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150309 A

Question Booklet Series:

A

CET – 2015
PAPER – C [Mathematics]
QUESTION BOOKLET

INSTRUCTIONS

Question Booklet Number:

313964

Maximum Time Allowed : 60 minutes
Negative Marking : 0.25

No. of Questions: 60
Maximum Marks: 60

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) Check your Roll Number, Question Booklet Number and Question Booklet Series carefully before entering them on the OMR Sheet. Ensure twice that you have made their entries on the OMR Answer Sheet correctly and darken the relevant bubbles on the Answer Sheet and sign at the appropriate place. Your OMR Answer Sheet will be evaluated on the basis of the information given by you in its ovals.

4) If you have made any wrong entry of Roll Number, Booklet Number or Booklet Series Number in the OMR Answer Sheet, you should report it to the Invigilator / Superintendent or report it within three days after the conclusion of the Entrance Test to the BOPEE office, Jammu / Srinagar positively, failing which no complaint / representation will be entertained and the OMR Answer Sheet will be evaluated strictly according to the entries made by you.

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

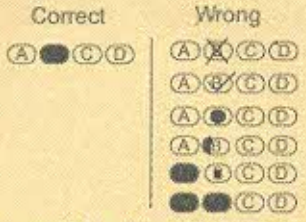
6) Candidates are not allowed to carry any papers, notes, books, calculators, cellular phones, scanning devices, pagers etc. to the Examination Hall. Any candidate found using, or in possession of, such unauthorized material or indulging in copying or impersonation or adopting unfair means / reporting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

7) 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.

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

9) There will be 0.25 negative marking for every wrong answer.

10) For marking response to a question, completely darken the CIRCLE so that the alphabet inside the CIRCLE is not visible. Ensure that you darken only one circle in the Answer Sheet. Even a stray mark / faint mark on the Answer Sheet is read by the scanner and will make your answer invalid by reading it as a case of double shading. You have to be very very careful while darkening the bubbles. The CORRECT and the WRONG methods of darkening the CIRCLE on the OMR Answer Sheet are shown below.



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

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

13) DO NOT fold or wrinkle the OMR Answer Sheet.

14) Rough work MUST NOT be done on the OMR Answer Sheet. Use rough page of your Question Booklet for this purpose.

15) 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 retain candidate's copy.

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

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1. The number of integer value(s) of k for which the expression $x^2 - 2(4k - 1)x + 15k^2 - 2k - 7 > 0$ for every real number x, is/are

(A) None

(B) One

(C) Finitely many greater than 1

(D) Infinitely many

2. The integral $\int_0^{\pi} \frac{x}{2cosecx - \sin x}\,dx$ is equal to

(A) $\frac{\pi}{4}$

(B) $\frac{\pi}{2}$

(C) $\frac{\pi^2}{2}$

(D) $\frac{\pi^2}{4}$

3. Let $f(x) = x^2,\ g(x) = \log_e x$. The number of values of x for which $(f \circ g)(x) = (g \circ f)(x)$ is

(A) 1

(B) 2

(C) Finite, but greater than 2

(D) Infinitely many

4. The sum of major and minor axes lengths of an ellipse whose eccentricity is 4/5 and length of latus rectum is 14.4, is

(A) 24

(B) 32

(C) 64

(D) 48

5. If $|\vec{a}| = 7$ and $|\vec{b}| = 11$; then the angle between the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ is equal to

(A) π

(B) $\frac{5\pi}{6}$

(C) $\frac{2\pi}{3}$

(D) $\frac{3\pi}{4}$

6. If $\sin\theta + \cos\theta = \sqrt{2}$, then $\cos^6\theta + \sin^6\theta$ is equal to

(A) 1/4

(B) 1/2

(C) 3/4

(D) $2\sqrt{2}$

7. Let the general term of a series be (2k - 1)(2k) (2k + 1), k = 1, 2, 3, ... If the sum of first n terms is 24090, then n is

(A) 8

(B) 9

(C) 10

(D) 11

8. The shortest distance between the lines $\frac{x}{-1} = \frac{y}{1} = \frac{z}{1}$ and $\frac{x-3}{0} = \frac{y+3}{1} = \frac{z-3}{-1}$ is

(A) $\sqrt{6}$

(B) 6

(C) $2\sqrt{3}$

(D) $3\sqrt{2}$

9. Which of the following is a tangent to the curve given by $x^3 + y^3 = 2xy$?

(A) y = x

(B) y = x + 2

(C) y = -x + 2

(D) y = -x +3/2

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10. The last digit in the integer $3^{101} + 1$ is

(A) 1

(B) 2

(C) 3

(D) 4

11. If $z_1 = \cos\alpha + i\sin\alpha$ and $z_2 = \cos\beta + i\sin\beta$, then $\frac{(z_1 - z_2)(z_1 z_2 + 1)}{(z_1 + z_2)(z_1 z_2 - 1)}$ is equal to

(A) $\tan\left(\frac{\alpha-\beta}{2}\right)\tan\left(\frac{\alpha+\beta}{2}\right)$

(B) $\cot\left(\frac{\alpha-\beta}{2}\right)\cot\left(\frac{\alpha+\beta}{2}\right)$

(C) $\tan\left(\frac{\alpha-\beta}{2}\right)\cot\left(\frac{\alpha+\beta}{2}\right)$

(D) $\cot\left(\frac{\alpha-\beta}{2}\right)\tan\left(\frac{\alpha+\beta}{2}\right)$

12. In a ΔABC, if $\sin(A) = 5/13$ and $\sin(B) = 99/101$, then the value of $(1313\cos(C))$ is

(A) 255

(B) 265

(C) 275

(D) 770

13. The area of the parallelogram with co-terminal edges as $\vec{a} = 3\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{b} = 4\hat{i} + 9\hat{j} + 2\hat{k}$ is

(A) $5\sqrt{70}$

(B) $50\sqrt{7}$

(C) $\sqrt{70}$

(D) $5\sqrt{7}$

14. $\lim_{x\to 0} \frac{\sin x^2}{1 - \cos x}$ is

(A) 1/2

(B) 0

(C) 1

(D) 2

15. Let an odd number of terms n of an AP be such that the sum and product of its first and last terms are 10 and 0 respectively. If the common difference is 1/10, then the number of terms n is

(A) 99

(B) 101

(C) 103

(D) 191

16. If ${}^{32}P_6 = k({}^{32}C_6)$, then k is equal to

(A) 6

(B) 24

(C) 120

(D) 720

17. The area bounded by the curves $y = \sqrt{|x|}$ and $y = \pm x$, is

(A) 0

(B) 1/6

(C) 1/3

(D) 2/3

18. Let $M = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$. Then, $\frac{1}{3}\det\left(3\left(M + M^T\right)\right)$ is equal to

(A) -18

(B) 54

(C) -72

(D) 72

19. If the image of the point (1, -2, 3) in the plane $2x + 3y - z = 7$ is the point (α, β, γ), then $\alpha + \beta + \gamma$ is equal to

(A) -6

(B) 10

(C) 8

(D) -4

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20. Let $A = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$. Then determinant of $\frac{1}{3}A\left(adj\left(adjA\right)\right)$ is

(A) 1

(B) -1

(C) 1/3

(D) 3

21. Value of $\cos\left(3\sin^{-1}\left(\frac{2}{5}\right)\right)$ is

(A) $\frac{17}{25}$

(B) $-\frac{31}{125}$

(C) $-\frac{9\sqrt{21}}{125}$

(D) $\frac{9\sqrt{21}}{125}$

22. In which of the following interval the function $y(x) = x^3 - 3x^2 - 9x + 5$ is always decreasing?

(A) (-1, 3)

(B) (-3, 3)

(C) (-4, 4)

(D) (-2, 2)

23. In an isosceles right angled triangle ABC, a value of $\tan\left(\frac{A}{2}\right) + \tan\left(\frac{B}{2}\right) + \tan\left(\frac{C}{2}\right)$ is

(A) $\sqrt{2} - 1$

(B) $2\sqrt{2}$

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

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

24. Let function $f(x) = (x - 1)^2(x + 1)^3$. Then which of the following is FALSE?

(A) There exists a point where f(x) has a maximum value

(B) There exists a point where f(x) has a minimum value

(C) There exists a point where f(x) has neither maximum nor minimum value

(D) All of the above

25. The number of the solutions of the equation $5^{2x-1} + 5^{x+1} = 250$ is/are

(A) 0

(B) 1

(C) 2

(D) infinitely many

26. The number of values of k for which the following system of equations has at least three solutions is

$8x + 16y + 8z = 25$, $x + y + z = k$ and

$3x + y + 3z = k^2$

(A) 0

(B) 1

(C) 2

(D) 3

27. The roots of the equation

$6\sin^{-1}(x^3 - 6x^2 + 8x + 1/2) = \pi$ are

(A) In AP

(B) In GP

(C) In AP and GP both

(D) Neither in AP nor in GP

28. Sum of the first 100 terms of the series

$1 + 3 + 7 + 15 + 31 + \ldots$, is

(A) $2^{100} - 102$

(B) $2^{101} - 102$

(C) $2^{102} - 103$

(D) $2^{102} - 104$

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29. $\lim_{n\to\infty} \frac{0+2+4+6+...+2n}{1+3+5+7+...+(2n-1)}$

(A) Is equal to 0

(B) Is equal to 1

(C) Is equal to 2

(D) Does not exist

30. Let G = $\{(b,b),(b,c),(c,c),(c,d)\}$ and H = $\{(b,a),(c,b),(d,c)\}$. Then the number of elements in the set $(G \bigcup H) \bigoplus (G \bigcup H)^{-1}$ where $\bigoplus$ denotes the symmetric difference,

(A) 0

(B) 2

(C) 7

(D) 14

31. Length of the segment of the normal at the point (1, 1) to the curve given by $y^2(2-x) = x^3$ between x-axis and the point is

(A) $\frac{\sqrt{5}}{2}$

(B) $\sqrt{5}$

(C) $2\sqrt{5}$

(D) $\sqrt{2}$

32. Consider the curve given by $(x^2 + y^2)^2 = 4(x^2 - y^2)$. Which of the following is NOT true?

(A) The curve has two tangents parallel to x-axis

(B) The curve has two tangents parallel to y-axis

(C) The area of the region bounded by this curve is less than 8

(D) All of the above

33. If a tangent to the hyperbola $4x^2 - 9y^2 = 1$ cuts the ellipse $4x^2 + 9y^2=1$ in points L and R, then the locus of the mid-point of segment LR is

(A) $(4x^2 + 9y^2)^2 = 4x^2 - 9y^2$

(B) $(4x^2 - 9y^2)^2 = 4x^2 + 9y^2$

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

(D) $(2x^2 - 3y^2)^2 = 2x^2 + 3y^2$

34. At present a firm manufactures 1000 items. It is estimated that the rate of change of production P with respect to additional number of workers x is given by $\frac{dP}{dx} = 100 - 12\sqrt{x}$. If the firm employees 25 more workers, then the new level of production of items is

(A) 2000

(B) 2500

(C) 3000

(D) 3500

35. Out of 64 students in a class, the number of students taking Mathematics is 55 and the number of students taking both Mathematics and Physics is 10. If all the students take either Mathematics or Physics or both, then the number of students taking only Physics is

(A) 19

(B) 20

(C) 15

(D) 25

36. The number of values of $\alpha \in [-\pi, \pi]$ for which $\sin^2\left(\frac{\pi}{8}+\alpha\right) - \sin^2\left(\frac{\pi}{8}-\alpha\right) = \frac{1}{2\sqrt{2}}$, is

(A) 1

(B) 2

(C) 3

(D) 4

37. In how many ways you can choose one or more identical balls out of six identical balls?

(A) 31

(B) 32

(C) 63

(D) 64

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38. If there are 6 red and 30 white beads, then the probability of drawing red beads in 2 successive trials, with replacement, is

(A) 1/18

(B) 1/6

(C) 5/216

(D) 1/36

39. The function $f(x) = \frac{1}{2 - \cos 3x}, \; x \in \left[0, \frac{\pi}{3}\right]$, is

(A) One to one, but not onto

(B) Onto, but not one to one

(C) One to one as well as onto

(D) Neither one to one nor onto

40. The number of values of $\theta \in (-\pi, \pi)$, satisfying $\sin 5\theta \cos 3\theta = \sin 6\theta \cos 2\theta$, is

(A) 1

(B) 2

(C) 3

(D) 4

41. A bag contains one marble which is either green or blue, with equal probability. A green marble is put in the bag (so there are 2 marbles now), and then a marble is picked at random from the bag. If the marble taken out is green, then the probability that the remaining marble is also green is

(A) 1/2

(B) 1

(C) 2/3

(D) 1/3

42. Let X be a random variable with its expectation E(X) = 3 and its variance V (X) = 2. If Y is another random variable defined by Y = 10X, then the ordered pair (E(Y), V (Y)) is equal to

(A) (10, 200)

(B) (30, 20)

(C) (10, 20)

(D) (30, 200)

43. Let R be the set of real numbers and let $G \subseteq \mathrm{R}^2$ be a relation defined by $G = \{[(a,b),(c,d)] \mid b - a = d - c\}$. Then, G is

(A) Reflexive only

(B) Symmetric only

(C) Transitive only

(D) An equivalence relation

44. The derivative of sin x with respect to cos x is

(A) sin x

(B) - cos x

(C) tan x

(D) - cot x

45. If the plane $2x - 3y + 6z - 11 = 0$ makes an angle θ with the x-axis, then value of tan(θ) is equal to

(A) 2/3

(B) 2/15

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

(D) $2\sqrt{5}/15$

46. The sum of the common roots of the equations $x^3 + 2x^2 - 5x + 2 = 0$ and $x^3 + x^2 - 8x + 4 = 0$ is

(A) -3

(B) $\frac{3}{2}$

(C) $-\frac{\sqrt{17}}{2}$

(D) $\frac{\sqrt{17}}{2}$

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47. If getting a number greater than 4 is a success in a throw of a fair die, then the probability of at least 2 successes in six throws of a fair die is

(A) 0.649

(B) 0.351

(C) 0.267

(D) 0.667

48. Let the n-th term of a sequence be $t_n = \frac{1}{2}\{(1+\sqrt{3})^n + (1-\sqrt{3})^n\}$, for n = 3, 4, 5, . . . Then, for m = 100

(A) $\frac{1}{4}t_m$ is the arithmetic mean of t_{m-1} and t_{m-2}

(B) $\frac{1}{4}t_{m-1}$ is the arithmetic mean of t_m and t_{m-2}

(C) $\frac{1}{4}t_m$ is the geometric mean of t_{m-1} and t_{m-2}

(D) $\frac{1}{4}t_{m-1}$ is the geometric mean of t_m and t_{m-2}

49. Let A and B be points (8, 10) and (18, 20), respectively. If the point Q divides AB externally in the ratio 2 : 3 and M is the midpoint of AB, then the length MQ is equal to

(A) 25

(B) $5\sqrt{34}$

(C) $25\sqrt{2}$

(D) $5\sqrt{26}$

50. Equation of the circle having the diameter as the line segment joining the complex numbers -1 -i and 1+i is:

(A) $|z+1+i|^2 + |z-1-i|^2 = 8$

(B) $|z|^2 = |1+i|^2 + |-1-i|^2$

(C) $|z-1+i|^2 + |z+1-i|^2 = 4$

(D) $|z+1+i|^2 = |z-1-i|^2$

51. If ${}^nC_r$ denotes the binomial coefficient then which of the following formula is correct?

(A) ${}^{n+1}C_r - {}^nC_{r-1} = {}^nC_r$

(B) ${}^{n+1}C_r - {}^{n-1}C_r = {}^nC_r$

(C) ${}^nC_{r+1} - {}^nC_{r-1} = {}^nC_r$

(D) ${}^{n-1}C_r + {}^nC_r = {}^{n+1}C_r$

52. An equation of the plane, parallel to the plane passing through the points (1, 1, 1), (2, 3, 5) and (-1, 0, 2) and at a distance 3 from it, is

(A) $2x - 3y + z + 3\sqrt{14} = 0$

(B) $2x - 3y + z + 2\sqrt{14} = 0$

(C) $2x - 3y + z + \sqrt{14} = 0$

(D) $2x - 3y + z - 2\sqrt{14} = 0$

53. A crime is committed by one of two suspects, A and B. Initially, there is equal evidence against both of them. In further investigation at the crime scene, it is found that the guilty party had a blood type found in 20% of the population. If the suspect A does match this blood type, whereas the blood type of suspect B is unknown, then the probability that A is the guilty party is

(A) 3/5

(B) 5/6

(C) 1/3

(D) 2/3

54. Let X = {a, b, c, d, e} and R = {(a, a), (b, b), (c, c), (a, b), (b, a)}. Then the relation R on X is

(A) Reflexive and symmetric

(B) Not reflexive, but symmetric

(C) Symmetric and transitive, but not reflexive

(D) Reflexive, but not transitive

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55. If the direction ratios of a line are $(\lambda+1, 1-\lambda, 2)$ and the line makes an angle 60^0 with the y-axis, then a value of λ is

(A) $1+\sqrt{3}$

(B) $2-\sqrt{3}$

(C) $3+\sqrt{5}$

(D) $2-\sqrt{5}$

56. The range of the function $y(x) = 4\sin x - 3\cos x$ is

(A) (-5,5)

(B) (-5, 5]

(C) [-5,5)

(D) [-5,5]

57. The radius of the largest circle, having center (1, 0), that can be inscribed in the ellipse $x^2 + 4y^2 = 16$, is

(A) $\sqrt{11}$

(B) $\sqrt{11/3}$

(C) $\sqrt{22/3}$

(D) $\sqrt{22}$

58. The points (1, 3, 4), (-1, 6, 10), (-7, 4, 7) and (-5, 1, 1)

(A) Form a rectangle which is not a square

(B) Form a rhombus which is not a square

(C) Form a parallelogram which is not a rhombus

(D) Are collinear

59. Suppose 70% of all voters in a city support a candidate A. If 40 voters in the city are randomly selected, then the expected number of voters that will support candidate A in this group is

(A) 12

(B) 20

(C) 28

(D) 32

60. If M is a 3 x 3 skew symmetric matrix, then det(M) is

(A) -1

(B) 0

(C) 1

(D) i

Space for Rough Work:

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