

Question Booklet Series: A

Question Booklet Serial No.: 310729

CET (UG) – 2024

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)

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O.M.R. Answer Sheet Serial No.

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Signature of Candidate: _____

Signature of Invigilator: _____

SUBJECT: MATHEMATICS

Time: 70 Minutes

Number of Questions: 60

Total 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 / Gel Pen only**.
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 / Gel Pen only**.
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. 25% 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. The University will provide logarithmic table. 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 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 will 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 assistance or found giving or receiving assistance 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/cordless phones, pager, wireless, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. **Use of calculator is not allowed.**
18. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

- The number that least fits this set: (324, 441, 97 and 64) is _____.
(A) 324 (B) 441 (C) 97 (D) 64
- The rank of the identity matrix of order n is
(A) $n-1$ (B) n (C) $n+1$ (D) None of these
- P, Q, R and S are working on a project. Q can finish the task in 25 days, working alone for 12 hours a day. R can finish the task in 50 days, working alone for 12 hours per day. Q worked 12 hours a day but took sick leave in the beginning for two days. R worked 18 hours a day on all days. What is the ratio of work done by Q and R after 7 days from the start of the project?
(A) 10:11 (B) 11:10 (C) 21:20 (D) 20:21
- Value of $\lim_{x \rightarrow 0} (1 + \sin(x))^{\csc(x)}$
(A) e (B) 0 (C) 1 (D) ∞
- Let $f(x) = \begin{cases} x^p \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$. Then $f(x)$ is continuous but not differentiable at $x = 0$ if
(A) $p < 0$ (B) $p = 0$ (C) $0 < p < 1$ (D) $p \geq 1$
- It takes 10s and 15s, respectively, for two trains travelling at different constant speeds to completely pass a telegraph post. The length of the first train is 120 m and that of the second train is 150 m. The magnitude of the difference in the speeds of the two trains (in m/s) is
(A) 2 (B) 10 (C) 12 (D) 22
- Given $0 \leq a \leq \frac{\pi}{2}$ and $\sin a = \frac{1}{2}$, the exact value of $\cos 2a$ is
(A) $\frac{1}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $-\frac{1}{2}$ (D) 0
- k and a are given by $k \sin a = \sqrt{3}$ and $k \cos a = 1$ where $k > 0$ and $0 \leq a \leq 90$. The values of k and a are
(A) $k = 2, a = 60$ (B) $k = 2, a = 30$
(C) $k = \sqrt{10}, a = 60$ (D) $k = \sqrt{10}, a = 30$
- The y -axis is a tangent to the circle with centre $(-4, 7)$. The equation of this circle is
(A) $(x - 4)^2 + (y + 7)^2 = 16$ (B) $(x + 4)^2 + (y - 7)^2 = 16$
(C) $(x - 4)^2 + (y + 7)^2 = 49$ (D) $(x + 4)^2 + (y - 7)^2 = 49$
- $x - 2$ is a factor of $x^3 - 9x + k$. The value of k is
(A) 13 (B) -13 (C) 10 (D) -10
- $A(2, -1, 3)$, $E(4, -5, 9)$ and $B(7, -11, 18)$ are three collinear points. E lies between A and B. The ratio in which E divides AB is
(A) 1:2 (B) 2:3 (C) 3:2 (D) 2:1
- Vectors u and v are such that $|u| = 4$ and $|v| = 6$ and $u \cdot v = 10$. The value of $v \cdot (u + v)$ is
(A) 20 (B) 26 (C) 46 (D) 60

13. The matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 1 & 3 & 1 \\ 0 & 1 & 3 \end{bmatrix}$ can be decomposed uniquely into the product $A = LU$, where

$$L = \begin{bmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{bmatrix} \text{ and } U = \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{bmatrix}. \text{ The solution of the system } LX = [1 \ 2 \ 2]^t \text{ is}$$

- (A) $[1 \ 1 \ 1]^t$ (B) $[1 \ 1 \ 0]^t$ (C) $[0 \ 1 \ 1]^t$ (D) $[1 \ 0 \ 1]^t$

14. M has a son Q and a daughter R. He has no other children. E is the mother of P and daughter-in-law of M. How is P related to M?

- (A) P is the son-in-law of M (B) P is the grandchild of M
(C) P is the daughter-in law of M (D) P is the grandfather of M

15. M and N start from the same location. M travels 10 km East and then 10 km North-East. N travels 5 km South and then 4 km South-East. What is the shortest distance (in km) between M and N at the end of their travel?

- (A) 18.60 (B) 22.50 (C) 20.61 (D) 25.00

16. Let $A = \{0, 1, 2, 4\}$ and $B = \{1, 3, 5\}$ then $(A - B) \times (A \cap B) =$

- (A) $\{(0,1), (2,1), (4,1)\}$ (B) $\{(0,1), (4,1), (2,1)\}$
(C) $\{(2,1), (0,1), (4,1)\}$ (D) None of these

17. The cardinality of the power set of $\{0, 1, 2, 3, \dots, 8, 9\}$

- (A) 512 (B) 256 (C) 624 (D) 1024

18. If $A + B = C$, then $\tan A \tan B \tan C =$

- (A) $\tan C + \tan A - \tan B$ (B) $\tan C - \tan A - \tan B$
(C) $\tan A - \tan B - \tan C$ (D) $\tan A + \tan B - \tan C$

19. If $\vec{a}, \vec{b}, \vec{c}$ be unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$. Which one of the following is correct?

- (A) $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a} = \vec{0}$
(B) $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a} \neq \vec{0}$
(C) $\vec{a} \times \vec{b} = \vec{a} \times \vec{c} = \vec{a} \times \vec{c} \neq \vec{0}$
(D) $\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}$ are mutually perpendicular

20. The Boolean expression $\sim(p \vee q) \vee (\sim p \vee q)$ is equivalent to

- (A) $\sim q$ (B) q (C) $\sim p$ (D) p

21. $\int_0^1 \frac{1}{\sqrt{3+x} + \sqrt{1+x}} dx = a + b\sqrt{2} + c\sqrt{3}$, then $2a - 3b - 4c$ is equal to

- (A) 10 (B) 0 (C) 12 (D) 20

22. What will be the value of $\int_0^1 \ln\left(\frac{1}{x} - 1\right) dx$

- (A) -1 (B) 0 (C) 1 (D) None of these

23. If $\lim_{x \rightarrow \infty} \left(\frac{x^2 + x + 1}{x + 1} - ax - b \right) = 4$, then

- (A) $a = 1, b = 4$ (B) $a = 1, b = -4$ (C) $a = 2, b = -3$ (D) $a = 2, b = 3$

24. The total number of ways in which 5 balls of different colours can be distributed among 3 persons so that each person gets at least one ball is
 (A) 75 (B) 210 (C) 243 (D) 150
25. If a coin is tossed 4 times, what is the probability of getting exactly 2 heads?
 (A) $\frac{1}{4}$ (B) $\frac{3}{8}$ (C) $\frac{1}{2}$ (D) $\frac{5}{8}$
26. A coin is tossed until a head appears or until the coin has been tossed five times. If a head does not occur on the first two tosses, then the probability that the coin will be tossed 5 times is
 (A) $\frac{1}{2}$ (B) $\frac{3}{5}$ (C) $\frac{1}{4}$ (D) $\frac{1}{3}$
27. A basic solution is called non-degenerate if
 (A) All the basic variables are zero (B) None of the basic variables is zero
 (C) At least one of the basic variables is zero (D) None of these
28. From a book containing 100 pages, one page is selected randomly. The probability that the sum of the digits of the page number of the selected page is 11, is
 (A) $\frac{2}{25}$ (B) $\frac{9}{100}$ (C) $\frac{11}{100}$ (D) None of these
29. An integrating factor of differential equation $\frac{dy}{dx} = \frac{1}{x+y+2}$ is
 (A) e^x (B) e^{x+y+2} (C) e^{-y} (D) $\log |x + y + 2|$
30. The solution of the differential equation $\frac{dy}{dx} = \frac{x^2+xy+y^2}{x^2}$ is:
 (A) $\tan^{-1}\left(\frac{x}{y}\right) = \log y + c$ (B) $\tan^{-1}\left(\frac{y}{x}\right) = \log x + c$
 (C) $\tan^{-1}\left(\frac{x}{y}\right) = \log x + c$ (D) None of these
31. A(2, -1, 3), E(4, -5, 9) and B(7, -11, 18) are three collinear points. E lies between A and B. The ratio in which E divides AB is
 (A) 1:2 (B) 2:3 (C) 3:2 (D) 2:1
32. The equation of the plane passing through the point (1, 1, 1) and perpendicular to the planes $2x + y - 2z = 5$ and $3x - 6y - 2z = 7$, is
 (A) $14x + 2y - 15z = 1$ (B) $14x - 2y + 15z = 27$
 (C) $14x + 2y + 15z = 31$ (D) $-14x + 2y + 15z = 3$
33. If the adjoint of a 3×3 matrix P is $\begin{bmatrix} 1 & 4 & 4 \\ 2 & 1 & 7 \\ 1 & 1 & 3 \end{bmatrix}$, then the possible value(s) of the determinant of P is
 (A) 2 (B) 1 (C) -1 (D) 3
34. The objective function $z=4x+3y$ can be maximized subjected to the constraints
 $3x + 4y \leq 24, 8x + 6y \leq 48, x \leq 5, y \leq 6; x, y \geq 0$
 (A) At only one point (B) At two points only
 (C) At an infinite number of points (D) None of these

35. For an Arithmetic Progression series, $T_{10} = \frac{1}{20}$; $T_{20} = \frac{1}{10}$. Find sum of first 200 terms.
 (A) $201\frac{1}{2}$ (B) $101\frac{1}{2}$ (C) $301\frac{1}{2}$ (D) $100\frac{1}{2}$
36. The first, second and last terms of an A.P. are a, b and $2a$. The number of terms in the A.P. is
 (A) $\frac{b}{b-a}$ (B) $\frac{b}{b+a}$ (C) $\frac{a}{a-b}$ (D) $\frac{a}{a+b}$
37. Let $x = 1 + a + a^2 + a^3 + \dots \infty$ ($a < 1$) and $y = 1 + b + b^2 + b^3 + \dots \infty$ ($b < 1$). Then the value of $1 + ab + a^2b^2 + \dots \infty$ is
 (A) $\frac{xy}{x+y-1}$ (B) $\frac{xy}{x+y+1}$ (C) $\frac{xy}{x-y-1}$ (D) $\frac{xy}{x-y+1}$
38. If the sum of the coefficients in the expansion of $(a+b)^n$ is 4096, then the greatest coefficient in the expansion is
 (A) 1594 (B) 924 (C) 792 (D) 2924
39. If the coefficients of x^7 and x^8 in of $\left(2 + \frac{x}{3}\right)^n$ are equal, then n is
 (A) 55 (B) 56 (C) 45 (D) None of these
40. The sum of all two-digit natural numbers which leave a remainder 5 when they are divided by 7 is equal to
 (A) 602 (B) 715 (C) 615 (D) 702
41. If $0 < x < \frac{\pi}{2}$ then the minimum value of $(\sin x + \cos x + \operatorname{cosec} 2x)^3$ is
 (A) 27 (B) 13.5 (C) 6.75 (D) None of these
42. The length of the latus rectum of the parabola is $x^2 - 4x + 8y + 12 = 0$ is
 (A) 2 (B) 4 (C) 6 (D) 8
43. The equation of the hyperbola with center at the origin, the length of transverse axis 6 and one focus is (0,4) is
 (A) $9x^2 - 7y^2 = 63$ (B) $7y^2 - 9x^2 = 63$
 (C) $9y^2 - 7x^2 = 63$ (D) $7x^2 - 9y^2 = 63$
44. A line makes an angle α, β, γ with the x, y, z axes. Then $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma$ is
 (A) 0 (B) 1 (C) 2 (D) 3
45. If the variance of x is 4 then the variance of $3 + 5x$ is
 (A) 100 (B) 103 (C) 20 (D) 23
46. The area bounded by the curve $y^2 = 4x$, y -axis and $y = 3$ is
 (A) 2 (B) $9/4$ (C) $7/3$ (D) 3
47. In a series of $2n$ observations half of the observations are equal to b and remaining half equal to $-b$. If the standard deviation of the observations is 3 then $|b|$ is equal to
 (A) 3 (B) $\sqrt{3}$ (C) $\frac{\sqrt{3}}{n}$ (D) $\frac{1}{n}$
48. The area between the curve $y = x(x-1)(x-2)$ and x -axis is
 (A) $1/4$ (B) $1/2$ (C) 1 (D) 0

49. Which of the following statements are True or False?

1. Length of the zero vector is unity.
2. The zero vector has no direction.

(A) 1 - False, 2 - True

(B) 1 - False, 2 - False

(C) 1 - True, 2 - False

(D) 1 - True, 2 - True

50. The distance 's' meters covered by a body in t seconds, is given by $s = 3t^2 - 12t + 5$. The body will stop after

(A) 12 seconds

(B) 8 seconds

(C) 4 seconds

(D) 2 seconds

51. The system of linear equations $x + y - z = 1$; $2x + 3y + kz = 3$; $x + ky + 3y = 2$ where $k \in \mathbb{R}$, has an infinite number of solutions. What will be the value of k ?

(A) $k = 3$

(B) $k = -3$

(C) $k = 2$

(D) $k = -2$

52. Maximum and minimum values of $5x + 7y$ when $|x| + |y| \leq 1$ are

(A) 5 and -5

(B) 5 and -7

(C) 7 and -5

(D) 7 and -7

53. The principal value of $(-1)^{\left(\frac{-2i}{\pi}\right)}$ is

(A) e^2

(B) e^{2i}

(C) e^{-2i}

(D) e^{-2}

54. The values of a and b for which the function

$$f(x) = \begin{cases} -2, & x \leq -1 \\ ax - b, & -1 < x < 1 \\ 3, & x \geq 1 \end{cases}$$

is continuous at every x ?

(A) $a = \frac{3}{2}, b = -\frac{5}{2}$

(B) $a = -\frac{1}{2}, b = \frac{5}{2}$

(C) $a = -\frac{3}{2}, b = +\frac{5}{2}$

(D) $a = \frac{5}{2}, b = -\frac{1}{2}$

55. The number of non-negative integer solutions to the equation $x_1 + x_2 + x_3 + x_4 = 18, x_i \leq 7$ for $1 \leq i \leq 4$, are

(A) 245

(B) 246

(C) 247

(D) 248

56. The number $\sqrt{2}e^{i\pi}$ is

(A) a rational number

(B) an imaginary number

(C) an irrational number

(D) a transcendental number

57. The value of the determinant $\begin{vmatrix} x & x+y & x+2y \\ x+2y & x & x+y \\ x+y & x+2y & x \end{vmatrix}$ is

(A) $9x^2(x+y)$

(B) $9y^2(x+y)$

(C) $3y^2(x+y)$

(D) $7x^2(x+y)$

58. Let X be a random variable that follows Binomial distribution with Expectation $E(X) = 7$ and variance $V(X) = 6$. Then the probability of success p is

(A) $6/7$

(B) $36/49$

(C) $1/7$

(D) $1/49$

59. Let x denote the number of times heads occur in n tosses of a fair coin. If $P(x=4), P(x=5)$ and $P(x=6)$ are in A.P., then the value of n is

(A) 7

(B) 10

(C) 12

(D) 15

60. The equation of the plane passing through the line of intersection of the planes $4x - 5y - 4z = 1$ and $2x + y + 2z = 8$ and the point $(2, 1, 3)$ is

(A) $32x - 5y + 8z = 83$

(B) $32x + 5y - 8z = 83$

(C) $32x - 5y + 8z + 83 = 0$

(D) None of these

x-x-x

ROUGH WORK