MOCK TEST - 03
COMMON ENTRANCE TEST 2012
Subject: MATHEMATICS

Time: 1.10Hrs   Max. Marks 60

Questions – 60

1. $\sin\left[\frac{1}{4}\cos^{-1}\left(-\frac{1}{2}\right)\right] =$

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

2. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = -\frac{3\pi}{2}$ then $x^{50} + y^{50} + z^{50} - \frac{3}{x^{49} + y^{49} + z^{49}}$ is

   1) 4   2) 6   3) 0   4) 3

3. If $\tan\left(\frac{p\pi}{4}\right) = \cot\left(\frac{q\pi}{4}\right)$ if then

   1) p + q = 0 2) p + q = 2n   3) p + q = 2n + 1   4) p + q = 2(2n + 1)

4. The principal amplitude of $\log\left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)$ is

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

5. If $x_r = \cos\frac{\pi}{4^r} + i\sin\frac{\pi}{4^r}$, $y_r = CiS\left(\frac{\pi}{3^r}\right)$ and $z_r = x_r.(y_r)^4$, then $z_1z_2z_3$...............to ∞ is

   1) $CiS\frac{5\pi}{6}$ 2) – 1   3) $CiS\frac{\pi}{3}$ 4) i

6. The distance s moved by a particle in time t is given by s = a cos 2t + b sin 2t. Its acceleration is

   1) 4s   2) a + b   3) -4s   4) s

7. In what ratio should a given line be divided into two parts so that the rectangle contained by them is maximum?

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

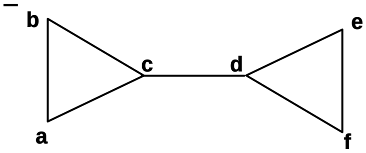
8. The equation of the normal to the curve $y = x^2 + \sin x \cos x$ at the origin is

   1) x + y = 1   2) x - y = 0   3) 2x – y = 0   4) x + y =0

9. The acute angle between the curves xy = 2 and $y^2 = 4x$ at their point of intersection is

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

10. If p is the number of cut vertices and q is the number of cut edges of the following graph, then $p^2 + 3q =$



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

11. $(2 + 5k)x - 3(1 + 2k)y + 2 - k = 0$ represents a concurrent system of lines meeting at the point

1) (5, 4) 2) (1, -1) 3) (1, 1) 4) (4, 5)

12. If the sum of the slopes of the lines $4x^2 + 2hxy - y^2 = 0$ is equal to the product, then h is

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

13. If A is (-1, 3) and (1, -1) is the centroid of triangle ABC, then mid point of BC is

1) (3, -5) 2) (2, -3) 3) (1/3, 1/3) 4) (-2, 5)

14. Let $ax^3 + bx^2 + cx + d = \begin{vmatrix} 3x & x+1 & x-1 \\ x-3 & -2x & x+2 \\ x+3 & x-4 & 5x \end{vmatrix}$ where a, b, c are constants, then the value of d is

1) 5 2) - 6 3) 6 4) 0

15. In a triangle ABC if $\begin{vmatrix} 1 & \sin A & \sin^2 A \\ 1 & \sin B & \sin^2 B \\ 1 & \sin C & \sin^2 C \end{vmatrix} = 0$, the triangle must be

1) scalene 2) equilateral 3) isosceles 4) right-angled

16. If $A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$ then find $A^2 - 9A + 9I =$

1) 7I 2) 5I 3) 9I 4) 3I

17. If A and B are two matrices such that AB = B and BA = A, then $A^2 + B^2 =$

1) 2 AB 2) 2 BA 3) AB 4) A + B

18. The last digit of $3^{3^{4n}} + 2$ is

1) 1 2) 9 3) 3 4) 5

19. Sum to infinity of the series $1 + 2.\frac{1}{3} + 3.\frac{1}{3^2} + 4.\frac{1}{3^3} + \ldots\ldots$

1) 1 2) 3/2 3) 9/4 4) 7/4

20. For each $n \in N$, $2^{3n} - 1$ is divisible by

1) 8 2) 32 3) 7 4) 16

21. If $\frac{2x}{x^3-1}=\frac{A}{x-1}+\frac{Bx+C}{x^2+x+1}$, then

1) A ≠ B ≠ C 2) A = B = C 3) A ≠ B = C 4) A = B ≠ C

22. If in the expansion of $\left(x^3-\frac{1}{x^2}\right)^n$, n ∈ N, sum of the coefficient of x^5 and x^{10} is 0, then value of n is

1) 5 2) 10 3) 20 4)15

23. If y= $\sqrt{\log(\sin x)+\sqrt{\log(\sin x)+\sqrt{\log(\sin x)+........to\ \ \infty}}}$ $\frac{dy}{dx}$ =

1) $\frac{\cot x}{2y-1}$ 2) $\frac{\cot x}{2\sqrt{\log(\sin x)+\sqrt{\log(\sin x)+.......to \inf inity}}}$ 3) $\frac{\cot x}{1-2y}$ 4) $\frac{\cos x}{2y-1}$

24. y = $\sec^{-1}\left(\frac{\sqrt{x}+1}{\sqrt{x}-1}\right)+\sin^{-1}\left(\frac{\sqrt{x}-1}{\sqrt{x}+1}\right)$, then the value of $\frac{dy}{dx}$ will be

1)1 2) – ½ 3) – 1 4)0

25. If y = $ae^x + be^{2x}$, then

1) $\frac{d^2y}{dx^2}-3\frac{dy}{dx}+2y=0$ 2) $\frac{d^2y}{dx^2}+3\frac{dy}{dx}-2y=0$

3) $\frac{d^2y}{dx^2}-3\frac{dy}{dx}-2y=0$ 4) $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=0$

26. If y = $\frac{(1-x)^2}{x^2}$, then $\frac{dy}{dx}$

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

27. $\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)$ is equal to

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

28. In a triangle ABC, a = 2b and ∠A = 3 ∠B, then angle A is

1) 30^o 2) 90^o 3) 60^o 4) 45^o

29. If sin A + sin B + sin C = 3, then $\sin\frac{A}{3}+\sin\frac{B}{3}+\sin\frac{C}{3}=$

1) ½ 2) 1 3) 3/2 4) $\frac{3\sqrt{3}}{2}$

30. If Secθ = m and Tanθ = n, then $\frac{1}{m}\left[(m+n)+\frac{1}{(m+n)}\right]$ =

1) 2m 2) 2n 3) 2 4) mn

31. $\int \frac{5\cot x-2}{2\cot x+3}dx=$

1) $\frac{4}{13}\log(2\cot x+3)+\frac{19}{13}x+C$ 2) $\frac{19}{13}\log(2\cot x+3)+\frac{4}{13}x+C$

3) $\frac{11}{13}\log(2\cot x+3)+\frac{4}{13}x+C$ 4) $\frac{19}{13}\log(2\cos x+3\sin x)+\frac{4}{13}x+C$

32. $\int \frac{e^x}{3\sinh x+3\cosh x}dx =$

1) x 2) $\frac{x}{9}$ 3) $\frac{x}{6}$ 4) $\frac{x}{3}$

33. $\int \sec^{-1} x dx =$

1) $x \sec^{-1} x - x\cosh^{-1} x$ 2) $x \sec^{-1} x - \cosh^{-1} x$

3) $x \sec^{-1} x + \cosh^{-1} x$ 4) $x \sec^{-1} x + \sin^{-1} x$

34. $\int \sqrt{\frac{1-\cos x}{1+\cos x}}\ dx =$

1) $\log \frac{(\sec x)}{2}$ 2) $2 \log \frac{(\sec x)}{2}$ 3) $2 \log \left(\sec\frac{x}{2}\right)$ 4) $4 \log \frac{(\sec x)}{2}$

35. In the set of real numbers R which of the following is a not binary operation

1) $a * b = \frac{a}{b+2}$ 2) $a * b = \sqrt{a^2+b^2}$

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

36. If $\vec{a} = 2i + j - 3k$ and $\vec{b} = i - 2j + k$ then a vector of magnitude 5 perpendicular to both $\vec{a}$ and $\vec{b}$ is

1) $\frac{5}{\sqrt{3}}(i + j + k)$ 2) $\frac{1}{\sqrt{5}}(i + j + k)$ 3) $\frac{1}{\sqrt{3}}(i + j + k)$ 4) $\frac{1}{5\sqrt{3}}(i + j + k)$

37. Let $\vec{a} = i + 2j + 2k$ and $\vec{b} = 3i + 6j + 2k$. Then the vector in the direction of $\vec{a}$ having magnitude equal to the magnitude of $\vec{b}$ is

1) $7(i + 2j + 2k)$ 2) $\frac{7}{3}(i + 2j + 2k)$ 3) $\frac{7}{3}(i + 2j + 3k)$ 4) $\frac{7}{9}(i + 2j + 2k)$

38. The vertices of a triangle are $i + 2j + 4k$, $-2i + 2j + k$ and $2i + 4j - 3k$. The triangle is

1) isosceles 2) right angled 3) equilateral 4) Obtuse angled

39. In the group (G, *) where G = {1, 5, 7, 11} and * is multiplication modulo 12, then which of the following is a subgroup of G

1) {5, 7, 11} 2) {1, 5, 7} 3) {1, 5} 4) {7, 11}

40. If $2 + i$ is a root of the equation $x^3 - 5x^2 + 9x - 5 = 0$, then the other roots are

1) $2 - i$ and 1 2) -1 and $3 + i$ 3) 1 and 2 4) -1 and $i - 2$

41. If 3 is a root of $x^2 + kx - 24 = 0$ it is also a root of

1) $x^2 - 5x + k = 0$ 2) $x^2 + kx + 24 = 0$

3) $x^2 + 5x + k = 0$ 4) $x^2 - kx + 6 = 0$

42. The value of $\sqrt{10^{\left(2+\frac{1}{2}\right)\log_{10} 16}}$ =

1) 80 2) $2\sqrt{2}$ 3) 40 4) 32

43. The negation of the statement "If it rains then you get wet" is

1) if you get wet then it rains 2) it doesnot rain but you get wet

3) it rains and you don't get wet 4) if you get wet then it will not rain

44. $\int \sec^2 x \operatorname{cosec}^4 x dx =$

1) $-\frac{1}{3}\cot^3 x + \tan x - 2\cot x$ 2) tanx + cotx

3) tanx – cotx 4) $\frac{1}{3}\cot^3 x + \tan x - 2\cot x$

45. If $\int_0^\infty \frac{x^2 \; dx}{(x^2+a^2)(x^2+b^2)(x^2+c^2)} = \frac{\pi}{2(a+b)(b+c)(c+a)}$, then the value of $\int_0^\infty \frac{dx}{(x^2+4)(x^2+9)}$ =

1) $\pi/60$ 2) $\pi/20$ 3) $\pi/40$ 4) $\pi/80$

46. Area between $y^2 = 6x$ and $x^2 = 6y$ is

1) $\frac{5}{6}$ 2) 6 3) 2 4) 12

47. The order and degree of the differential equation $\sqrt{\frac{dy}{dx}} - 4\frac{dy}{dx} - 7x = 0$ are

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

48. Solution of $(yx^2 + y)\, dy = (xy^2 + x)\, dx$ is

1) $(x + 1)^2 = k(y + 1)^2$ 2) $(x^2 + 1) = k(y^2 + 1)$

3) $(x - 1)^2 = k(y - 1)^2$ 4) $(x^2 - 1) = k(y^2 - 1)$

49. $\lim_{n\to\infty} (3^n + 4^n)^{\frac{1}{n}} =$ 1) 4 2) 3 3) e 4) ∞

50. The function $f(x) = |x| + \frac{|x|}{x}$ is

1) discontinuous at the origin $\frac{|x|}{x}$ is discontinuous there

2) continuous at the origin

3) discontinuous at the origin because both $|x| \text{ and } \frac{|x|}{x}$ are discontinuous there

4) discontinuous at the origin because |x| is discontinuous there

51. The domain of definition of the function f (x) = $\frac{1}{\log_{10}(1-x)} + \sqrt{x+2}$ is

1) set of reals 2) [-2, 1]
3) [0, 1] excluding 0.5 4) [-2, 1) excluding 0

52. If A = {1, 2, 3, 4, 5, 6} then the number of proper subsets of A is
1) 64 2) 63 3) 62 4) 32

53. The tangent to the circle $x^2 + y^2 = 5$ at (1, -2) touches the circle $x^2 + y^2 - 8x + 6y + 20 = 0$. The point of contact is
1) (-2, 1) 2) (-1, 1) 3) (3, -1) 4) (-3, 0)

54. Equation of the circle passing through the point of intersection of the circles $x^2 + y^2 = 6$ and
$x^2 + y^2 - 6x + 8 = 0$ and the point (1, 1) is
1) $x^2 + y^2 - 6x + 4 = 0$ 2) $x^2 + y^2 - 3y + 1 = 0$
3) $x^2 + y^2 - 3x + 1 = 0$ 4) $x^2 + y^2 - 3x + 7 = 0$

55. Two circles of the same radius r cut each other orthogonally. If their centers are (1, -1) and (-1, 1) then r =
1) 4 2) 3 3) 1 4) 2

56. The locus of the center of a circle of radius 1, which rolls outside the circle $x^2 + y^2 - 6x + 8y = 0$ is
1) $x^2 + y^2 + 6x - 8y - 34 = 0$ 2) $x^2 + y^2 - 6x - 8y - 11 = 0$
3) $x^2 + y^2 - 6x - 8y + 11 = 0$ 4) $x^2 + y^2 - 6x + 8y - 11 = 0$

57. The line y = x – 1 touches the curve $3x^2 - 4y^2 = 12$. The point of contact is
1) (3, 4) 2) (4, 3) 3) (4, -3) 4) (3, 2)

58. A tangent to the parabola $y^2 = 8x$ makes an angle of 45^o with y = 3x + 5. The equation of the tangent is
1) 2x + y - 1 = 0 2) x + 2y – 1 = 0 3) 2x + y + 1 = 0 4) x – 2y - 1 = 0

59. The length of the transverse axis of the hyperbola $x^2 - 4y^2 - 2x + 8y - 2 = 0$ is
1) 1 2)1/2 3) ¼ 4) 2

60. If the major axis of an ellipse is double the minor axis and the length of L. R is 3, then the distance between foci is
1) $6\sqrt{3}$ 2) 6 3) $12\sqrt{3}$ 4) $3\sqrt{3}$