COMMON ENTRANCE TEST - 2011

DATE	SUBJECT	TIME
27-04-2011	MATHEMATICS	02.30 PM to 03.50 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	372321

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the Invigilator after the 2nd **Bell**, i.e., after **02.30 p.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should be shaded completely.
5. Compulsory sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts :

1. **The timing and marks printed on the OMR answer sheet should not be damaged/mutilated/spoiled.**
2. The 3rd **Bell** rings at **02.40 p.m.** till then;
   - Do not remove the seal/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.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters (four different options / choices).
2. After the 3rd **Bell** is rung at **02.40 p.m.**, remove the seal/staple present on the right hand side of this question booklet and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes :
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options/choices) given under each question/statement.
   - 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 ● ③ ④

4. Please note that even a minute unintended ink dot on the OMR sheet will also be recognized and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell** is rung at **03.50 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.
7. Hand over the OMR answer sheet to the room Invigilator as it is.
8. 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.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

MATHEMATICS

1. If $\frac{Log\, x}{b-c} = \frac{Log\, y}{c-a} = \frac{Log\, z}{a-b}$, then the value of $x^{b+c} \cdot y^{c+a} \cdot z^{a+b}$ is ....

   1) 1   2) 2

   3) 0   4) –1

2. The sum of the first n terms of $\frac{1^2}{1} + \frac{1^2+2^2}{1+2} + \frac{1^2+2^2+3^2}{1+2+3} + \ldots\ldots\ldots$ is ....

   1) $\frac{n^2-2n}{3}$ 2) $\frac{2n^2+n}{3}$

   3) $\frac{n(n+2)}{3}$ 4) $\frac{2n^2-n}{3}$

3. In n is an odd positive integer and $\left(1+x+x^2+x^3\right)^n = \sum_{r=0}^{3n} a_r x^r$, then

   $a_0 - a_1 + a_2 - a_3 + \ldots\ldots - a_{3n}$ is = ...

   1) 4^n 2) 1

   3) –1   4) 0

4. If r^{th} and $(r+1)^{th}$ terms in the expansion of $(p+q)^n$ are equal, then $\frac{(n+1)q}{r(p+q)}$ is ....

   1) 0   2) 1

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

5. If α, β and γ are roots of $x^3 - 2x + 1 = 0$, then the value of $\sum\left(\frac{1}{\alpha+\beta-\gamma}\right)$ is ....

   1) $\frac{-1}{2}$ 2) –1

   3) 0   4) $\frac{1}{2}$

(Space for Rough Work)

6. Define a relation R on $A = \{1, 2, 3, 4\}$ as ${}_xR_y$ if x divides y. R is ....

1) reflexive and transitive
2) reflexive and symmetric
3) symmetric and transitive
4) equivalence

7. The negation of $p \rightarrow (\sim p \vee q)$ is ....

1) $p \vee (p \vee \sim q)$
2) $p \rightarrow \sim (p \vee q)$
3) $p \rightarrow q$
4) $p \wedge \sim q$

8. In any triangle ABC, the simplified form of $\frac{Cos\,2A}{a^2} - \frac{Cos\,2B}{b^2}$ is ....

1) $a^2 - b^2$
2) $\frac{1}{a^2 - b^2}$
3) $\frac{1}{a^2} - \frac{1}{b^2}$
4) $a^2 + b^2$

9. Angles of elevation of the top of a tower from three points (collinear) A, B and C on a road leading to the foot of the tower are 30^0, 45^0 and 60^0 respectively. The ratio of AB to BC is ....

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

10. The value of $Sin\,10 \cdot Sin\,30 \cdot Sin\,50 \cdot Sin\,70$ is ....

1) $\frac{1}{8}$
2) $\frac{3}{16}$
3) $\frac{\sqrt{3}}{16}$
4) $\frac{1}{16}$

(Space for Rough Work)

11. Locus of a point which moves such that its distance from the X-axis is twice its distance from the line $x - y = 0$ is ....

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

12. The points $A(1, 2)$, $B(2, 4)$ and $C(4, 8)$ form a/an ....

1) isosceles triangle
2) equilateral triangle
3) straight line
4) right angled triangle

13. If lines represented by $x + 3y - 6 = 0$, $2x + y - 4 = 0$ and $kx - 3y + 1 = 0$ are concurrent, then the value of k is ....

1) $\frac{6}{19}$
2) $\frac{19}{6}$
3) $\frac{-19}{6}$
4) $\frac{-6}{19}$

14. $\underset{x \to a}{Lim} \left[\dfrac{\sqrt{a + 2x} - \sqrt{3x}}{\sqrt{3a + x} - \sqrt[2]{x}} \right] =$ ....

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

15. If $f(x) = \begin{cases} \dfrac{Log\, x}{x - 1} & \text{if} x \neq 1 \\ k & \text{if} x = 1 \end{cases}$ is continuous at $x = 1$, then the value of k is ....

1) 0
2) -1
3) 1
4) e

(Space for Rough Work)

16. If $A = \begin{bmatrix} Cos\theta & Sin\theta \\ -Sin\theta & Cos\theta \end{bmatrix}$, then $A \cdot A'$ is ....

1) I
2) A
3) $-A$
4) A^2

17. If $\begin{bmatrix} 1 & 2 & -1 \\ 1 & x-2 & 1 \\ x & 1 & 1 \end{bmatrix}$ is singular, then the value of x is ....

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

18. If A and B are symmetric matrices of the same order, then which one of the following is NOT true?

1) $A + B$ is symmetric
2) $A - B$ is symmetric
3) $AB + BA$ is symmetric
4) $AB - BA$ is symmetric

19. If ω is an imaginary cube root of unity, then the value of $\begin{vmatrix} 1 & \omega^2 & 1-\omega^4 \\ \omega & 1 & 1+\omega^5 \\ 1 & \omega & \omega^2 \end{vmatrix}$ is ....

1) -4
2) $\omega^2 - 4$
3) ω^2
4) 4

20. If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ then angle between $\vec{a}$ and $\vec{b}$ is ....

1) $\frac{\pi}{2}$
2) $\frac{\pi}{3}$
3) $\frac{2\pi}{3}$
4) π

(Space for Rough Work)

21. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are noncoplanar, then the value of $\vec{a}\cdot\left\{\dfrac{\vec{b}\times\vec{c}}{3\vec{b}\cdot(\vec{c}\times\vec{a})}\right\}-\vec{b}\cdot\left\{\dfrac{\vec{c}\times\vec{a}}{2\vec{c}\cdot(\vec{a}\times\vec{b})}\right\}$ is ....

1) $\frac{-1}{2}$ 2) $\frac{-1}{3}$

3) $\frac{-1}{6}$ 4) $\frac{1}{6}$

22. If $2\hat{i}+3\hat{j}$, $\hat{i}+\hat{j}+\hat{k}$ and $\lambda\hat{i}+4\hat{j}+2\hat{k}$ taken in an order are coterminous edges of a parallelopiped of volume 2 Cu units, then value of λ is ....

1) -4 2) 2

3) 3 4) 4

23. A unit vector perpendicular to both $\hat{i}+\hat{j}+\hat{k}$ and $2\hat{i}+\hat{j}+3\hat{k}$ is ....

1) $\left(2\hat{i}-\hat{j}-\hat{k}\right)\sqrt{6}$ 2) $\dfrac{\left(2\hat{i}-\hat{j}-\hat{k}\right)}{\sqrt{6}}$

3) $2\hat{i}+\hat{j}+\hat{k}$ 4) $\dfrac{3\hat{i}+\hat{j}-2\hat{k}}{\sqrt{6}}$

24. The digit in the unit's place of $7^{171}+(177)!$ is ....

1) 3 2) 2

3) 1 4) 0

25. The sum of all positive divisors of 242 except 1 and itself is ....

1) 156 2) 242

3) 342 4) 399

(Space for Rough Work)

26. On the set of all nonzero reals, an operation $*$ is defined as $a * b = \dfrac{3ab}{2}$. In this group, a solution of $(2 * x) * 3^{-1} = 4^{-1}$ is ....

1) 6
2) 1
3) $\dfrac{1}{6}$
4) $\dfrac{3}{2}$

27. $G = \left\{ \begin{bmatrix} x & x \\ x & x \end{bmatrix}, x \text{ is a nonzero real number} \right\}$ is a group with respect to matrix multiplication. In this group, the inverse of $\begin{bmatrix} \frac{1}{3} & \frac{1}{3} \\ \frac{1}{3} & \frac{1}{3} \end{bmatrix}$ is ....

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

28. If $2x^2 + 2y^2 + 4x + 5y + 1 = 0$ and $3x^2 + 3y^2 + 6x - 7y + 3k = 0$ are orthogonal, then value of k is ....

1) $\dfrac{17}{12}$
2) $\dfrac{12}{17}$
3) $\dfrac{-12}{17}$
4) $\dfrac{-17}{12}$

29. The total number of common tangents of $x^2 + y^2 - 6x - 8y + 9 = 0$ and $x^2 + y^2 = 1$ is ....

1) 4
2) 2
3) 3
4) 1

30. The center of a circle which cuts $x^2 + y^2 + 6x - 1 = 0$, $x^2 + y^2 - 3y + 2 = 0$ and $x^2 + y^2 + x + y - 3 = 0$ orthogonally is ....

1) $\left(\dfrac{1}{7}, \dfrac{9}{7}\right)$
2) $\left(\dfrac{-1}{7}, \dfrac{-9}{7}\right)$
3) $\left(\dfrac{1}{7}, \dfrac{-9}{7}\right)$
4) $\left(\dfrac{-1}{7}, \dfrac{9}{7}\right)$

(Space for Rough Work)

31. The length of the latus rectum of $3x^2 - 4y + 6x - 3 = 0$ is ....

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

32. The sum of the reciprocals of focal distances of a focal chord PQ of $y^2 = 4ax$ is ....

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

33. If the focii of $\frac{x^2}{16} + \frac{y^2}{4} = 1$ and $\frac{x^2}{a^2} - \frac{y^2}{3} = 1$ coincide, then value of a is ....

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

34. The equation of a hyperbola whose asymptotes are $3x \pm 5y = 0$ and vertices are $(\pm 5, 0)$ is ....

1) $3x^2 - 5y^2 = 25$
2) $5x^2 - 3y^2 = 225$
3) $25x^2 - 9y^2 = 225$
4) $9x^2 - 25y^2 = 225$

35. The domain of $f(x) = Sin^{-1}\left[Log_2\left(\frac{x}{2}\right)\right]$ is ....

1) $0 \le x \le 1$
2) $0 \le x \le 4$
3) $1 \le x \le 4$
4) $4 \le x \le 6$

(Space for Rough Work)

36. If $Tan^{-1}x = \frac{\pi}{4} - Tan^{-1}\left(\frac{1}{3}\right)$, then x is ....

1) $\frac{1}{3}$
2) $\frac{1}{2}$
3) $\frac{1}{4}$
4) $\frac{1}{6}$

37. A value of θ satisfying $Sin\,5\theta - Sin\,3\theta + Sin\,\theta = 0$ such that $0 < \theta < \frac{\pi}{2}$ is ....

1) $\frac{\pi}{12}$
2) $\frac{\pi}{6}$
3) $\frac{\pi}{4}$
4) $\frac{\pi}{2}$

38. The value of $\left|\frac{1+i\sqrt{3}}{\left(1+\frac{1}{i+1}\right)^2}\right|$ is ....

1) 20
2) 9
3) $\frac{5}{4}$
4) $\frac{4}{5}$

39. If ω is an imaginary cube root of unity, then the value of $(1-\omega+\omega^2)\cdot(1-\omega^2+\omega^4)\cdot(1-\omega^4+\omega^8)\cdot$..........$(2n$ factors$)$ is ....

1) 2^{2n}
2) 2^n
3) 1
4) 0

40. If $P(x, y)$ denotes $z = x + iy$ in Argand's plane and $\left|\frac{z-1}{z+2i}\right| = 1$, then the locus of P is a/an ....

1) hyperbola
2) ellipse
3) circle
4) straight line

(Space for Rough Work)

41. If $\sqrt{r} = a e^{\theta Cot\alpha}$ where a and α are real numbers, then $\frac{d^2r}{d\theta^2} - 4r Cot^2\alpha$ is ....

1) r
2) $\frac{1}{r}$
3) 1
4) 0

42. The derivative of $Tan^{-1}\left[\frac{Sin x}{1+Cos x}\right]$ with respect to $Tan^{-1}\left[\frac{Cos x}{1+Sin x}\right]$ is ....

1) 2
2) –1
3) 0
4) –2

43. $\frac{d}{dx}\left[Cos^2\left(Cot^{-1}\sqrt{\frac{2+x}{2-x}}\right)\right]$ is ....

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

44. If $f(x) = \frac{Sin^2x}{1+Cot x} + \frac{Cos^2x}{1+Tan x}$, then $f'\left(\frac{\pi}{4}\right)$ is ....

1) $\sqrt{3}$
2) $\frac{1}{\sqrt{3}}$
3) 0
4) $-\sqrt{3}$

45. If $Cos^{-1}\left(\frac{y}{b}\right) = n Log\left(\frac{x}{n}\right)$, then ....

1) $xy_1 = n\sqrt{b^2 - y^2}$
2) $xy_1 + n\sqrt{b^2 - y^2} = 0$
3) $y_1 = x\sqrt{b^2 - y^2}$
4) $xy_1 - \sqrt{b^2 - y^2} = 0$

(Space for Rough Work)

46. Area of a triangle formed by tangent and normal to the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ at $P\left(\frac{a}{\sqrt{2}},\frac{b}{\sqrt{2}}\right)$ with the X-axis is ....

1) $4ab$
2) $\frac{ab\sqrt{a^2+b^2}}{4}$
3) $\frac{ab\sqrt{a^2-b^2}}{4}$
4) $\frac{b\left(a^2+b^2\right)}{4a}$

47. The angle between $y^2=4x$ and $x^2+y^2=12$ at a point of their intersection is ....

1) $Tan^{-1}\sqrt{2}$
2) $Tan^{-1}2$
3) $Tan^{-1}2\sqrt{2}$
4) $Tan^{-1}\left(\frac{1}{2}\right)$

48. A sphere increases its volume at the rate of π cc/s. The rate at which its surface area increases when the radius is 1 cm is ....

1) 2π sq.cm/s
2) π sq.cm/s
3) $\frac{3\pi}{2}$ sq.cm/s
4) $\frac{\pi}{2}$ sq.cm/s

49. The value of $\int_0^4 |x-1|\,dx$ is ....

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

50. If $I_n=\int_0^{\pi/4} Tan^n x\,dx$, where n is a positive integer, then $I_{10}+I_8$ is ....

1) $\frac{1}{9}$
2) $\frac{1}{8}$
3) $\frac{1}{7}$
4) 9

(Space for Rough Work)

51. $\int e^x \left[\frac{Sin\,x + Cos\,x}{1 - Sin^2 x}\right] dx$ is ....

1) $\left(e^x \cdot Cosec\,x\right) + c$
2) $e^x Cot\,x + c$
3) $\left(e^x \cdot Sec\,x\right) + c$
4) $e^x Tan\,x + c$

52. When $x > 0$, then $\int Cos^{-1}\left(\frac{1 - x^2}{1 + x^2}\right) dx$ is ....

1) $2\left[x\,Tan^{-1}x - Log\left(1 + x^2\right)\right] + c$
2) $2\left[x\,Tan^{-1}x + Log\left(1 + x^2\right)\right] + c$
3) $2x\,Tan^{-1}x + Log\left(1 + x^2\right) + c$
4) $2x\,Tan^{-1}x - Log\left(1 + x^2\right) + c$

53. If the area between $y = mx^2$ and $x = my^2\ (m > 0)$ is $\frac{1}{4}$ sq. units, then value of m is ....

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

54. If m and n are degree and order of $\left(1 + y_1^{\,2}\right)^{2/3} = y_2$, then the value of $\frac{m + n}{m - n}$ is ....

1) 3
2) 4
3) 5
4) 2

55. The general solution of $\frac{dy}{dx} = 1 - x^2 - y^2 + x^2 y^2$ is ....

1) $2Sin^{-1}y = x\sqrt{1 - x^2} + Sin^{-1}x + c$
2) $Cos^{-1}y = x\,Cos^{-1}x + c$
3) $Sin^{-1}y = \frac{1}{2}Sin^{-1}x + c$
4) $2Sin^{-1}y = x\sqrt{1 - y^2} + c$

(Space for Rough Work)

56. If $x\,Cos\,\alpha + y\,Sin\,\alpha = 4$ is tangent to $\frac{x^2}{25}+\frac{y^2}{9}=1$, then the value of α is ....

1) $Tan^{-1}(3/7)$
2) $Tan^{-1}\left(\sqrt{3}/7\right)$
3) $Tan^{-1}(7/3)$
4) $Tan^{-1}\left(3/\sqrt{7}\right)$

57. If P is a point on $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ with focii S and S', then the maximum value of triangle SPS' is ....

1) ab
2) abe^2
3) abe
4) ab/e

58. In Argand's plane, the point corresponding to $\frac{\left(1-i\sqrt{3}\right)(1+i)}{\left(\sqrt{3}+i\right)}$ lies in ....

1) quadrant I
2) quadrant II
3) quadrant III
4) quadrant IV

59. If $y = Sin\,x \cdot Sin\,2x \cdot Sin\,3x$ .... $\cdot Sin\,nx$, then y' is ....

1) $\sum_{k=1}^{n} k\,Tan\,kx$
2) $y \cdot \sum_{k=1}^{n} k\,Cot\,kx$
3) $y \cdot \sum_{k=1}^{n} k\,Tan\,kn$
4) $\sum_{k=1}^{n} Cot\,kx$

60. $\begin{vmatrix} Sin\,\alpha & Cos\,\alpha & Sin(\alpha+\delta) \\ Sin\,\beta & Cos\,\beta & Sin(\beta+\delta) \\ Sin\,\gamma & Cos\,\gamma & Sin(\gamma+\delta) \end{vmatrix}$ = ...

1) 0
2) 1
3) $1 + Sin\,\alpha\; Sin\,\beta\; Sin\,\gamma$
4) $1-(Sin\,\alpha - Sin\,\beta)(Sin\,\beta - Sin\,\gamma)(Sin\,\gamma - Sin\,\alpha)$

(Space for Rough Work)