Question Booklet Series:

A

CET– 2014
Mathematics
QUESTION BOOKLET

INSTRUCTIONS

Question Booklet Number:

602638

Maximum Time Allowed : 1 Hour 30 Minutes.
Negative Marking : 0.2

No. of Questions: 75
Maximum Marks: 75

Roll Number: | | | | | | | | |

Answer Sheet Number: | | | | | | |

Please read the following instructions carefully:

1) **Check the booklet thoroughly**: In case of any defect – Misprint, Missing question(s), Missing page, Blank page, Damaged or Defaced page or duplication of question(s) / Page(s), get the booklet changed with the booklet of the same series from the Room Invigilator. No complaint shall be entertained after the entrance test is over

2) Write your Roll Number and the OMR Answer Sheet Number on the question booklet.

3) Mark carefully your Roll Number, Question Booklet Number and Question Booklet series on OMR Answer sheet and sign at the appropriate place. Incomplete and/or incorrect particulars will result in the non-evaluation of your answer sheet.

4) Strictly follow the instructions given by the Centre Supervisor / Room Invigilator and those given on the Question Booklet.

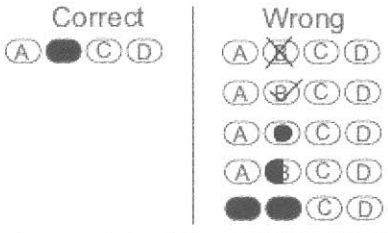
5) Candidates are not allowed to carry any papers, notes, books, calculators, cellular phones, scanning devices, pagers etc. to the Examination Hall. Any candidate found using, or in possession of such unauthorized material, indulging in copying or impersonation or adopting unfair means / reporting late / without Admit Card will be debarred from the written test.

6) Please mark the right responses on the OMR Sheet with ONLY a Blue/Black ball point pen. Use of eraser, whitener (fluid) and cutting on the OMR Answer Sheet is NOT allowed.

7) The test is of objective type containing multiple choice questions (MCQs). Each objective question is followed by four responses. Your task is to choose the correct/best response and mark your response on the OMR Answer Sheet and NOT on the Question Booklet.

8) There will be 0.2 negative marking for every wrong answer.

9) For marking response to a question, completely darken the CIRCLE so that the alphabet inside the CIRCLE is not visible. Darken only ONE circle for each question. If you darken more than one circle, it will be treated as wrong answer. The CORRECT and the WRONG methods of darkening the CIRCLE on the OMR Answer Sheet are shown below.



10) Please be careful while marking the response to questions. The response once marked cannot be changed and if done shall be treated as wrong answer.

11) In view of the tight time span, do NOT waste your time on a question which you find to be difficult. Attempt easier questions first and come back to the difficult questions later during the test.

12) DO NOT make any stray marks anywhere on the OMR Answer Sheet. DO NOT fold or wrinkle the OMR answer sheet.

13) Rough work MUST NOT be done on the OMR Answer Sheet. Use your test booklet for this purpose.

14) Candidates are provided carbonless OMR Answer Sheet having original copy and candidate's copy. After completing the examination, candidates are directed to fold at perforation on the top of the sheet, tear it to separate original copy and candidate's copy and then hand over the original copy of OMR Answer Sheet to the Room Invigilator and take candidate's copy with them.

DO NOT OPEN THE SEAL OF THIS BOOKLET UNTIL TOLD TO DO SO

1. Find the sum to n terms of the series whose nth term is $n^2 - 2n$

(A) 2n(n-1)

(B) 2n(n+1)

(C) $2n^2(n+1)$

(D) $2n^2(n-1)$

2. There are 7 horses in a race, Mr. X selected 2 horses at random and bet on them. The probability that Mr. X selected the winning horse, is

(A) 1/7

(B) 4/7

(C) 3/7

(D) 2/7

3. Integrate $\frac{sec^2(sin^{-1}x)}{\sqrt{1-x^2}}$

(A) sin $(\tan^{-1}x)$ + c

(B) $\tan(\sec^{-1}x)$ + c

(C) $\tan(\sin^{-1}x)$ + c

(D) $-\tan(\cos^{-1}x)$ + c

4. Find the multiplicative inverse of 5-6i

(A) −(5/61) + (6/61)i

(B) (5/61) + (6/61)i

(C) (5/61) – (6/61)i

(D) −(5/61) – (6/61)i

5. In a moderately asymmetrical distribution, the mean and median are 36 and 34 respectively, find out the value of empirical mode. ?

(A) 30

(B) 32

(C) 42

(D) 22

6. The mean and variance of a random variable X having a binomial distribution are 4 and 2 respectively, find the value of P (X = 1)?

(A) 1/4

(B) 1/16

(C) 1/8

(D) 1/32

7. A plane which passes through the point (3, 2, 0) and the line (x – 4) /1=(y – 7) /5 =(z – 4) /4 is :

(A) x + y + z = 1

(B) x + 2 y – z = 1

(C) x – y + z = 1

(D) 2x – y + z = 5

8. Find cos(x/2) if tanx = 5/12, x in Quadrant III

(A) $5/\sqrt{13}$

(B) $5/\sqrt{26}$

(C) 5/13

(D) 5/26

9. Find the values of x, y and z from the following equations: $\begin{bmatrix} 4 & x-z \\ 2+y & xz \end{bmatrix} = \begin{bmatrix} 4 & 3 \\ -1 & 10 \end{bmatrix}$

(A) x=-5, y=3, z=2

(B) x=5, y=-3, z=2

(C) x=5, y=3, z=-2

(D) x=5, y=-3, z=-2

10. Solve the linear programming problem: max.Z = x+2y subject to constraints: x-y≤10, 2x+3y≤20, x ≥0, y ≥0

(A) Max.Z = 10

(B) Max.Z = 30

(C) Max.Z = 40

(D) Max.Z = 50

11. If $y = xe^{2y}$, then find dy/dx?

(A) y/(x(1-2x))

(B) x/(y(1-2x))

(C) x/(y(1-2y))

(D) y/(x(1-2y))

12. Integrate $\frac{1}{x^3(x^3-1)}$

(A) $\frac{1}{3}\log\left|\frac{x^3}{x^3-1}\right| + c$

(B) $\frac{1}{3}\log\left|\frac{1-x^3}{x^3}\right| + c$

(C) $\log\left|\frac{x^3}{x^3-1}\right| + c$

(D) $\frac{1}{3}\log\left|\frac{x^3-1}{x^3}\right| + c$

13. The sum of first 8 terms of the geometric series 2 + 6 + 18 + 54 + ... is?

(A) 6506

(B) 5650

(C) 6650

(D) 6560

14. Given two vectors are i – j and i +2j, the unit vector is coplanar with the two vectors and perpendicular to the first. Find the vector?

(A) $+\frac{1}{\sqrt{2}}(\vec{i} + \vec{k})$

(B) $+\frac{1}{\sqrt{5}}(2\vec{i} + \vec{j})$

(C) $+\frac{1}{\sqrt{2}}(\vec{i} + \vec{j})$

(D) $\pm\frac{1}{\sqrt{2}}(2\vec{i} + 3\vec{j})$

15. Find the domain of the function $f(x) = (x^2+1)/(x^2-3x+3)$?

(A) R-{1, 2}

(B) R-{1, 4}

(C) R

(D) R-{1}

16. 9th term in $n(n-4)/(n^2+1)$ is?

(A) 55/82

(B) 40/82

(C) 45/82

(D) 36/82

17. If sin y = x sin (a + y), then find dy/dx

(A) $\sin^2(a + y) / \sin a$

(B) $\sin a / \sin^2(a + y)$

(C) $\sin a \sin^2(a - y)$

(D) $\sin^2(a - y) / \sin a$

18. Find the length of the diagonal of the parallelepiped formed by planes drawn through the points (2, 3, 5) and (5, 9, 7), parallel to the co–ordinate planes?

(A) √ 38 units

(B) 7 units

(C) √ 155 units

(D) 13 units

19. If the eccentricity of an ellipse with its center at the origin is 1/2 and one of its directrices is x = 4, then find the equation of the ellipse

(A) $3x^2 + 4y^2 = 1$

(B) $4x^2 + 3y^2 = 12$

(C) $3x^2 + 4y^2 = 12$

(D) $4x^2 + 3y^2 = 12$

20. If $x^y = e^{(x-y)}$, then find dy/dx

(A) $\log x / (1 + \log x)^2$

(B) $(\log x)/ (1 + \log x)$

(C) $(1 - \log x)/ (1 + \log x)$

(D) $(\log x)/ (1 - \log x)^2$

21. Solve $\sin^{-1}2x + \cos^{-1}2x + 2\tan^{-1}x = \pi$

(A) 1

(B) 0

(C) -1

(D) $1/\sqrt{2}$

22. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a} x \vec{b} = \vec{c}$ and $\vec{b} x \vec{c} = \vec{a}$ then

(A) $\vec{a} \neq \vec{b} \neq, \vec{c}$

(B) $\vec{a} = \vec{b} = \vec{c}$

(C) $\vec{a} \neq \vec{b} \neq \vec{c} \neq 1$

(D) $\vec{a}, \vec{b}, \vec{c}$ are orthogonal in pairs

23. A line makes the same angle θ with each of the x and z axis. If it makes the angle β with y-axis such that $\sin^2 \beta = 3\sin^2 \theta$, then $\cos^2 \theta$ equals :

(A) 3/5

(B) 1/5

(C) 2/5

(D) 2/3

24. Find $\frac{dy}{dx}$ if $y = \sin^2 x + \cos^4 x$

(A) $\frac{-\sin 4x}{4}$

(B) $\frac{-\sin 2x}{2}$

(C) $\frac{\sin 4x}{4}$

(D) $\frac{-\sin 4x}{2}$

25. Find the derivative of $\sqrt{2}x + 2\sqrt{x} - 1/\sqrt{x}$?

(A) $\sqrt{2}+1/\sqrt{x}(1-1/2x)$

(B) $\sqrt{2}-1/\sqrt{x}(1+1/2x)$

(C) $\sqrt{2}-1/\sqrt{x}(1-1/2x)$

(D) $\sqrt{2}+1/\sqrt{x}(1+1/2x)$

26. If g(x) = (x2 + 2x +3) f(x), f(0) = 5 and $\lim_{x\to 0}\left(\frac{f(x)-5}{x}\right)=4$, then f^1 (0) is equal to

(A) 22

(B) 18

(C) 20

(D) 25

27. Discuss the continuity of the function f(x) = sin2x - 1 at the point x = 0 and x = π?

(A) Continuous at x = 0, π

(B) Discontinuous at x = 0 but continuous at x= π

(C) Continuous at x = 0 but discontinuous at x = π

(D) Discontinuous at x = 0, π

28. If $\vec{u}$, $\vec{v}$ and $\vec{w}$ are three non coplanar vectors then $(\vec{u} + \vec{v} - \vec{w}) \cdot [(\vec{u} - \vec{v}) \times (\vec{v} - \vec{w})]$ equals to

(A) $\vec{u} \cdot \vec{w} \times \vec{v}$

(B) $\vec{u} \cdot \vec{v} \times \vec{w}$

(C) 0

(D) $\overrightarrow{3u} \cdot \vec{v} \times \vec{w}$

29. Let A = {1, 2, 3, 4, 5}. Find the domain in the relation from A to A by R = {(x, y): y = 2x-1}?

(A) {1, 2, 3}

(B) {1, 2}

(C) {1, 3, 5}

(D) {2, 4}

30. Differentiate $x^{-3}(2+7x)$

(A) $\frac{-1}{x^4}(3+7x)$

(B) $\frac{-2}{x^3}(2+7x)$

(C) $\frac{2}{x^4}(2+7x)$

(D) $\frac{-2}{x^4}(3+7x)$

31. Find the intersection of the spheres $x^2 + y^2 + z^2+7x - 2y - z = 13$ and $x^2 + y^2 + z^2 - 3x + 3y + 4z = 8$

(A) $x - y - z = 1$

(B) $x - 2y - z = 1$

(C) $x - y - 2z = 1$

(D) $2x - y - z = 1$

32. $(1+i)^3 + (1-i)^3$ =?

(A) 1

(B) -2

(C) 0

(D) -4

33. The two curves $x^3 - 3xy^2 + 2 = 0$ and $3x^2y - y^3 - 2 = 0$

(A) Touch each other

(B) Cut at an angle $\pi/4$

(C) Cut at an angle $\pi/3$

(D) Cut at an angle $\pi/2$

34. The probability that A speaks the truth is 3/5 and probability that B speaks the truth is 3/4. Find the probability that they contradict each other when asked to speak a fact.

(A) 3/20

(B) 4/5

(C) 9/20

(D) 7/20

35. Which term of the series $\sqrt{2}$, 2/3, $2\sqrt{2}/9$,.... is 16/2187?

(A) 10th term

(B) 8th term

(C) 9th term

(D) 11th term

36. Solve the inequality $3x+2 > -16$, $2x-3 \leq 11$

(A) (-6, 7)

(B) [-6, 7)

(C) (-6, 7]

(D) [-6, 7]

37. Let A = {1, 2, 3, 4} and R be the relation on A defined by {(a, b); a, b $\in$ A, a × b is an even number}, then find the range of R.

(A) {1, 2, 3, 4}

(B) {2, 4}

(C) {2, 3, 4}

(D) {1, 2, 4}

38. $\lim_{x \to 0} \frac{sin^{-1}(x-2)}{x^2-4}$ is equal to?

(A) 0

(B) 2

(C) 1/2

(D) 1

39. Find the radius of the circle in which the sphere $x^2+y^2+z^2+2x-2y-4z = 19$ is cut by the plane $x+2y+2z+7 = 0$

(A) 2

(B) 3

(C) 1

(D) 4

40. If $f(x) = x^3 - 1$, then find $[f(3) + f(2)]/11$

(A) 1

(B) 2

(C) 3

(D) 4

41. Solve the inequality $2x - 5 \leq (4x-7)/3$?

(A) $x \in (-\infty, 4)$

(B) $x \in (-\infty, 4]$

(C) $x \in (-\infty, 8]$

(D) $x \in (-\infty, -4]$

42. In a group of students, 40 students chose Physics, 30 students chose Chemistry and 15 students chose both. Each of the students chose either Physics or Chemistry. How many students are there in the group?
(A) 60
(B) 70
(C) 75
(D) 55

43. Let A = {1, 2, {a, b}, 3, 4} Which among the following statements is incorrect?
(A) $\{a, b\} \subset A$
(B) $\{a, b\} \in A$
(C) $\{\{a, b\}\} \subset A$
(D) $\varnothing \in A$

44. A circle with center (0, 3) is passing through the foci of the ellipse $x^2/16 + y^2/9 = 1$. Find the radius of the circle?
(A) 7/2 units
(B) 3 units
(C) 4 units
(D) $\sqrt{12}$ units

45. Solve the system of linear equations x+y = 1, x-2y = 4?
(A) x = 2, y = -5
(B) x = 1, y = 2
(C) x = 2, y = -1
(D) x = -1, y = 2

46. The vector $\vec{i} + x\vec{j} + 3\vec{k}$ is rotated through an angle θ and doubled in magnitude, then it becomes $4\vec{i} + (4x - 2)\vec{j} + 2\vec{k}$. Find the value of x?
(A) { – 2/3, 2 }
(B) { 2/3, 2 }
(C) { 2/3, 0 }
(D) { 1/3, 2 }

47. A manufacturer has 500 lit of a 10% solution of acid. Find the range of 40% acid to be added to it, such that the acid content in the resultant mixture will be more than 15% but less than 20%?
(A) More than 250lit and less than 300
(B) More than 300lit and less than 400
(C) More than 100lit and less than 250
(D) More than 250lit and less than 350

48. In an experiment with 15 observations on x the following results are available $\sum x^2 = 2830$, $\sum x = 170$. One observation that was 20, was found to be wrong and was replaced by correct value 30. Find the correct variance
(A) 78
(B) 186
(C) 158
(D) 18

49. Find the value of cos (29π/3)?
(A) 1
(B) 0
(C) $\sqrt{3}/2$
(D) 1/2

50. The probability of India winning a test match against South Africa is 1/2 assuming independence from match to match played. The probability that in a match series India's second win occurs at the third one day is

(A) 1/8

(B) 1/2

(C) 1/4

(D) 2/3

51. Let A (2, –3) and B (–2, 1) be vertices of a triangle ABC. If the centroid of this triangle moves on the line 2x + 3y = 1, then the locus of the vertex C is the line

(A) 3x – 2y = 3

(B) 2x + 3y = 9

(C) 2x – 3y = 7

(D) 3x + 2y = 5

52. If $A = \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$, then A^2 +2A -3I=?

(A) $\begin{bmatrix} 4 & -6 \\ 6 & 4 \end{bmatrix}$

(B) 0

(C) $\begin{bmatrix} -6 & 2 \\ -2 & 6 \end{bmatrix}$

(D) 5I

53. The intercept on the line y = x by the circle $x^2 + y^2 – 2x = 0$ is AB. Find the equation of the circle on AB as a diameter?

(A) $x^2 + y^2 + x + y = 0$

(B) $x^2 + y^2 – x – y = 0$

(C) $x^2 + y^2 + x – y = 0$

(D) $x^2 + y^2 – x + y = 0$

54. Solve the equation $x^2 - \sqrt{3}x + 1 = 0$

(A) $x = (-\sqrt{3} \pm 2i)/2$

(B) $x = (-\sqrt{3} \pm i)/2$

(C) $x = (-\sqrt{3} \pm i)$

(D) $x = (\sqrt{3} \pm i)/2$

55. Evaluate $\lim_{x \to 3} \frac{3-x}{\sqrt{4+x} - \sqrt{1+2x}}$

(A) 0

(B) $7\sqrt{2}$

(C) $4\sqrt{7}$

(D) $2\sqrt{7}$

56. The sum of first three terms of a Geometric progression is 7/9 and their product is -8/27. Find the common ratio of the series?

(A) r = -2/3 or -3/2

(B) r = -2/3 or 3/2

(C) r = 2/3 or -3/2

(D) r = 2/3 or 3/2

57. Solve $dy/dx + \frac{y}{x} = x^3$

(A) $y = \frac{x^4}{5} + cx$

(B) $y = \frac{x^3}{3} + cx$

(C) $y = \frac{x^3}{3} + c$

(D) $y = \frac{x^4}{4} + x$

58. The value of $2\cot^2(\pi/6) + 4\tan^2(\pi/6) - 3\operatorname{cosec}(\pi/6)$ is

(A) 2

(B) 4

(C) 4/3

(D) ¾

59. Find the value of $\sin(2\tan^{-1}x)$, $|x| \le 1$

(A) 1/x

(B) x

(C) $1/x^2$

(D) $2x/(1+x^2)$

60. Differentiate sin(sin2x)

(A) 2cos2x.cos2x

(B) 2cos2x.cos(sin2x)

(C) 2cos2x.sin2x

(D) cos2x.cos(sin2x)

61. $\int \sin^{-1}\cos 3x\,dx$ is?

(A) $\frac{3\pi}{2}x - \frac{x^2}{2} + c$

(B) $\frac{\pi}{2}x - \frac{x^2}{2} + c$

(C) $\frac{3\pi}{2}x + \frac{x^2}{2} + c$

(D) $\frac{\pi}{2}x - \frac{x^3}{3} + c$

62. Find $\int \frac{1}{\sqrt{7 - x^2}}\,dx$

(A) $\frac{1}{2\sqrt{7}} \log\left|\frac{\sqrt{7+x}}{\sqrt{7-x}}\right| + c$

(B) $\sin^{-1}(\frac{x}{\sqrt{7}}) + c$

(C) $\log\left|x + \sqrt{x^2 - 7}\right| + c$

(D) $\frac{1}{2\sqrt{7}} \log\left|\frac{x-\sqrt{7}}{x+\sqrt{7}}\right| + c$

63. Find the range of the function

f: [0, 1] → R f (x) = x3 – x2 +4x + 2Sin–1 x?

(A) $[-(\pi + 2), 0]$

(B) $[0, 4+ \pi]$

(C) [2,3]

(D) $(0, 2 + \pi]$

64. Compute the product

$$\begin{bmatrix} -1 & 3 & 0 \\ 2 & 1 & 4 \end{bmatrix} \times \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ -2 & -1 \end{bmatrix}$$

(A) $\begin{bmatrix} 1 & 3 \\ 6 & -4 \end{bmatrix}$

(B) $\begin{bmatrix} -1 & -3 \\ 6 & 4 \end{bmatrix}$

(C) $\begin{bmatrix} -1 & 3 \\ -6 & 4 \end{bmatrix}$

(D) $\begin{bmatrix} -1 & 3 \\ -6 & -4 \end{bmatrix}$

65. Determine n if $2\ {}^{n}C_2 : {}^{n}C_2 = 9:2$

(A) 5

(B) 4

(C) 3

(D) 2

66. Convert $(i+1) / (\cos(\pi/4) - i \sin(\pi/4))$ in polar form?

(A) $\cos(\pi/4) + i \sin(\pi/4)$

(B) $\text{Cos}(\pi/2) - i \sin(\pi/2)$

(C) $\sqrt{2}(\cos(\pi/4) + i \sin(\pi/4))$

(D) $\sqrt{2}(\cos(\pi/2) + i \sin(\pi/2))$

67. For what values of x, the numbers -1, x, -3/4 are in Geometric progression?

(A) 3/2

(B) $\sqrt{3}/4$

(C) $\sqrt{3}/2$

(D) $3/\sqrt{2}$

68. Events A, B and C are mutually exclusive events such that

$P(A) = (3x + 1)/3$ $P(B) = (1 - x)/4$ $P(C) = (1 - 2x)/2$.

Find the set of possible values of x in the interval.

(A) [–1/3 , 1/2]

(B) [1/3 , 2/3]

(C) [1/3 , 13/3]

(D) [0 , 1]

69. Find area of the triangle with vertices (2,3), (0, 1) and (1, 2)

(A) ½ sq.unit

(B) 1 sq.unit

(C) 2 sq.units

(D) 2 ½ sq.units

70. Solve for x, $\tan^{-1}(1/x) = \pi + \tan^{-1}x$, $0<x<1$

(A) not defined

(B) $\sqrt{3}$

(C) ± 1

(D) 0

71. $\int \sec^3 x\, dx$?

(A) 1/2 [sec x tan x – log| sec x + tan x|] + C

(B) 1/2 [sec x tan x + log| sec x – tan x|] + C

(C) 1/2 [sec x tan x – log| sec x – tan x|] + C

(D) 1/2 [sec x tan x + log| sec x + tan x|] + C

72. If $a \neq 0$ and the line $2bx + 3cy + 4d = 0$ passes through the points of intersection of the parabolas $y^2 = 4ax$ and $x^2 = 4ay$, then

(A) $d^2 + (2b - 3c)^2 = 0$

(B) $d^2 + (3b - 2c)^2 = 0$

(C) $d^2 + (2b + 3c)^2 = 0$

(D) $d^2 + (3b + 2c)^2 = 0$

73. If $\text{Cos}^{-1}(1-x^2) / (1+x^2) + \tan^{-1}x = \pi/2$, then x is equal to?

(A) 0

(B) 1

(C) $1/\sqrt{3}$

(D) $\sqrt{3}$

74. Find ${}^{n}C_{21}$ if ${}^{n}C_{10} = {}^{n}C_{11}$?

(A) 1

(B) 0

(C) 11

(D) 10

75. If a circle passes through the point (a, b) and cuts the circle $x^2 + y^2 = 4$ orthogonally, then the locus of its centre is

(A) $2ax + 2by - (a^2 + b^2 + 4) = 0$

(B) $2ax + 2by + (a^2 + b^2 + 4) = 0$

(C) $2ax - 2by + (a^2 + b^2 + 4) = 0$

(D) $2ax - 2by - (a^2 + b^2 + 4) = 0$

Space for Rough Work: