## COMMON ENTRANCE TEST - 2004

**Subject: MATHEMATICS** 

DATE: 18.05.2004

TIME: 2.30 P.M. TO 3.50 P.M.

**MAXIMUM MARKS: 60** 

**MAXIMUM TIME: 80 MINUTES** 

| Please fill your<br>CET No. below |  |  |  |   |  |
|-----------------------------------|--|--|--|---|--|
|                                   |  |  |  | l |  |

| QUESTION BOOKLET |                  |  |  |
|------------------|------------------|--|--|
| VERSION<br>CODE  | SERIAL<br>NUMBER |  |  |
| <b>A</b> 1       | 057185           |  |  |

## IMPORTANT INSTRUCTIONS TO CANDIDATES

(Please read the following instructions carefully, before you start answering on the OMR answer sheet)

- 1. The OMR answer sheet is issued at the start of the examination at 2.15 p.m., the candidate should first enter only Name and CET No. on the OMR answer sheet.
- 2. After the 2<sup>nd</sup> bell at 2.30 p.m. the Question Papers will be issued. Now, the candidate should enter the Version Code and Serial Number of question booklet on the OMR answer sheet. But, he shall not remove the staples on the right side of this booklet OR look inside the question booklet OR start answering on the OMR answer sheet until the 3<sup>rd</sup> bell rings.

As answer sheets are designed to suit the Optical Mark Reader (OMR) system, special care should be taken to fill those items accurately.

## DO NOT DAMAGE OR MUTILATE THE TIMING, MARKS ON THE OMR ANSWER SHEETS.

- 3. Remove the staples at the right side to open the question paper booklet only after the 3<sup>rd</sup> bell at 2.40 p.m.
- 4. This question booklet contains 60 questions.
- 5. During the subsequent 70 minutes:
  - a) Read each question carefully.
  - b) Determine the correct answer from out of the four available choices given under each question.
  - c) Completely darken / shade the relevant circle with a blue or black ink ballpoint pen against the question number on the OMR answer sheet.

For example:

**Q. No. 14:** The product of 0.5 x 0.05 is: 1) 0.05 2) 0.005 3) 0.025 4) 0.25

As the correct answer is option no. 3, the candidate should darken the circle corresponding to option no. 3 completely with a blue or black ink ballpoint pen on the OMR answer sheet, as shown below :



- 6. For each correct answer, one mark will be awarded. For each wrong answer, quarter (1/4) mark will be deducted and if more than one circle is darkened for a given question, one mark will be deducted. Even a minute unintended dot will also be recognised and recorded by the scanner. Please avoid multiple markings of any kind.
- 7. Rough work should be done only on the blank space provided on each page of the question booklet. Rough work should not be done on the OMR answer sheet.
- 8. Please stop writing when the last bell rings at 3.50 p.m. Hand over the OMR answer paper set to the invigilator, who will separate the top sheet and will retain the same with him and return the bottom sheet replica to you to carry home.

NOTE: The candidate should safely preserve the replica of the OMR answer sheet for a minimum period of one year from the date of Common Entrance Test.

## **MATHEMATICS**

1. If 
$$\frac{Log x}{a-b} = \frac{Log y}{b-c} = \frac{Log z}{c-a}$$
 then  $xyz =$ 

1) 0

2) 1

3) -1

4) 2

2. The last digit in  $7^{300}$  is .......

1) 7

2) 9

3) 1

4) 3

3. How many numbers of 6 digits can be formed from the digits of the number 112233?

1) 30

2) 60

3) 90

4) 120

4. The number of solutions for the equation  $x^2-5|x|+6=0$  is ......

1) 4

2) 3

3) 2

4) 1

**5.** 0.5737373 ..... =

1)  $\frac{284}{497}$ 

2)  $\frac{284}{495}$ 

3)  $\frac{568}{999}$ 

4)  $\frac{567}{990}$ 

**6.** If  $ax^2 - y^2 + 4x - y = 0$  represents a pair of lines then  $a = \dots$ 

1) - 16

2) 16

3) 4,

4) - 4

7. What is the equation of the locus of a point which moves such that 4 times its distance from the x- axis is the square of its distance from the origin?

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

2) 
$$x^2 + y^2 - 4|y| = 0$$

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

4) 
$$x^2 + y^2 - 4|x| = 0$$

8. Equation of the straight line making equal intercepts on the axes and passing through the point (2, 4) is ........

1) 
$$4x - y - \dot{4} = 0$$

2) 
$$2x + y - 8 = 0$$

3) 
$$x + y - 6 = 0$$

4) 
$$x + 2y - 10 = 0$$

9. If the area of the triangle with vertices (x, 0), (1,1) and (0,2) is 4 square units then a value of x is ......

$$(2) -4$$

$$3) -6$$

10. 
$$\lim_{\theta \to \frac{\pi}{2}} \frac{\frac{\pi}{2} - \theta}{\cot \theta} =$$

1) 0

2) - 1

3) 1

(4) ∞

11. 
$$\lim_{x \to \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1} =$$

1)  $e^{12}$ 

2)  $e^{-12}$ 

3)  $e^4$ 

4)  $e^{3}$ 

12. If 
$$A + B + C = 180^{\circ}$$
 then  $\sum Tan \frac{A}{2} Tan \frac{B}{2} =$ 

1) 0

2)

3) 2

- 4) 3
- 13. In a triangle ABC if b=2,  $B=30^{\circ}$  then the area of the circumcircle of triangle ABC in square units is ...........
  - π

2) 2 π

3) 4 π

- 4) 6 π
- **14.** If  $Sin x + Sin^2 x = 1$  then,  $Cos^{12} x + 3Cos^{10} x + 3Cos^8 x + Cos^6 x =$ 
  - 1) 1

-2) 2

3) 3

- 4) 0
- 15. If R denotes the set of all real numbers then the function  $f: R \to R$  defined by f(x) = |x| is ..........
  - 1) one one only

- 2) onto only
- 3) both one-one and onto
- 4) neither one-one nor onto

- **16.** Which of the following is the inverse of the proposition: "If a number is a prime then it is odd"?
  - 1) If a number is not a prime then it is odd.
  - 2) If a number is not a prime then it is not odd.
  - 3) If a number is not odd then it is not a prime.
  - 4) If a number is odd then it is a prime.
- 17.  $\sim p \wedge q$  is logically equivalent to ......
  - 1).  $p \rightarrow q$

 $2) \quad q \rightarrow p$ 

3)  $\sim (p \rightarrow q)$ 

- 4)  $\sim (q \rightarrow p)$
- 18. What must be the matrix X if  $2X + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ ?
  - $1) \quad \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$

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

 $3) \quad \begin{bmatrix} 2 & 6 \\ 4 & -2 \end{bmatrix}$ 

- $4) \quad \begin{bmatrix} 2 & -6 \\ 4 & -2 \end{bmatrix}$
- 19. The value of  $\begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ b+c & c+a & a+b \end{vmatrix}$  is .......
  - 1) 1

- 2) 0
- 3) (a-b)(b-c)(c-a)
- 4) (a+b)(b+c)(c+a)
- 20. The value of  $\begin{vmatrix} 441 & 442 & 443 \\ 445 & 446 & 447 \\ 449 & 450 & 451 \end{vmatrix}$  is .........
  - 1) 441 × 446 × 451

2) 0

3) -1

4) 1

- Inverse of the matrix  $\begin{bmatrix} Cos 2\theta & -Sin 2\theta \\ Sin 2\theta & Cos 2\theta \end{bmatrix}$  is ......
  - 1)  $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$  2)  $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{bmatrix}$
  - 3)  $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$
- $egin{array}{ccc} Cos\,2 heta & Sin\,2 heta \ -Sin\,2 heta & Cos\,2 heta \end{array}$
- 22. If  $|\vec{a}| = 3$ ,  $|\vec{b}| = 4$  then a value of  $\lambda$  for which  $\vec{a}_{+\lambda}\vec{b}$  is perpendicular to  $\vec{a}_{-\lambda}\vec{b}$  is ......
  - 1)  $\frac{9}{16}$

- 23.  $\left(\vec{a} \cdot \hat{i}\right)\hat{i} + \left(\vec{a} \cdot \hat{j}\right)\hat{j} + \left(\vec{a} \cdot \hat{k}\right)\hat{k} =$

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

2)  $\frac{2}{\sqrt{14}}$ 

3)  $\sqrt{14}$ 

- In the group  $\{1, 2, 3, 4, 5, 6\}$  under multiplication modulo  $7, 2^{-1} \times 4 =$ 
  - 1) 1

2) 4

- **26.** If  $Q_1$  is the set of all rationals other than 1 with the binary operation \* defined by a\*b=a+b-ab for all a,b in  $Q_1$  then the identity in  $Q_1$  w.r.t. \* is
  - 1) 1

2) 0

3) -1

- 4) 2
- **27.** Which of the following is true?
  - 1) The set of all fourth roots of unity is a multiplicative group.
  - 2) The set of all cube roots of unity is an additive group.
  - 3)  $(ab)^{-1} = a^{-1}b^{-1}$  for all a, b in any group G.
  - 4) If  $(ab)^2 = a^2b^2$  for all a, b in any group G, then the group G is nonabelian.
- 28. The set of all integral multiples of 5 is a subgroup of
  - 1) The set of all rational numbers under multiplication.
  - 2) The set of all integers under multiplication.
  - 3) The set of all nonzero rational numbers under multiplication.
  - 4) The set of all integers under addition.
- **29.** The circle  $x^2 + y^2 8x + 4y + 4 = 0$  touches
  - 1) x axis

2) y - axis

3) both axes

- 4) neither x axis nor y axis
- **30.** The value of k so that  $x^2 + y^2 + kx + 4y + 2 = 0$  and  $2(x^2 + y^2) 4x 3y + k = 0$  cut orthogonally is
  - 1)  $\frac{10}{3}$

2)  $\frac{-8}{3}$ 

3)  $\frac{-10}{3}$ 

4)  $\frac{8}{3}$ 

- 31. The coaxal system of circles given by  $x^2 + y^2 + 2gx + c = 0$  for c < 0 represents.
  - 1) intersecting circles
- 2) non intersecting circles

3) touching circles

- 4) touching or non intersecting circles
- 32. The radius of the circle passing through the point (6, 2) and two of whose diameters are x + y = 6 and x + 2y = 4 is
  - 1) 4

2)

3) 20.

- 4)  $\sqrt{20}$
- 33. If (0, 6) and (0, 3) are respectively the vertex and focus of a parabola then its equation is
  - 1)  $x^2 + 12y = 72$

 $2) \quad x^2 - 12y = 72$ 

3)  $y^2 - 12x = 72$ 

- 4)  $y^2 + 12x = 72$
- **34.** For the ellipse  $25x^2 + 9y^2 150x 90y + 225 = 0$  the eccentricity, e =
  - 1)  $\frac{2}{5}$

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

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

- 4)  $\frac{1}{5}$
- **35.** If the foci of the ellipse  $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$  and the hyperbola  $\frac{x^2}{144} \frac{y^2}{81} = \frac{1}{25}$  coincide then the value of  $b^2$  is
  - 1) 1

2) 7

3) 5

4) 9

- 36. The equation of the director circle of the hyperbola  $\frac{x^2}{16} \frac{y^2}{4} = 1$  is given by .......
  - 1)  $x^2 + y^2 = 16$

 $2) \quad x^2 + y^2 = 4$ 

3)  $x^2 + y^2 = 20$ 

- 4)  $x^2 + y^2 = 12$
- \*37. If  $0 \le x \le \pi$  and  $81^{Sin^2x} + 81^{Cos^2x} = 30$  then x =
  - 1)  $\frac{\pi}{6}$

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

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

- $4) \quad \frac{3\pi}{4}$
- 38. If  $Sin^{-1} \frac{x}{5} + Cosec^{-1} \frac{5}{4} = \frac{\pi}{2}$  then  $x = \frac{\pi}{2}$ 
  - 1)

2) 4

3) 3

- 4) 5
- **39.** If  $Cos^{-1}p + Cos^{-1}q + Cos^{-1}r = \pi$  then  $p^2 + q^2 + r^2 + 2pqr =$ 
  - 1) 3

2) 1

3) 2

- 4) -1
- **40.** The smallest positive integer n for which  $(1+i)^{2n} = (1-i)^{2n}$  is
  - 1) 1

2) 2

3) 3

4) 4

41. If  $x + \frac{1}{x} = 2 \cos \alpha$  then  $x^n + \frac{1}{x^n} =$ 

- 1)  $2^n \cos \alpha$
- 2)  $2^n Cos n\alpha$
- 3)  $2i Sin n\alpha$
- 4)  $2\cos n\alpha$

**42.** If  $w = \frac{-1 + \sqrt{3}i}{2}$  then  $(3 + w + 3w^2)^4 =$ 

1) 16

3) 16 w

4)  $16w^2$ 

43. If  $f(x) = \begin{cases} \frac{1 - \cos x}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$  is continuous at x = 0, then k = 0

1) 0

44. If  $y = Tan^{-1} \left( Sec x - Tan x \right)$  then  $\frac{dy}{dx} = \frac{dy}{dx}$ 

1) 2

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

The differential coefficient of f(Sin x) w.r.t. x where f(x) = log x is

- 1) Tan x
- $2) \quad Cot \ x$
- 3)  $f(\cos x)$

**46.** If 
$$x = a\left(t - \frac{1}{t}\right)$$
,  $y = a\left(t + \frac{1}{t}\right)$  then  $\frac{dy}{dx} =$ 

1)  $\frac{y}{x}$ 

 $2) \quad \frac{-y}{x}$ 

3)  $\frac{x}{y}$ 

4)  $\frac{-x}{y}$ 

**47.** If 
$$x = A \cos 4t + B \sin 4t$$
 then  $\frac{d^2x}{dt^2} =$ 

1) -16x

2) 16 x

3) x

4) - x

**48.** For the curve  $y^n = a^{n-1}x$  if the subnormal at any point is a constant then n =

1) 1

2) 2

3) - 2

4) -1

49. If the distance 's' metres traversed by a particle in 't' seconds is given by  $s = t^3 - 3t^2$ , then the velocity of the particle when the acceleration is zero, in metres/sec is -

1) 3

2) -2

3) - 3

4) 2

**50.** The maximum of the function  $3 \cos x - 4 \sin x$  is

1) 2

2) 3

3) 4

4) 5

- 51. If a tangent to the curve  $y = 6x x^2$  is parallel to the line 4x 2y 1 = 0, then the point of tangency on the curve is
  - 1) (2, 8)

2) (8, 2)

3) (6, -1)

4) (4, 2)

- **52.**  $\int \frac{dx}{x^2 + 2x + 2} =$ 
  - 1)  $Sin^{-1}(x+1)+c$

2)  $Sin h^{-1}(x+1) + c$ 

3)  $Tan h^{-1} (x+1) + c$ 

4)  $Tan^{-1}(x+1)+c$ 

- $53. \quad \int \sqrt{x} \ e^{\sqrt{x}} \ dx =$ 
  - 1)  $2\sqrt{x} e^{\sqrt{x}} 4\sqrt{x} e^{\sqrt{x}} + c$
- $2) \quad \left(2x-4\sqrt{x}+4\right)e^{\sqrt{x}}+c$
- $3) \quad \left(2x+4\sqrt{x}+4\right)e^{\sqrt{x}}+c$
- $4) \quad \left(1-4\sqrt{x}\right)e^{\sqrt{x}}+c$

- $54. \quad \int \frac{dx}{x(x^7+1)} =$ 
  - 1)  $Log\left(\frac{x^7}{x^7+1}\right)+c$

 $2) \quad \frac{1}{7} Log \left( \frac{x^7}{x^7 + 1} \right) + c$ 

3)  $Log\left(\frac{x^7+1}{x^7}\right)+c$ 

 $4) \quad \frac{1}{7} Log \left( \frac{x^7 + 1}{x^7} \right) + c$ 

- 55.  $\int_{-1}^{1} |1-x| dx =$ 
  - 1) -2

2) (

3) 2

4) 4

**56.** 
$$\int_{0}^{\pi/2} \frac{\cos x - \sin x}{1 + \cos x \sin x} dx =$$

1) 0

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

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

4)  $\frac{\pi}{6}$ 

57. 
$$\int_{0}^{\pi/8} \cos^3 4\theta \, d\theta =$$

 $\frac{2}{3}$ 

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

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

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

**58.** The area enclosed between the curves  $y = x^3$  and  $y = \sqrt{x}$  is, in square units

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

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

3)  $\frac{5}{12}$ 

4)  $\frac{12}{5}$ 

**59.** The degree of the differential equation  $\left(1 + \left(\frac{dy}{dx}\right)^2\right)^{\frac{3}{4}} = \left(\frac{d^2y}{dx^2}\right)^{\frac{1}{3}}$  is

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

2) 4

3) 9

4) 3/4

**60.** The general solution of the differential equation  $\frac{dy}{dx} + \frac{1 + Cos 2y}{1 - Cos 2x} = 0$  is given by

- 1) Tan y + Cot x = c
- $2) \quad Tan \ y \ \ Cot \ x \ = \ c$
- 3) Tan x Cot y = c
- 4) Tan x + Cot y = c

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