**IIT-JEE-2008-Paper1**

**PAPER - I
SECTION - I
Straight Objective Type** **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

This section contains 6 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which ONLY ONE is correct.

**1.** If 0 < x < 1 then √1+x2 [{x cos (cot-1 x) + sin (cot-1 x)}2 - 1]1/2
(1) x/√1+x2
(2) x
(3)  x√1+x2
(4) √1+x2

**2.** Consider the two curves
C1 : y2 = 4x
C2 : x2 + y2 - 6x + 1 = 0
Then,
(1) C1 and C2 touch each other only at one point
(2) C1 and C2 touch each other exactly at two points
(3) C1 and C2 intersect (but do not touch) at exactly two points
(4) C1 and C2 neither intersect nor touch each other

**3.** The edges of a parallelopiped are of unit length and are parallel to non-coplanar unit vectors a, b, c such that a.b = b.c = c.a = 1/2
Then, the volume of the parallelopiped is
(1) 1/√2
(2) 1/2√2
(3) √3 / 2
(4) 1/√3

**4.** Let a and b be non-zero real numbers. Then, the equation (ax2 + by2 + c) (x2 - 5xy + 6y2) = 0 represents
(1) four straight lines, when c = 0 and a, b are of the same sign
(2) two straight lines and a circle, when a = b, and c is of sign opposite to that of a
(3) two straight lines and a hyperbola, when a and b are of the same sign and c is of sign opposite to that of a
(4) a circle and an ellipse, when a and b are of the same sign and c is of sign opposite to that of a.

**5.** The total number of local maxima and minima of the function

             
(1) 0
(2) 1
(3) 2
(4) 3
**6.**
          
 m and n are integers m ≠ 0, n > 0 and let p be the left hand derivative of
         
(1) n = 1, m = 1
(2) n = 1, m = -1
(3) n = 2, m = 2
(4) n > 2, m = n

**SECTION II

Multiple Correct Answers Type**

This section contains 4 multiple correct answer(s) type questions. Each question has 4 choices (1), (2), (3) and (4), out of which ONE OR MORE is/are correct.

**7.** Let P (x1, y1) and Q(x2, y2), y1 < 0, y2 < 0, be the end points of the latus rectum of the ellipse x2 + 4y2 = 4. The equations of parabolas with latus rectum PQ are
(1)    x2 + 2√3  y = 3 + √3
(2)    x2 - 2√3  y = 3 + √3
(3)    x2 + 2√3  y = 3 - √3
(4)    x2 - 2√3  y = 3 - √3

 **8.** A straight line through the vertex P of a triangle PQR intersects the side QR at the point S and the circumcircle of the triangle PQR at the point T. If S is not the centre of the circumcircle, then
(1)    1/PS + 1/ST < 2/√(QS \* SR)
(2)    1/PS + 1/ST > 2/√(QS \* SR)
(3)    1/PS + 1/ST < 4/ QR
(4)    1/PS + 1/ST > 4/ QR

 **9.** Let f(x) be a non-constant twice differentiable function defined
       
Then,

(1) f''(x) vanishes at least twice on [0, 1]


 **10.**
        

(1)      Sn < Π/3√3
(2)      Sn > Π/3√3
(3)      Tn < Π/3√3
(4)      Tn > Π/3√3
**SECTION - III

Assertion - Reason Type**

This section contains 4 reasoning type questions. Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.

**11.** Consider the system of equations
x - 2y + 3z = - 1
-x + y - 2z = k
x - 3y + 4z = 1

STATEMENT-1: The system of equations has no solutions for k ≠ 3
and

STATEMENT-2:
                        

(1) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a correct explanation for STATEMENT-1
(2) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
(3) STATEMENT-1 is True, STATEMENT-2 is False
(4) STATEMENT-1 is False, STATEMENT-2 is True

**12.** Consider the system of equations ax + by = 0, cx + dy = 0, where a, b, c, d ∈{0, 1}

STATEMENT-1: The probability that the system of equations has a unique solution is 3/8
and

STATEMENT-2: The probability that the system of equations has a solution is 1.

(1) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a correct explanation for STATEMENT-1
(2) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
(3) STATEMENT-1 is True, STATEMENT-2 is False
(4) STATEMENT-1 is False, STATEMENT-2 is True

**13.** Let f and g be real valued functions defined on interval (-1, 1) such that g''(x) is continuous g(0) ≠ 0, g''(0) = 0

STATEMENT-1:  g''(0) ≠ 0, and f(x) = g(x) sinx
                       limx→0 [g(x) cot x -g(x) cosec x] = f''(0).
and

STATEMENT-2: f''(0) = g(0)

(1) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a correct explanation for STATEMENT-1
(2) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
(3) STATEMENT-1 is True, STATEMENT-2 is False
(4) STATEMENT-1 is False, STATEMENT-2 is True

**14.** Consider three planes P1 : x - y + z = 1
P2 : x + y - z = - 1
P3 : x - 3y + 3z = 2
Let L1 , L2, L3 be the lines of intersection of the planes P2 and P3, P3 and P1, and P1 and P2, respectively

STATEMENT-1: At least two of the lines L1, L2 and L3 are non-parallel
and

STATEMENT-2: The three planes do not have a common point

(1) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is a correct explanation for STATEMENT-1
(2) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
(3) STATEMENT-1 is True, STATEMENT-2 is False
(4) STATEMENT-1 is False, STATEMENT-2 is True
 **SECTION - IV
Linked Comprehension Type**

This section contains 3 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.

**Paragraph for Questions Nos. 15 to 17**

Let A, B, C be three sets of complex numbers as defined below
A = { z: Imz > 1}
B = { z: |z-2-i| = 3}
C = { z: Re((1-i)z) = √2}
 **15.** The number of element in the set A ∩ B ∩ C is
(1) 0
(2) 1
(3) 2
(4) ∞

**16.** Let z be any point in A ∩ B ∩ C. Then, |z + 1 - i|2 + |z - 5 - i|2 lies between
(1) 25 and 29
(2) 30 and 34
(3) 35 and 39
(4) 40 and 44
**17.** Let z be any point in A ∩ B ∩ C and let w be any point satisfying |w - 2 - i| < 3. Then, |z| - |w| + 3 lies between
(1) -6 and 3
(2) -3 and 6
(3) -6 and 6
(4) -3 and 9

**Paragraph for Questions Nos. 18 to 20**

A circle C of radius 1 is inscribed in an equilateral triangle PQR. The points of contact of C with the sides PQ, QR, RP are D,E, F, respectively. The line PQ is given by the equation  √3x + y - 6 = 0 and the point D is (3√3/2, 3/2) Further, it is given that the origin and the centre of C are on the same side of the line PQ.

**18.** The equation of circle C is
(1)   (x-2√3)2 + (y-1)2 = 1
(2)   (x-2√3)2 + (y-1/2)2 = 1
(3)   (x-√3)2 + (y+1)2 = 1
(4)   (x-√3)2 + (y-1)2 = 1

**19.** Points E and F are given by
(1)  (√3/2, 3/2) (√3, 0)
(2)  (√3/2, 1/2) (√3, 0)
(3)  (√3/2, 3/2) (√3/2, 1/2)
(4)  (3/2, √3/2) (√3/2, 1/2)

**20.** Equations of the sides QR, RP are
(1)  y = (2/√3)x + 1, y = -(2/√3)x - 1
(2)  y = (1/√3)x  y = 0
(3)  y = (√3/2)x + 1, y = -(√3/2)x - 1
(4)  y = (√3)x, y = 0

**Paragraph for Questions Nos. 21 to 23**

Consider the functions defined implicitly by the equation y3 - 3y + x = 0 on various intervals in the real line. If x ∈ (-∞,2) U (2,∞)the equation implicitly defines a unique real valued differentiable function y = f(x).
If x ∈ (-2, 2), the equation implicitly defines a unique real valued differentiable function y = g(x) satisfying g (0) = 0.

**21.**  If f(-10√2) = 2√2, then f''(-10√2) =
(1)  4√2 / 73 32
(2)  -4√2 / 73 32
(3)  4√2 / 73 3
(4)  -4√2 / 73 3

**22.** The area of the region bounded by the curve y = f(x), the x-axis, and the lines x = a and x = b, where -∞ < a < b < -2, is

    

**23.**  ∫1-1 g'(x)dx =

(1) 2g(-1)
(2) 0
(3) -2g (1)
(4) 2g(1)