x - 4y - 5 = 0$
    (C) $x^2 + y^2 - 4x = 13$ (D) $x^2 + y^2 - 4x - 4y + 5 = 0$

12. The area of circle centred at (1, 2) and passing through (4, 6) is

    (A) 5π (B) 10π (C) 12π (D) 25π

13. It the two circles $(x-1)^2 + (y-3)^2 = r^2$ and $x^2 + y^2 - 8x + 2y + 8 = 0$ intersect in two distinct points, then

    (A) $2 < r < 8$ (B) $r < 2$ (C) $r > 8$ (D) $r = 2$

14. It θ be the angle between the vectors $\vec{i}+\vec{j}$ *and* $\vec{j}+\hat{k}$ then θ is

(A) 0 (B) π/4 (C) π/2 (D) π/3

15. The vectors $\vec{A}=3\vec{i}-\hat{k}$ *and* $\vec{B}=\vec{i}+2\vec{j}$ are adjacent sides of a parallelogram. Its area is

(A) $\frac{\sqrt{17}}{2}$ (B) $\frac{\sqrt{14}}{2}$ (C) $\sqrt{41}$ (D) $\frac{\sqrt{7}}{2}$

16. The points with position vectors $10\vec{i}+3\vec{j}, 12\vec{i}-5\vec{j}$ *and* $a\vec{i}+11\vec{j}$ are collinear if a equals

(A) -8 (B) 4 (C) 8 (D) 12

17. The volume of a parallelepiped whose sides are given by $\overrightarrow{OA}=2\vec{i}-3\vec{j}, \overrightarrow{OB}=\vec{i}+\vec{j}-\hat{k}$, $\overrightarrow{OC}=3\vec{i}-\hat{k}$ is

(A) $\frac{4}{13}$ (B) 4 (C) $\frac{2}{7}$ (D) 1

18. The value of $9^{1/3}\times9^{1/9}\times9^{1/27}\times\ldots$ is

(A) 9 (B) 1 (C) 3 (D) ∞

19. If the harmonic mean between two positive numbers is to their geometric mean as 12 : 13, then the numbers are in the ratio

(A) 12:13 (B) $\frac{1}{12}:\frac{1}{13}$ (C) 4:9 (D) $\frac{1}{4}:\frac{1}{9}$

20. In an arithmetic progression, the sum of terms equidistant from the beginning and end is equal to

(A) First term (B) Second term
(C) Sum of first and last term (D) Last term

21. The first term of a geometric progression whose second term is 2 and sum to infinity is 8 will be

(A) 6 (B) 3 (C) 4 (D) 1

22. The number of quadratic equations which are unchanged by squaring their roots is

(A) 1 (B) 2 (C) 4 (D) 6

23. If one root of the equation $x^2+px+12=0$ is 4 while the equation $x^2+px+q=0$ has equal roots, the value of q is

(A) $\frac{49}{4}$ (B) $\frac{49}{2}$ (C) 49 (D) 4

24. If α and β are the roots of $4x^2+3x+7=0$ then the value of $\frac{1}{\alpha}+\frac{1}{\beta}$ is

(A) $\frac{-3}{4}$ (B) $\frac{-3}{7}$ (C) $\frac{3}{7}$ (D) $\frac{7}{4}$

25. The points z_1, z_2, z_3, z_4 in the complex plane are the vertices of a parallelogram taken in orde if and only if

(A) $z_1+z_4=z_2+z_3$ (B) $z_1+z_3=z_2+z_4$
(C) $z_1+z_2=z_3+z_4$ (D) $z_1+z_2+z_3+z_4=0$

26. For any complex number z, the minimum value of $|z| + |z - 1|$ is

(A) 1 (B) 0 (C) 1/2 (D) 3/2

27. If the imaginary part of $\frac{2z+1}{iz+1}$ is -2, then the locus of the point representing z in the complex plane is

(A) A circle (B) A straight line (C) A parabola (D) An ellipse

28. Sum of coefficients in the expansion of $(x+2y+z)^{10}$ is

(A) 2^{10} (B) 3^{10} (C) 4^{10} (D) 1

29. If $(1-x+x^2)^n = a_0 + a_1x + a_2x^2 + ... + a_{2n}x^{2n}$ then $a_0 + a_2 + a_4 + ... + a_{2n}$ equals

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

30. If ω is cube root of unity, then a root of the equation $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} = 0$ is

(A) $x = 1$ (B) $x = \omega$ (C) $x = \omega^2$ (D) $x = 0$

31. If every element of a determinant of third order with value Δ is multiplied by 3, then the value of the newly formed determinant is

(A) Δ (B) 3Δ (C) 9Δ (D) 27Δ

32. If $\log_{0.3}(x-1) < \log_{0.09}(x-1)$ then x lies in the interval

(A) $(2, \infty)$ (B) $(-\infty, 2)$ (C) $(1, 2)$ (D) $(0, 1)$

33. Everyone in a room shakes hands with everybody else. The total number of handshakes is 66. The total number of persons in the room is

(A) 11 (B) 12 (C) 13 (D) 14

34. A five-digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4, 5 without repetition. The total number of ways this can be done is

(A) 216 (B) 240 (C) 600 (D) 3125

35. If 7 points out of 12 are in the same straight line, then the number of triangles formed is

(A) 19 (B) 185 (C) 201 (D) 220

36. $\lim_{x \to \pi/4} \frac{\sqrt{2}\cos x - 1}{\cot x - 1}$ equals

(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$ (C) $\frac{1}{2\sqrt{2}}$ (D) 1

37. If $f(x) = \begin{cases} \frac{\sin[x]}{[x]}, & [x] \neq 0 \\ 0, & [x] = 0 \end{cases}$, where [x] denotes the greatest integer less than or equal to x, then $\lim_{x \to 0}$ equals

(A) 1 (B) 0 (C) -1 (D) Does not exists

38. Let $y = \sin^{-1}\frac{2x}{1+x^2}$ where $0 < x < 1$ and $0 < y < \pi/2$ then $\frac{dy}{dx}$ is equal to

(A) $\frac{2}{1+x^2}$ (B) $\frac{2x}{1+x^2}$ (C) $\frac{1}{1+x^2}$ (D) $\frac{-x}{1+x^2}$

39. The derivative of f(ln x) where f(x)=ln x is

(A) $\frac{x}{\ln x}$ (B) $\frac{\ln x}{x}$ (C) $\frac{1}{x \ln x}$ (D) $x \ln x$

40. The tangent of the curve $y = 2x^2-x+1$ is parallel to the line $y = 3x+9$ at the point

(A) (3, 9) (B) (2, −1) (C) (2, 1) (D) (1, 2)

41. The normal to a given curve is parallel to x−axis if

(A) $\frac{dy}{dx}=0$ (B) $\frac{dy}{dx}=1$ (C) $\frac{dx}{dy}=0$ (D) $\frac{dx}{dy}=1$

42. The point on the curve $y^2 = x$, the tangent at which it makes an angle of $\pi/4$ with x−axis is

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

43. $f(x) = (3-x)e^{2x} - 4xe^x - x$ has

(A) Maxima at x = 0 (B) Minima at x = 0

(C) Neither maxima nor minima at x=0 (D) Is not differentiable at x=0

44. The maximum value of $\frac{\ln x}{x}$ is

(A) 1 (B) 2/e (C) e (D) 1/e

45. The area common to the curves $y^2 = x$ and $x^2 = y$ is

(A) 1 (B) 2/3 (C) 1/3 (D) 2

46. $\int \frac{\sin x + \cos x}{\sqrt{1+\sin 2x}} dx$ equals

(A) sin x (B) x (C) cos x (D) tan x

47. The area cut off by the parabola $y^2 = 4ax$, $(a > 0)$ and its latus rectum is

(A) $\frac{8}{3}a^2$ (B) $\frac{4}{3}a^2$ (C) $\frac{2}{3}a^2$ (D) a^2

48. $\int_0^{\pi/4} \tan^2 x dx$ equals

(A) $\pi/4$ (B) $1+\pi/4$ (C) $1-\pi/4$ (D) 0

49. $\int e^x \sin e^x dx$ equals

(A) $\cos e^x$ (B) $-\cos e^x$ (C) $(\cos e^x)^{-1}$ (D) $\sin e^x$

50. Let A be a square matrix of odd order which is anti-symmetric. Then trace of A equals

(A) 0 (B) 1

(C) Number of rows in the matrix (D) -1

51. Which of these is not an elementary row operation on matrices

(A) Multiplying a row by a non-zero constant
(B) Adding a multiple of a row to another row
(C) Adding a constant to each term of a row
(D) Interchange of rows

52. The differential equation $e^x \frac{dy}{dx} + 3y = x^2 y$ is

(A) Separable and not linear
(B) Linear and not separable
(C) Both separable and linear
(D) Neither separable nor linear

53. An integrating factor $I(x)$ is found for the linear differential equation $(1+x^2)\frac{dy}{dx} + xy = 0$ and the equation is rewritten as $\frac{d}{dx}(I(x)y) = 0$. Which of the following options is correct?

(A) $I(x) = e^{x^{3/2}}$
(B) $I(x) = \sqrt{1+x^2}$
(C) $I(x) = 1 + x^2$
(D) It is not possible to find such a function $I(x)$

54. What are the chances that no two boys are sitting together for a photograph if there are 5 girls and 2 boys:

(A) 1/21 (B) 4/7 (C) 2/7 (D) 5/7

55. In a drawer there are four white socks, three blue socks and five grey socks. Two socks are picked at random. What is the probability that both the socks are of same colour?

(A) 4/11 (B) 1 (C) 2/33 (D) 19/66

56. What is the probability of having 53 Thursdays in a non-leap year?

(A) 5/7 (B) 1/7 (C) 1/365 (D) 53/365

57. If A and B are sets and $A \cup B = A \cap B$ then

(A) $A = \phi$ (B) $B = \phi$ (C) A = B (D) None of these

58. If $f(x) : X \to Y$ and $A, B \subseteq X$, then $f(A \cap B)$ is equal to

(A) f(A)-f(B)
(B) $f(A) \cap f(B)$
(C) A subset of $f(A) \cap f(B)$
(D) f(B)-f(A)

59. Which of the following is a valid objective function for a linear programming problem?

(A) Maximize 5xy
(B) Linearize x^2+5y^2
(C) Maximize 5x+6y
(D) Maximize xy(x-y)

60. Which of the following relations is a function?

(A) {(0, 0), (1, 2), (2, 3)}
(B) {(0, 0), (0, 1), (1, 2)}
(C) {(3, 1), (4, 1), (3, 2)}
(D) {(1, 1), (1, 2), (1, 3)}

x-x-x