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COMMON ENTRANCE TEST - 2008

DATE	SUBJECT	TIME
19 - 04 - 2008	MATHEMATICS	02.00 PM to 03.20 PM

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER					QUESTION BOOKLET DETAILS	
					VERSION CODE	SERIAL NUMBER
					A - 1	377873

IMPORTANT INSTRUCTIONS TO CANDIDATES

(Candidates are advised to read the following instructions carefully, before answering on OMR answer sheet.)

1. Ensure that the CET No. has been entered and shaded the respective circles on the OMR answer sheet.
2. **ENSURE THAT THE TIMING, MARKS PRINTED ON THE OMR ANSWER SHEET ARE NOT DAMAGED / MUTILATED / SPOILED.**
3. This Question Booklet is issued to you by the invigilator after the 2nd Bell. i.e., after 02.00 p.m.
4. Enter the Serial Number of this question booklet on the OMR answer sheet.
5. Carefully enter the Version Code of this question booklet on the OMR answer sheet and SHADE the respective circles completely.
6. As answer sheets are designed to suit the Optical Mark Reader (OMR) system, please take special care while filling and shading the CET NO. and Version Code of this question booklet.
7. DO NOT FORGET TO SIGN AT THE BOTTOM PORTION OF OMR ANSWER SHEET IN THE SPACE PROVIDED.
8. Until the 3rd Bell is rung at 02.10 p.m. :
   - Do not remove the staple present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.
9. After the 3rd Bell is rung at 02.10 p.m., remove the staple present on the right hand side of this question booklet and start answering on the OMR answer sheet.
10. This question booklet contains 60 questions and each question will have four different options / choices.
11. During the subsequent 70 minutes :
    - Read each question carefully.
    - Determine the correct answer from out of the four available options / choices given under each question.
    - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALLPOINT PEN against the question number on the OMR answer sheet.**

CORRECT METHOD OF SHADING THE CIRCLE ON THE OMR SHEET IS AS SHOWN BELOW :

① ② ● ④

12. Please note that even a minute unintended ink dot on the OMR sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
13. Use the space provided on each page of the question booklet for Rough Work AND do not use the OMR answer sheet for the same.
14. After the last bell is rung at 03.20 p.m., stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
15. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
16. After separating and retaining the top sheet (KEA Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
17. Preserve the replica of the OMR answer sheet for a minimum period of One year.

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MATHEMATICS

1. A variable line $\frac{x}{a} + \frac{y}{b} = 1$ is such that $a + b = 4$. The locus of the midpoint of the portion of the line intercepted between the axes is

 1) $x + y = 4$ 2) $x + y = 8$

 3) $x + y = 1$ 4) $x + y = 2$

2. The point $(5, -7)$ lies outside the circle

 1) $x^2 + y^2 - 8x = 0$ 2) $x^2 + y^2 - 5x + 7y = 0$

 3) $x^2 + y^2 - 5x + 7y - 1 = 0$ 4) $x^2 + y^2 - 8x + 7y - 2 = 0$

3. If the circles $x^2 + y^2 = 9$ and $x^2 + y^2 + 2\alpha x + 2y + 1 = 0$ touch each other internally, then $\alpha =$

 1) $\pm\frac{4}{3}$ 2) 1

 3) $\frac{4}{3}$ 4) $\frac{-4}{3}$

4. The locus of the midpoints of the line joining the focus and any point on the parabola $y^2 = 4ax$ is a parabola with the equation of directrix as

 1) $x + a = 0$ 2) $2x + a = 0$

 3) $x = 0$ 4) $x = \frac{a}{2}$

5. The tangents drawn at the extremeties of a focal chord of the parabola $y^2 = 16x$

 1) intersect on $x = 0$ 2) intersect on the line $x + 4 = 0$

 3) intersect at an angle of 60^0 4) intersect at an angle of 45^0

(Space for Rough Work)

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6. On the set Z, of all integers $*$ is defined by $a * b = a + b - 5$. If $2 * (x * 3) = 5$ then $x =$

1) 0
2) 3
3) 5
4) 10

7. Which of the following is false ?

1) Addition is commutative in N.
2) Multiplication is associative in N.
3) If $a * b = a^b$ for all $a, b \in N$ then $*$ is commutative in N.
4) Addition is associative in N.

8. If $\vec{a} \cdot \hat{i} = \vec{a} \cdot (\hat{i} + \hat{j}) = \vec{a} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$ then $\vec{a} =$

1) $\hat{i} + \hat{j}$
2) $\hat{i} - \hat{k}$
3) $\hat{i}$
4) $\hat{i} + \hat{j} - \hat{k}$

9. If $\vec{a}$ and $\vec{b}$ are unit vectors and $|\vec{a} + \vec{b}| = 1$ then $|\vec{a} - \vec{b}|$ is equal to

1) $\sqrt{2}$
2) 1
3) $\sqrt{5}$
4) $\sqrt{3}$

10. The projection of $\vec{a} = 3\hat{i} - \hat{j} + 5\hat{k}$ on $\vec{b} = 2\hat{i} + 3\hat{j} + \hat{k}$ is

1) $\frac{8}{\sqrt{35}}$
2) $\frac{8}{\sqrt{39}}$
3) $\frac{8}{\sqrt{14}}$
4) $\sqrt{14}$

(Space for Rough Work)

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11. If $f : R \to R$ is defined by $f(x) = x^3$ then $f^{-1}(8) =$

1) $\{2\}$
2) $\{2, 2w, 2w^2\}$
3) $\{2, -2\}$
4) $\{2, 2\}$

12. R is a relation on N given by $R = \{(x, y) \mid 4x + 3y = 20\}$. Which of the following belongs to R ?

1) $(-4, 12)$
2) $(5, 0)$
3) $(3, 4)$
4) $(2, 4)$

13. If $Log_{10} 7 = 0.8451$ then the position of the first significant figure of 7^{-20} is

1) 16
2) 17
3) 20
4) 15

14. $\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \ldots\ldots$ upto n terms =

1) $\frac{n}{4n+6}$
2) $\frac{1}{6n+4}$
3) $\frac{n}{6n+4}$
4) $\frac{n}{3n+7}$

15. The ten's digit in $1! + 4! + 7! + 10! + 12! + 13! + 15! + 16! + 17!$ is divisible by

1) 4
2) 3!
3) 5
4) 7

(Space for Rough Work)

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16. The equation $\frac{x^2}{2-\lambda} - \frac{y^2}{\lambda-5} - 1 = 0$ represents an ellipse if

1) $\lambda > 5$
2) $\lambda < 2$
3) $2 < \lambda < 5$
4) $2 > \lambda > 5$

17. The equation to the normal to the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ at $(-4, 0)$ is

1) $2x - 3y = 1$
2) $x = 0$
3) $x = 1$
4) $y = 0$

18. The converse of the contrapositive of the conditional $p \to \sim q$ is

1) $p \to q$
2) $\sim p \to \sim q$
3) $\sim q \to p$
4) $\sim p \to q$

19. The perimeter of a certain sector of a circle is equal to the length of the arc of the semicircle. Then the angle at the centre of the sector in radians is

1) $\pi - 2$
2) $\pi + 2$
3) $\frac{\pi}{3}$
4) $\frac{2\pi}{3}$

20. The value of $Tan\ 67\frac{1}{2}^0 + Cot\ 67\frac{1}{2}^0$ is

1) $\sqrt{2}$
2) $3\sqrt{2}$
3) $2\sqrt{2}$
4) $2 - \sqrt{2}$

(Space for Rough Work)

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21. If e_1 and e_2 are the eccentricities of a hyperbola $3x^2 - 3y^2 = 25$ and its conjugate, then

1) $e_1^2 + e_2^2 = 2$
2) $e_1^2 + e_2^2 = 4$
3) $e_1 + e_2 = 4$
4) $e_1 + e_2 = \sqrt{2}$

22. If p and q are prime numbers satisfying the condition $p^2 - 2q^2 = 1$, then the value of $p^2 + 2q^2$ is

1) 5
2) 15
3) 16
4) 17

23. If $A(adj\ A) = 5I$ where I is the identity matrix of order 3, then $|adj\ A|$ is equal to

1) 125
2) 25
3) 5
4) 10

24. The number of solutions for the equation $Sin\ 2x + Cos\ 4x = 2$ is

1) 0
2) 1
3) 2
4) Infinite

25. $\int e^x \cdot x^5\, dx$ is

1) $e^x\left[x^5 + 5x^4 + 20x^3 + 60x^2 + 120x + 120\right] + C$
2) $e^x\left[x^5 - 5x^4 - 20x^3 - 60x^2 - 120x - 120\right] + C$
3) $e^x\left[x^5 - 5x^4 + 20x^3 - 60x^2 + 120x - 120\right] + C$
4) $e^x\left[x^5 + 5x^4 + 20x^3 - 60x^2 - 120x + 120\right] + C$

(Space for Rough Work)

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26. If $f(x)$ is an even function and $f'(x)$ exists, then $f'(e)+f'(-e)$ is

1) >0
2) 0
3) ≥ 0
4) <0

27. If α is a complex number satisfying the equation $\alpha^2+\alpha+1=0$ then α^{31} is equal to

1) α
2) α^2
3) 1
4) i

28. The derivative of $Sin\left(x^3\right)$ w.r.t. $Cos\left(x^3\right)$ is

1) $-Tan\left(x^3\right)$
2) $Tan\left(x^3\right)$
3) $-Cot\left(x^3\right)$
4) $Cot\left(x^3\right)$

29. A unit vector perpendicular to both the vectors $\hat{i}+\hat{j}$ and $\hat{j}+\hat{k}$ is

1) $\dfrac{-\hat{i}-\hat{j}+\hat{k}}{\sqrt{3}}$
2) $\dfrac{\hat{i}+\hat{j}-\hat{k}}{3}$
3) $\dfrac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$
4) $\dfrac{\hat{i}-\hat{j}+\hat{k}}{\sqrt{3}}$

30. If $A=\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ and $B=\begin{vmatrix} c_1 & c_2 & c_3 \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix}$ then

1) $A=-B$
2) $A=B$
3) $B=0$
4) $B=A^2$

(Space for Rough Work)

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31. The locus of a point which moves such that the sum of its distances from two fixed points is a constant is

1) a circle
2) a parabola
3) an ellipse
4) a hyperbola

32. The centroid of the triangle ABC where $A \equiv (2, 3)$, $B \equiv (8, 10)$ and $C \equiv (5, 5)$ is

1) $(5, 6)$
2) $(6, 5)$
3) $(6, 6)$
4) $(15, 18)$

33. If $3x^2 + xy - y^2 - 3x + 6y + K = 0$ represents a pair of lines, then $K =$

1) 0
2) 9
3) 1
4) -9

34. The equation of the smallest circle passing through the points $(2, 2)$ and $(3, 3)$ is

1) $x^2 + y^2 + 5x + 5y + 12 = 0$
2) $x^2 + y^2 - 5x - 5y + 12 = 0$
3) $x^2 + y^2 + 5x - 5y + 12 = 0$
4) $x^2 + y^2 - 5x + 5y - 12 = 0$

35. The characteristic roots of the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 4 & 5 & 6 \end{bmatrix}$ are

1) 1, 3, 6
2) 1, 2, 4
3) 4, 5, 6
4) 2, 4, 6

(Space for Rough Work)

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36. If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$, then $A^{-1}=$

1) $\frac{-1}{2}\begin{bmatrix}4 & -2\\ -3 & 1\end{bmatrix}$
2) $\frac{1}{2}\begin{bmatrix}4 & -2\\ -3 & 1\end{bmatrix}$
3) $\begin{bmatrix}-2 & 4\\ 1 & 3\end{bmatrix}$
4) $\begin{bmatrix}2 & 4\\ 1 & 3\end{bmatrix}$

37. The set $\{-1, 0, 1\}$ is not a multiplicative group because of the failure of

1) Closure law
2) Associative law
3) Identity law
4) Inverse law

38 The angle of elevation of the top of a TV tower from three points A, B and C in a straight line through the foot of the tower are α, 2α and 3α respectively. If $AB = a$, the height of the tower is

1) $a\, Tan\, \alpha$
2) $a\, Sin\, \alpha$
3) $a\, Sin\, 2\alpha$
4) $a\, Sin\, 3\alpha$

39. The angles A, B and C of a triangle ABC are in A.P. If $b : c = \sqrt{3} : \sqrt{2}$, then the angle A is

1) 30^0
2) 15^0
3) 75^0
4) 45^0

40. $Sin\left(2Sin^{-1}\sqrt{\frac{63}{65}}\right)=$

1) $\frac{2\sqrt{126}}{65}$
2) $\frac{4\sqrt{65}}{65}$
3) $\frac{8\sqrt{63}}{65}$
4) $\frac{\sqrt{63}}{65}$

(Space for Rough Work)

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41. The general solution of $|Sin\,x| = Cos\,x$ is (when $n \in Z$) given by

1) $n\pi + \frac{\pi}{4}$ 2) $2n\pi \pm \frac{\pi}{4}$

3) $n\pi \pm \frac{\pi}{4}$ 4) $n\pi - \frac{\pi}{4}$

42. The real root of the equation $x^3 - 6x + 9 = 0$ is

1) -6 2) -9

3) 6 4) -3

43. The digit in the unit's place of 5^{834} is

1) 0 2) 1

3) 3 4) 5

44. The remainder when $3^{100} \times 2^{50}$ is divided by 5 is

1) 1 2) 2

3) 3 4) 4

45. $\int \frac{Sin\,x\,Cos\,x}{\sqrt{1 - Sin^4 x}}\,dx =$

1) $\frac{1}{2}\,Sin^{-1}\left(Sin^2 x\right) + C$ 2) $\frac{1}{2}\,Cos^{-1}\left(Sin^2 x\right) + C$

3) $Tan^{-1}\left(Sin^2 x\right) + C$ 4) $Tan^{-1}\left(2\,Sin\,x\right) + C$

(Space for Rough Work)

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46. The value of $\int_{-2}^{2}\left(ax^3+bx+c\right)dx$ depends on the

1) value of b
2) value of c
3) value of a
4) values of a and b

47. The area of the region bounded by $y=2x-x^2$ and the x-axis is

1) $\frac{8}{3}$ sq. units
2) $\frac{4}{3}$ sq. units
3) $\frac{7}{3}$ sq. units
4) $\frac{2}{3}$ sq. units

48. The differential equation $y\frac{dy}{dx}+x=c$ represents

1) a family of hyperbolas
2) a family of circles whose centres are on the y-axis
3) a family of parabolas
4) a family of circles whose centres are on the x-axis

49. If $f\left(x^5\right)=5x^3$, then $f'(x)=$

1) $\frac{3}{\sqrt[5]{x^2}}$
2) $\frac{3}{\sqrt[5]{x}}$
3) $\frac{3}{x}$
4) $\sqrt[5]{x}$

50. $f(x)=2a-x$ in $-a<x<a$

$=3x-2a$ in $a\le x$.

Then which of the following is true?

1) $f(x)$ is discontinuous at $x=a$
2) $f(x)$ is not differentiable at x
3) $f(x)$ is differentiable at all $x\ge a$
4) $f(x)$ is continuous at all $x<a$

(Space for Rough Work)

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51. The maximum area of a rectangle that can be inscribed in a circle of radius 2 units is (in square units)

1) 4
2) 8π
3) 8
4) 5

52. If Z is a complex number such that $Z = -\overline{Z}$, then

1) Z is purely real
2) Z is purely imaginary
3) Z is any complex number
4) Real part of Z is the same as its imaginary part

53. The value of $\sum_{K=1}^{6}\left[Sin\frac{2K\Pi}{7} - i\,Cos\frac{2K\Pi}{7}\right]$ is

1) i
2) 0
3) $-i$
4) -1

54. $\underset{x \to \infty}{Lt}\; x\,Sin\left(\frac{2}{x}\right)$ is equal to

1) ∞
2) 0
3) 2
4) $\frac{1}{2}$

55. A stone is thrown vertically upwards and the height x ft. reached by the stone in t seconds is given by $x = 80t - 16t^2$. The stone reaches the maximum height in

1) 2 seconds
2) 2.5 seconds
3) 3 seconds
4) 1.5 seconds

(Space for Rough Work)

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56. The maximum value of $\frac{Log\ x}{x}$ in $(2, \infty)$ is

1) 1
2) $\frac{2}{e}$
3) e
4) $\frac{1}{e}$

57. If $f(x) = be^{ax} + ae^{bx}$, then $f''(0) =$

1) 0
2) $2ab$
3) $ab(a+b)$
4) ab

58. If $\sqrt{\frac{1+Cos\,A}{1-Cos\,A}} = \frac{x}{y}$, then the value of $Tan\,A$ =

1) $\frac{x^2+y^2}{x^2-y^2}$
2) $\frac{2xy}{x^2+y^2}$
3) $\frac{2xy}{x^2-y^2}$
4) $\frac{2xy}{y^2-x^2}$

59. $\int \frac{Sec\,x}{Sec\,x + Tan\,x}\,dx =$

1) $Tan\,x - Sec\,x + C$
2) $Log\,(1+Sin\,x) + C$
3) $Sec\,x + Tan\,x + C$
4) $Log\ Sin\,x + Log\ Cos\,x + C$

60. If $\int f(x)\,dx = g(x)$, then $\int f(x)\,g(x)\,dx =$

1) $\frac{1}{2}f^2(x)$
2) $\frac{1}{2}g^2(x)$
3) $\frac{1}{2}[g'(x)]^2$
4) $f'(x)\,g(x)$

(Space for Rough Work)