IMCA Entrance Questions, Utkal University, Vani Vihar, Bhubaneswar

Time: Full Marks:

(Answer _____ questions)

1. Let $A=\{x: x \text{ is a multiple of } 4\}$ and, $B=\{x: x \text{ is a multiple of } 6\}$, then $A\cap B$ consists of multiples of
   (a) 16 **(b) 12** (c) 8 (d) 4
2. Let A and B be two non-empty sets having n elements in common. Then, the number of elements common to $A\times B$ and $B\times A$ is
   (a) $2n$ (b) n **(c)** n^2 (d) non of these
3. Let the function $f: R\to R$ be defined by $f(x)=2x+\sin x$. Then f is
   (a) One-to-one and onto (b) One-to-one but not onto (c) onto but not one-to-one
   (d) neither one-to-one nor onto
4. The proposition $(p\to\neg p)\wedge(\neg p\to p)$ is
   (a) a tautology (b) a contradiction (c) neither a tautology nor a contradiction
   (d) a tautology and a contradiction
5. If $\arg(z)<0$, then $\arg(-z)-\arg(z)=$
   (a) π (b) –π (c) –π/2 (d) π/2
6. If 1, α, α^2,....., α^{n-1} are nth roots of unity. The value of $(3-\alpha)(3-\alpha^2)(3-\alpha^3).....(3-\alpha^{n-1})$ is
   (a) n (b) 0 (c) $\frac{3^n-1}{2}$ (d) $\frac{3^n+1}{2}$
7. If Z_1, Z_2, Z_3 are complex numbers such that $|Z_1|=|Z_2|=|Z_3|=\left|\frac{1}{Z_1}+\frac{1}{Z_2}+\frac{1}{Z_3}\right|=1$, then $|Z_1+Z_2+Z_3|$ is
   (a) 1 (b) <1 (c) >1 (d) 0.
8. The 50th term of the series 2+3+6+11+18+.....is
   (a) 49^2-1 (b) 49^2 (c) 50^2+1 (d) 49^2+2
9. The number of real solutions of $1+|e^x-1|=e^x(e^x-2)$ is
   (a)0 (b) 1 (c) 2 (d) 4
10. The coefficient of x^6 in the expansion of $(1+x+x^2)^{-3}$ is
    (a) 6 (b) 5 (c) 4 (d) 3
11. The sum of the series $\sum_{n=0}^{\infty}\frac{n^2-n-1}{n!}$, is
    (a) 2e (b) 3e/2 (c) e (d) 3e
12. If A and B are two matrices such that $AB=A$ and $BA=B$, then B^2 is equal to

(a) B (b) A (c) 1 (d) 0

13. If A is a 3×3 matrix and B is its adjoint such that $|B|$ =64 , then $|A|=$

(a) 64 (b) 60 (c) ±8 (d) 18.

14. If $A=\begin{bmatrix}2&0&0\\0&2&0\\0&0&2\end{bmatrix}$, then A^5=

(a) $5A$ (b) $10A$ (c) $16A$ (d) $32A$

15. If $P(A)=\frac{2}{3}, P(B)=\frac{1}{2}$ and $P(A\cup B)=\frac{5}{6}$ then events A and B are

(a) mutually exclusive (b) independent (c) dependent (d) non of these

16. Two numbers are selected randomly from the set $S=\{1,2,3,4,5,6\}$ without replacement one by one. The probability that the minimum of the two numbers is less than 4 is (a) $\frac{1}{15}$ (b) $\frac{14}{15}$ (c) $\frac{1}{5}$ (d) $\frac{4}{5}$

17. A problem in mathematics is given to three students A , B , C and their respective probability of solving the problem are $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. Probability that the problem is solved is (a) $\frac{3}{4}$ (b) $\frac{1}{2}$ (c) $\frac{2}{3}$ (d) $\frac{1}{3}$

18. Three straight lines $ax+by=c$, $bx+cy=a$ and $cx+ay=b$ are concurrent, if

(a) $a+b=c$ (b) $b+c=a$ (c) $c+a=b$ (d) $a+b+c=0$

19. If $\lambda x^2-10xy+12y^2+5x-16y-3=0$, represents a pair of straight lines, then the value of λ is (a) 4 (b) 3 (c) 2 (d) 1

20. The equation $\lambda^2x^2+(\lambda^2-5\lambda+4)xy+(3\lambda-2)y^2-8x+12y-4=0$ will represents a circle, if $\lambda=$ (a) 1 (b) 4 (c) 2 (d) none of these.

21. The curve with parametric equations $x=1+4\cos\theta$, $y=2+3\sin\theta$ is

(a) an ellipse (b) a parabola (c) a hyperbola (d) a circle

22. The value of λ for which the line $y=x+\lambda$ touches the ellipse $9x^2+16y^2=144$, are

(a) ±5 (b) ±4 (c) ±12 (d) ±3.

23. Which of the following is correct

(a) $\sin1^\circ>\sin1$ (b) $\sin1^\circ<\sin1$ (c) $\sin1^\circ=\sin1$ (d) $\sin1^\circ=\frac{\pi}{180}\sin1$

24. If $\tan(A+B)=p$ and $\tan(A-B)=q$, then the value of $\tan2A$ is

(a) $\frac{p+q}{p-q}$ (b) $\frac{p-q}{1+pq}$ (c) $\frac{1+pq}{1-p}$ (d) $\frac{p+q}{1-pq}$

25. The value of the trigonometric function $\sin 765^{\circ}$ is

(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{2}$ (c) $\frac{3}{\sqrt{2}}$ (d) $\frac{1}{\sqrt{3}}$

26. The general solutions of the equation $\sec x = 2$ are

(a) $\frac{\pi}{3}$ (b) $\frac{5\pi}{3}$ (c) $\frac{n\pi}{2}$ (d) $2n\pi \pm \frac{\pi}{3}$ (n belongs to Z)

27. How many 3-digit numbers can be formed by using the digits 1 to 9 if no digit is repeated ?
(a) 103 (b) 607 (c) 504 (d) 301

28. If $n_{C_8} = n_{C_2}$, find n_{C_2}

(a) 30 (b) 40 (c) 45 (d) 36

29. A bag contains 5 black and 6 red balls. In how many ways 2 black and 3 red balls can be selected (a) 100 (b) 200 (c) 300 (d) 400

30. The value of $\lim_{x\to 0}\frac{(x+1)^5-1}{x}$ is

(a) 5 (b) 1 (c) 6 (d) 7

31. The value of $\lim_{x\to 0}\frac{\sin ax}{bx}$

(a) 0 (b) 1 (c) $\frac{a}{b}$ (d) ∞

32. The function $f(x) = 5x-3$ is continuous at $x =$

(a) 0 (b) 1 (c) 3 (d) 5

33. If $y = 2\sqrt{\cot\left(x^2\right)}$, then $\frac{dy}{dx}$ is

(a) $\frac{-2\sqrt{2}x}{\sin x^2\sqrt{\sin 2x^2}}$ (b) $\frac{\sqrt{2}x}{\sqrt{\sin 2x^2}}$ (c) $\frac{2}{\sin x^2}$ (d) $\frac{\sqrt{2}\sin x^2}{\sqrt{\sin 2x^2}}$

34. The value of $\lim_{x\to\infty} x^{1/x}$ equals

(a) 0 (b) 1 (c) e (d) e^{-1}

35. Every constant function is
(a) everywhere continuous (b) discontinuous (c) non of these (d) differentiable

36. The trigonometric function $\sin x$ is continuous at

(a) each points of its domain (b) $[0,\pi]$ (c) $\left[0,\frac{\pi}{2}\right]$ (d) $[0,1]$.

37. If $a+b+c=0$, then the equation $3ax^2+2bx+c=0$ has in the interval $(0,1)$

(a) at least one root (b) at most one root (c) no root (d) non of these

38. The value of a for which the function $f(x)=a\sin x+\frac{1}{3}\sin 3x$ has an extremum at $x=\frac{\pi}{3}$ is (a) 1 (b) -1 (c) 0 (d) 2

39. If $\int_0^a \frac{1}{1+4x^2}dx=\frac{\pi}{8}$, then a equals

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) 1 (d) $\frac{1}{2}$

40. Integrating factor of the differential equation $\cos x\frac{dy}{dx}+y\sin x=1$, is

(a) $\sin x$ (b) $\cos x$ (c) $\sec x$ (d) $\tan x$

41. The distance between the pair of points $(2,3,5)$ and $(4,3,1)$ is

(a) 5 (b) 2 (c) $\sqrt{5}$ (d) $2\sqrt{5}$

42. The principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$ is

(a) 1 (b) π (c) $\frac{\pi}{2}$ (d) $-\frac{\pi}{6}$

43. If $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix}=\begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$, then the value of x, y and z are

(a) (2,4,3) (b) (3,2,1) (C) (1,-1,2) (d)(6,3,1)

44. The directions cosines of the vector $\vec{a}=\hat{i}+2\hat{j}+3\hat{k}$ are

(a) $\left(\frac{1}{\sqrt{14}},\frac{2}{\sqrt{14}},\frac{3}{\sqrt{14}}\right)$ (b) $\left(\frac{1}{\sqrt{2}},\frac{3}{\sqrt{2}},\frac{5}{\sqrt{2}}\right)$ (c) $\left(\frac{1}{\sqrt{2}},\frac{2}{\sqrt{2}},\frac{3}{\sqrt{2}}\right)$ (d) $\left(\frac{3}{\sqrt{3}},\frac{2}{\sqrt{3}},\frac{1}{\sqrt{3}}\right)$

45. The projection of the vector $\hat{i}+3\hat{j}+7\hat{k}$ on the vector $7\hat{i}-\hat{j}+8\hat{k}$ is

(a) $\frac{60}{\sqrt{114}}$ (b) $\frac{55}{\sqrt{115}}$ (c) 60 (d) 55

46. For a unit vector $\vec{a}$, $\left(\vec{x}-\vec{a}\right)\left(\vec{x}+\vec{a}\right)=12$,then the value of $\left|\vec{x}\right|$ is

(a) $\sqrt{13}$ (b) 3 (c) $\sqrt{2}$ (d) 6

47. The angle between the planes $x+y+z=9$ and $2x-y+z=15$, is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) none of these

48. The variance of the given data 2, 4, 5, 6, 8, 17 is

(a) 46 (b) 46.66 (c) 23 (d) 23.33

49. The standard deviation of the given data 57, 64, 43, 67, 49, 59, 44, 47, 61, 59 is

(a) 8.13 (b) 8.11 (c) 9 (d) 9.2

50. one of the methods for determining mode is
    (a) Mode= 2median-3 mean (b) Mode= 3 median – 2 mean (C) mode = 2 mean – 3 median
    (d) Mode= 3 mean – 2 median
51. Mode is the
    (a) middle most frequent value (b) least frequent value (c) maximum frequent value (d) none of these
52. The algebraic sum of the deviations of a frequency distribution from its mean is always
    (a) >0 (b) <0 (c) 0 (d) non-zero number
53. Which of the following cannot be determined graphically
    (a) Mean (b) Median (c) Mode (d) None of these

54. A feasible solution of linear programming problem
    (a) Must satisfy all the constraints simultaneously
    (b) Need not satisfy all the constraints
    (c) is a corner point of the feasible region
    (d) all of the above
55. The set of all values of x satisfying the inequation $(x-1)^3(x+1)<0$ is
    (a) $(-1,1)$ (b) $(-\infty,-1)$ (c) $[-1,1]$ (d) $(-1,\infty)$
56. If $\log_4 5 = x$ and $\log_5 6 = y$, then $\log_2 3$ is equal to
    (a) $2xy+1$ (b) $2xy-1$ (c) $2x+1$ (d) $2x-1$
57. The number of real solutions of the equation $e^x = x$, is
    (a) 1 (b) 2 (c) 0 (d) none of these

58. Identify the quantifier of the statement " There exists a number which is equal to its square ". (a) There exists (b) number (c) square (d) equal
59. The degree (if defined) of differential equation $\left(\frac{d_2y}{dx^2}\right)^2+\cos\left(\frac{dy}{dx}\right)=0$ is
    (a) 1 (b) 2 (c) 3 (d) does not exist
60. The integrating factor of the differential equation $\frac{dy}{dx}+\sec xy=\tan x\left(0\le x<\frac{\pi}{2}\right)$ is
    (a) $\sin x$ (b) $\tan x$ (c) $\cot x$ (d) $\sec x+\tan x$

61. _____ is the brain of any computer system.
    a) Control Unit
    b) Arithmetic Logic Unit
    c) Central Processing Unit
    d) Memory Unit
62. Which is not a computer programming language?
    a) C
    b) C++
    c) C- -
    d) Java
63. The binary system uses the power of

a) 8
b) 16
c) 4
d) 2

64. RAM stands for
    a) Random Access Memory
    b) Range Action Memory
    c) Read Access Memory
    d) Record Access Memory
65. 1 byte=_____ bits.
    a) 4
    b) 8
    c) 6
    d) 2
66. Which is not a type of ROM (Read Only Memory)?
    a) PROM
    b) EPROM
    c) RROM
    d) EEPROM
67. The 2's complement of any binary number is calculated by adding _____ to the 1's complement of that number.
    a) 1
    b) -1
    c) 0
    d) 2
68. The full form of ASCII is _____.
    a) American Static Code for Information Interchange
    b) American Standard Code for Information Interchange
    c) American System Code for Information Interchange
    d) American Security Code for Information Interchange

69. Which of the following is not an input device?
    a) Mouse
    b) Printer
    c) Keyboard
    d) Scanner
70. Vacuum tubes were used in _____generation of computers.
    a) First
    b) Second
    c) Third
    d) Fourth