**IIT-JEE-Mathematics–Screening-2000**

**SCREENING**

Time : Two hours                                                         Max. Marks : 100
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**PART A**

**1.** Let f (θ) = sin θ (sin θ + sin 3 θ). Then f (θ) :
(A) ≥ 0 only when θ ≥ 0                (B) ≤ 0 for all real θ
(C) ≥ 0 for all real θ                     (D) ≤ 0 only when θ ≤ 0

**2.** If x + y = k is normal to y2 = 12 x, then k is :
(A) 3                                        (B) 9
(C) –9                                      (D) –3



**4.** If a and β (α < β) are the roots of the equation x2 + bx + c = 0 , where c < 0 < b, then :
(A) 0 < α < β                                             (B) α < 0 < β < │α│
(C) α < β < 0                                              (D) α < 0 < │α│< β

**5.** Let f : R → R be any function. Define g : R → R by g (x) = │f (x) │for all x.
Then g is :
Onto if f is onto
One-one is f one-one
Continuous if, f is continuous
Differentiable if f is differentiable

**6.** The domain of definition of the function y (x) is given by the equation 2x+ 2y = 2 is :
(A) 0< x≤1                                                  (B) 0≤x≤1
(C) -∞ < x ≤0                                              (D) -∞< x<1

**7.** If x2+ y2=1, then :
(A) yy'" - 2(y ' )2+1=0                                  (B) yy'' + (y ' )2+1=0
(C) yy " = (y ' )2-1=0                                   (D) yy''+2(y ' )2+1=0

**8.** If a,b, c, d are positive real numbers such that a + b + c + d = 2, then M = (a + b) (c + d) satisfies the relation :
(A) 0 ≤ M ≤ 1                                             (B) 1 ≤ M ≤ 2
(C) 2 ≤ M ≤ 3                                            (D) 3 ≤ M ≤ 4

**9.** If the system of equations x – ky – z = 0, kx – y – z = 0, x + y – z = 0 has a non-zero solution, then possible values of k are :
(A) –1, 2                                                   (B) 1, 2
(C) 0, 1                                                     (D) –1, 1

**10.** The triangle PQR is inscribed in the circle x2+ y2=25. If Q and R have coordinates (3, 4) and (–4, 3) respectively, then ∠PQR is equal to:
(A) π/2                                                         (B) π/3
(C) π/4                                                         (D) π/6

**11.** In a triangle ABC, 2ac sin 1/2 (A – B + C) =
(A) a2+b2-c2                                              (B) c2+a2-b2
(C) b2-c2-a2                                               (D) c2-a2-b2

**12.** For x Є R, limn→∞((x-3)/(x+2))x =
(A) e                                           (B) e-1
(C) e-5                                         (D) e5

**13.** Consider an infinite geometric series with first term and common ratio r. If its sum is 4 and the second term is 3/4, then :
(A) a=4/7, r=3/7                                     (B) a =2, r = 3/8
(C) a = 3/2, r = 1/2                                 (D) a = 3, r = ¼

**14.** Let g (x) = ∫0x f (t) dt, where f is such that 1/2 ≤ f(t) ≤ 1 for t ∈ [0,1] and

0 ≤ f(t) ≤1/2 for t ∈[1,2]. Then g (2) satisfies the inequality:

(A) -3/2 ≤ g (2) < 1/2                        (B) 0 ≤ g (2) <2
(C) 3/2 < g (2) ≤ 5/2                         (D) 2 < g (2)< 4

**15.** In a triangle ABC, Let ∠ C= π/2. If r is the inradius and R is the circum-radius of the triangle, then 2 (r +R) is equal to :
(A) a + b                                        (B) b + c
(C) c + a                                        (D) a + b + c

**16.** How many different nine digit numbers can be formed from the number 223355888 by rearranging its digits so that the odd digits occupy even position :
(A) 16                                            (B) 36
(C) 60                                            (D) 180

**17.** If arg (z) < 0, then arg (–z) – arg (z) =
(A) π                                             (B) –π
(C) -π/2                                         (D) π/2

**18.** Let PS be the median of the triangle with vertices P (2, 2), Q (6-1) and R (7, 3). The equation of the line passing through (1,–1) and parallel to PS is:
(A) 2x-9 y-7=0                               (B) 2 x-9 y-11=0
(C) 2 x+9 y-11=0                            (D) 2 x-9 y-11=0

**19.** A pole stands vertically inside a triangular park Δ ABC. If the angle of elevation of the top of the pole from each corner of the park is same, then in Δ ABC the foot of the pole is at the :
(A) centroid                                 (B) circumcentre
(C) incentre                                 (D) orthocenter.


(A) 0                                         (B) 1
(C) 2                                         (D) 3

**21.** The incentre of the triangle with vertices (1,√3 ), (0, 0) and (2, 0) is :
(A) (1,√3/2)                              (B) (2/3,1/√3)
(C) (2/3,√3/2)                           (D) (1,1/√3)

**22.** Consider the following statements in S and R :
S : Both sin x and cos x are decreasing functions in the interval (π/2,π)
R : If a differentiable function decreases in an interval (a, b), then its derivative also decreases in   (a, b).
Which of the following is true :
(A) Both S and R are wrong
(B) Both S and R are correct, but R is not the correct explanation of S.
(C) S is correct and R is correct explanation for S.
(D) S is correct and R is wrong.

**23.** Let f(x)= ∫ex (x-1)(x-2) dx. Then f decreases in the interval :

(A) (∞,-2)                                          (B) (–2, –1)
(C) (1, 2)                                          (D) (2,+∞)

**24.** If the circles x2+y2+2x+2ky+6=0 and x2+y2+2ky+k=0 intersect orthogonally, then k is :

(A) 2 or –3/2                                    (B) –2 or 3/2
(C) 2 or 3/2                                       (D) (2,+∞)



**26.** If the normal to the curve y=f (x) at the point (3, 4) makes an angle 3 π/4 with the positive x-axis then f' (3) =
(A) –1                                      (B) –3/4
(C) 4/3                                     (D) 1

**27.** Let the vectors a, b, c and d be such that (a × b) × (c × d) = 0. Let P1 and P2 be planes determined by the pairs of vectors a, b and c, d respectively, then the angle between P1 and P2 is :
(A) 0                                     (B) π/4
(C) π/3                                  (D) π/2


Then at x = 0, f has :
(A) A local maximum              (B) no local maximum
(C) a local minimum               (D) no extremum


(A) 0                               (B) 1
(C) -√3                            (D) √3

**30.** If b > a, then the equation (x-a)(x-b) –1 = 0 has :
(A) both roots in (a, b)
(B) both roots in (–∞, a)
(C) both roots in (b, + ∞)
(D) one root in (–∞, a) and the other in (b, + ∞)

**31.** If z1, z2 and z3 are complex numbers such that
│z1││z2│=│z3│= |1/z1 +1/z2 +1/z3 | = 1, then │z1+z2+z3│ is :

(A) equal to 1                     (B) less than1
(C) greater than 3               (D) equal to 3

**32.** For the equation 3x2+px+3=0,p>0, if one of the root is square of the other, then p is equal to :
(A) 1/3                              (B) 1
(C) 3                                 (D) 2/3

**33.** If the line x – 1 = 0 is the directrix of the parabola y2-kx+8=0 then one of the values of k is :
(A) 1/8                              (B) 8
(C) 4                                  (D) 1/4

**34.** For all ∈(0,1) :
(A) ex< 1+x                        (B) loge (1+x) < x

(C) sin x > x                       (D) loge x>x.

**35.** The value of the integral ∫e-1e2 | loge x / x | dx is :

(A) 3/2                             (B) 5/2
(C) 3                                (D) 5