JNU MCA

Solved Paper 2018

1. In a linked list each node contains minimum of 2 fields one field is data field to store the data what is the second field?

(a) Pointer to character (b) Pointer to integer
(c) Pointer to Node (d) Node

2. If 100 cats kill 100 mice in 100 days, then 4 cats kill 4 mice in how many days?

(a) 1 (b) 2 (c) 4 (d) 100

3. Who is the father of C language?

(a) Dennis Ritchie (b) Bjarne stroustrup
(c) John newman (d) None of these

4. $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}\,dx =$

(a) $\frac{\pi}{2}$ (b) π (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{8}$

5. $\lim_{\theta\to 0} \frac{\sin\theta}{\theta} =$

(a) 1 (b) 0
(c) ∞ (d) does not exist

6. If the circle $x^2+y^2+2x+2ky+6=0$ and $x^2+y^2+2ky+k=0$ intersect orthogonally, then k is

(a) 2 or – 2/3 (b) –2 or – 3/2
(c) 2 or – 3/2 (d) –2 or – 3/2

7. Which is not a leap year?

(a) 700 (b) 800 (c) 1200 (d) 2000

8. If $x = r\cos\theta$ and $y = r\sin\theta$, then find $\left(\frac{\partial r}{\partial x}\right)^2 + \left(\frac{\partial r}{\partial y}\right)^2 =$

(a) 0 (b) 1
(c) 2 (d) 3

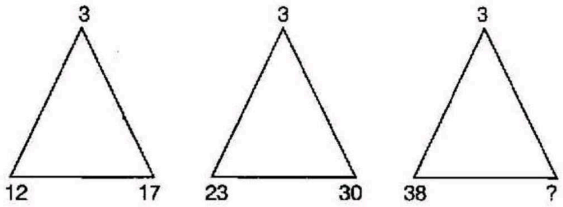
9. If $u = \tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$, then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$

(a) $\cos u$ (b) $\sin 2u$
(c) $\cos 2u$ (d) $\sin u$

10. What is the full form of SQL?

(a) Structural query language
(b) Sequential query language
(c) Standard query language
(d) None of the above

11.



(a) 41 (b) 46
(c) 44 (d) 47

12. $\int \log x\,dx$

(a) $x\log\left(\frac{x}{e}\right)$ (b) $x\log(e)$
(c) $x\log x$ (d) $x\log(xe)$

13. Find the last term of the series 8, 6, 9, 23, 87.

(a) 128 (b) 226
(c) 429 (d) 347

14. $y = x^{x^{x^{\cdots^{\infty}}}}$, then $x\frac{dy}{dx} =$?

(a) $\frac{y^2}{1-y\log x}$ (b) $\frac{x^2}{1+y\log x}$
(c) $\frac{y^2}{y\log x-1}$ (d) $\frac{y^2}{y\log x+1}$

15. $\begin{bmatrix}1&0&5\\0&6&9\\1&0&5\end{bmatrix} X = \begin{bmatrix}1\\2\\3\end{bmatrix}$, the number of solution of the system of equations

(a) 0 (b) 1 (c) 2 (d) ∞

16. Find the value of $\frac{1}{\log_4 120} + \frac{1}{\log_5 120} + \frac{1}{\log_6 120}$

(a) 1 (b) 0
(c) –1 (d) None of these

17. What will be the correct sequence of

P : Einstein was
Q : Although he was a great scientist
R : was weak in arithmetic
S : Right from the beginning of the school days.

(a) QPRS (b) QRSP
(c) PSRQ (d) None of these

18. If θ is the angle between the unit vectors **a** and **b**, then $\sin\frac{\theta}{2}$ is equal to

(a) $\frac{1}{2}|\mathbf{a}-\mathbf{b}|$ (b) $\frac{1}{2}|\mathbf{a}+\mathbf{b}|$

(c) $|\mathbf{a}-\mathbf{b}|$ (d) $\sqrt{\frac{1}{2}|\mathbf{a}-\mathbf{b}|}$

19. The smallest positive integer n for which $\left(\frac{1+i}{1-i}\right)^n = 1$ is

(a) 2 (b) 4 (c) 6 (d) 8

20. Which of the following is irrational?

(a) π (b) $\sqrt{2}$ (c) $\sqrt{3}$ (d) $\sqrt{4}$

21. Given that $x(x-y)dy + y^2dx = 0$, if c is a constant then

(a) $y = ce^{x/y}$ (b) $y = ce^{1/x}$

(c) $y = ce^{y/x}$ (d) None of these

22. If set A and B have 5 common elements, then find the number of common elements in $(A \times B)$ and $(B \times A)$

(a) 5^2 (b) 2^5

(c) 0 (d) None of these

23. The greatest common divisor of $(3^5 \times 2^7)$ and $(3^{11} \times 5^7)$

(a) 1 (b) 3

(c) 3^3 (d) 3^5

24. If $x = -1$ is one root of $x^3 - 4x^2 - 89x - 84 = 0$, then find the other root?

(a) 12 (b) 5 (c) –4 (d) None

25. Find the odd one out.

(a) Lotus (b) Rose

(c) Bud (d) Tulip

26. How many different digit of number used for making of 366 page book?

(a) 732 (b) 990

(c) 1110 (d) None of these

27. In which of the following 'Break' statement not simply use

(a) for (b) do-while

(c) while (d) if-else

28. What is the possible number of committee of 3 persons out of 10 persons can be formed?

(a) 120 (b) 20 (c) 24 (d) 720

29. Find the focus of the parabola $y = -2(x+1)^2 + 1$

(a) $\left(4, \frac{11}{8}\right)$ (b) $\left(-4, \frac{11}{8}\right)$

(c) $\left(4, \frac{9}{8}\right)$ (d) $\left(-4, -\frac{9}{8}\right)$

30. Find the nth derivative of $\sin(ax+b)$

(a) $y_n a^n \sin\left(ax + b + \frac{n\pi}{2}\right)$ (b) $y_n a^n \sin(ax + b + 2n\pi)$

(c) $y_n a^n \sin\left(ax + b + \frac{2\pi}{n}\right)$ (d) None of these

31. What is the value of $\sqrt{\frac{1}{2}}$

(a) $\sqrt{\pi}$ (b) $\sqrt{\frac{\pi}{2}}$

(c) $\frac{1}{2}$ (d) None of these

32. Pointer is pointing nothing is called

(a) Void pointer (b) Null pointer

(c) Empty Pointer (d) None of these

33. The sum of the products can be implemented by

(a) OR (b) XOR

(c) AND (d) NOT

34. If $m = a\cos\theta + b\sin\theta$ and $n = a\cos\theta - b\sin\theta$, then what is the value of $m^2 + n^2$ =

(a) $(ab)^2$ (b) $a^2 + b^2$

(c) $(a+b)^2$ (d) None of these

35. How many least NAND gate are used to make an OR gate?

(a) One (b) Two

(c) Three (d) None of these

36. Which of the following is false for zero?

(a) Even (b) Positive

(c) Additive inverse (d) Inverse of zero

37. If $R = \{(x, y) : x + 2y = 10, x \in N, y \in N\}$ $N = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

(a) Symmetric (b) Reflexive

(c) Anti symmetric (d) Transitive

38. If A, B, C, D are inserting in a stack in this order of removal is

(a) *ABCD* (b) *DCBA*

(c) *BACD* (d) *DABC*

39. The matrix $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 3 \\ 1 & 1 & 4 \end{bmatrix}$ is

(a) singular (b) skew-symmetric

(c) symmetric (d) identity matrix

40. What is the eigen vector of $\begin{bmatrix} 5 & 1 \\ -1 & 3 \end{bmatrix}$ with one of the eigen value of given $\lambda = 2$?

(a) $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$ (b) $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

(c) $\begin{bmatrix} -1 \\ 1 \end{bmatrix}$ (d) None of these

41. Which of the following hold commutative law?

(a) Division of real integer

(b) Addition of $n \times n$ matrix

(c) Multiplication of $n \times n$ matrix

(d) None of the above

42. The $\left[\frac{(-1)^n}{n}\right]$ is

(a) Convergent (b) Divergent
(c) Bounded (d) Unbounded

43. What is the value of $\begin{bmatrix} 1 & 2 & 2 \\ 1 & 4 & 8 \\ 1 & 6 & 16 \end{bmatrix}$?

(a) 2 (b) 3
(c) 6 (d) None of these

44. If α, β are the roots of the equation $ax^2 + bx + c = 0$. Then, find the value of $\alpha^2 + \alpha\beta + \beta^2 = ?$

(a) $\frac{b^2 - ac}{a^2}$ (b) $\frac{b^2 + ac}{a^2}$
(c) $\frac{ac - b^2}{a^2}$ (d) None of these

45. What are the Relational databases contains?

(a) Table (b) Keys (c) Entity (d) Tuples

46. If $\log \tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right) = \pi$, then $\tan h \frac{\theta}{2} = ?$

(a) $\frac{e^{\frac{h\theta}{2}} - e^{-\frac{h\theta}{2}}}{e^{\frac{h\theta}{2}} + e^{-\frac{h\theta}{2}}}$ (b) $\frac{e^{\frac{h\theta}{2}} + e^{-\frac{h\theta}{2}}}{e^{\frac{h\theta}{2}} - e^{-\frac{h\theta}{2}}}$
(c) $\frac{e^{h\theta} + e^{-h\theta}}{e^{h\theta} - e^{-h\theta}}$ (d) None of these

47. If 3 identical blue beads and 2 identical green beads can be arranged in a straight line in how many ways?

(a) 10 (b) 20 (c) 5 (d) 24

48. If $f(x) = x^2 + \frac{x^2}{(1+x^2)} + \frac{x^2}{(1+x^2)^2} + \ldots$ then, $f(x)$ at $x = 0$ is

(a) not continuous (b) limit exist but not continuous
(c) continuous (d) None of these

49. How many times do 3 come from counting from 1 to 100?

(a) 20 (b) 10 (c) 15 (d) 5

50. The real value of θ for $\cos\theta = x + \frac{1}{x}$

(a) acute (b) obtuse
(c) right angle (d) No value of θ

51. If $a = (1, 2, -1)$, $b = (0, 1, -1)$, then vector product of a and $b = ?$

(a) $-\hat{i} + \hat{j} + \hat{k}$ (b) $\hat{i} + \hat{j} + \hat{k}$
(c) $\hat{i} - \hat{j} - \hat{k}$ (d) $2\hat{i} + 3\hat{j} + 5\hat{k}$

52. What is the value of the gradient of the coordinates of (1, 2) and (4, 8)?

(a) 3 (b) 2 (c) –2 (d) 1

53. Find the eigen values of $\begin{bmatrix} 1 & -3 \\ 3 & 5 \end{bmatrix}$.

(a) 3, 3 (b) –3, 3
(c) –3, – 3 (d) None of these

54. If $\sin\theta + \cos\theta = 1$, then the value of $\sin 2\theta$?

(a) 0 (b) 1
(c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

55. A fair dice is throwing twice, find the probability of getting on face of first dice is 6 where as the sum 8 on the second dice is

(a) $\frac{1}{36}$ (b) $\frac{35}{36}$
(c) $\frac{2}{5}$ (d) $\frac{1}{6}$

56. The process is

(a) program in the execution
(b) program in the single thread execution
(c) program in memory
(d) None of the above

57. A coin is tossed 4 times then what is the probability of getting at least one head?

(a) $\frac{1}{16}$ (b) $\frac{1}{36}$
(c) $\frac{2}{36}$ (d) $\frac{15}{16}$

58. The complexity of worst case of quick sort is

(a) $O(n \log n)$ (b) $O(n^2)$
(c) $O(\log n)$ (d) None of these

59. What is the degree of multiprogramming ?

(a) The number of process executed per unit time
(b) The number of process in a ready queue
(c) The number of process in I/O queue
(d) The number of process in memory

60. To remove the table from the database we use command

(a) remove (b) delete
(c) drop table (d) None

61. What is the postfix order of the $A + B * C$

(a) $ABC + *$ (b) $+ * ABC$
(c) $A + BC *$ (d) $ABC * +$

62. If the shadow of a tree is 3 times the height of the tree then the angle of elevation of the sun with respect to tree is?

(a) 30° (b) 45°
(c) 60° (d) 90°

63. In a school the 75% students knows probability, 30% know the statics and 20% know the both so what is the probability of the students that they know probability or statics?

(a) 75% (b) 80%
(c) 85% (d) None of these

64. $X = 1010100$ and $Y = 1000011$. Find $X - Y$ using 2's complement

(a) 1011101 (b) 1000011
(c) 1001100 (d) 10001

65. A boy buy pineapple for ₹ 7 and watermelon for ₹ 5 if he take ₹ 38 to spend then find the no. of Pine apple does he buy?

(a) 3 (b) 4
(c) 2 (d) None of these

66. $(256)^{0.16} \times (256)^{0.09} =$

(a) 2 (b) 4
(c) 8 (d) None of these

67. The maximum unsigned maximum number of 2 byte will be

(a) $2^{16} - 1$ (b) $2^{15} - 1$
(c) 2^5 (d) None of these

68. Which of the following is not a reserved keyword in C?

(a) Case (b) Auto (c) Main (d) Return

69. Find the number of solutions of $x + 2y + z = 0$, $2x + y + 2z = 5, 3x + 7y + 9z = 3$

(a) unique solutions (b) No solution
(c) Infinite solution (d) None of these

70. If $P \oplus Q$ represent the following then $\oplus$ is

P	Q	$P \oplus Q$
T	T	T
T	F	F
F	T	F
F	F	F

(a) Conjunction (b) Disjunction
(c) XOR (d) None of these

71. To avoid a dead lock state which method is used

(a) Banker's Algorithm (b) Priority based
(c) FCFS (d) None of these

72. Time Quantum is used in

(a) Round Robin Scheduling
(b) Priority based Scheduling
(c) Shortest Process Scheduling
(d) None of the above

73. The number of significant digits in the number 204.020050 is

(a) 5 (b) 6
(c) 7 (d) 9

74. The convergence of which of the following method is sensitive to starting value?

(a) False Position
(b) Gauss Seidel Method
(c) Newton Raphson Method
(d) All of the above

75. Match the following

A.	Newton Raphson	1.	Integration
B.	Runge- Kutta	2.	Root finding
C.	Gauss-Seidel Equations	3.	Ordinary differential
D.	Simpson's Rule	4.	Solution of System of Linear Equations

The correct sequence is

(a) A2-B3-C4-D1 (b) A3-B2-C1-D4
(c) A1-B4-C2-D3 (d) A4-B1-C2-D3

76. We wish to solve $x^2 - 2 = 0$ by Newton Rapson technique. If the initial guess is $x_0 = 1.0$, subsequent estimate of x (i.e. x_1) will be

(a) 1.141 (b) 1.5
(c) 2.0 (d) None of these

Answer *with* Explanations

1. *(c)* In a linked list each node contains minimum of 2 fields, one field is data field to store the data, and the second field is pointer field to store 'address of the next Node'

So, the second field is 'Pointer to Node'.

2. *(d)* ∵ 100 cats can kill 100 mice in 100 days.

∴ So for 4 cats to kill 4 mice = they need 100 days.

3. *(a)* Dennis Ritchie is the father of C language.

4. *(c)* Let $I = \int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}\,dx$ ...(i)

$$\Rightarrow \quad I = \int_0^{\pi/2} \frac{\sqrt{\sin(\pi/2-x)}}{\sqrt{\sin(\pi/2-x)}+\sqrt{\cos(\pi/2-x)}}\,dx$$

$$\left[\because \int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx\right]$$

$$\Rightarrow \quad I = \int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\cos x}+\sqrt{\sin x}}\,dx \quad \ldots(ii)$$

On adding Eq. (i) and Eq. (ii), we get

$$2I = \int_0^{\pi/2} 1\,dx$$

$$\Rightarrow \quad 2I = [x]_0^{\pi/2}$$

$$\Rightarrow \quad 2I = \frac{\pi}{2}$$

$$\Rightarrow \quad I = \frac{\pi}{4}$$

5. *(a)* $\lim_{\theta\to 0} \frac{\sin\theta}{\theta} = \frac{0}{0}$

Using L' Hospital Rule

$$\lim_{\theta\to 0} \frac{\cos\theta}{1} = \cos 0 = 1$$

6. *(c)* Given circle

$$S_1 = x^2 + y^2 + 2x + 2ky + 6 = 0 \quad \ldots(i)$$

and $$S_2 = x^2 + y^2 + 2ky + k = 0 \quad \ldots(ii)$$

We know that,

$$S_1 = x^2 + y^2 + 2g_1x + 2f_1y + c_1 = 0$$

$$S_2 = x^2 + y^2 + 2g_2x + 2f_1y + c_2 = 0$$

Intersect orthogonally when

$$2g_1 \cdot g_2 + 2f_1 \cdot f_2 = c_1 + c_2 \quad \ldots(iii)$$

Therefore, from Eq. (i), $g_1 = 1, f_1 = k, c_1 = 6$

From Eq. (ii), $g_2 = 0, f_2 = k, c_2 = k$

On putting these values in Eq. (iii), we get

$$2k^2 = 6 + k$$

$$\Rightarrow \quad 2k^2 - k - 6 = 0$$

$$\Rightarrow \quad (k-2)(2k+3) = 0$$

$$\Rightarrow \quad k = 2, \frac{-3}{2}$$

7. *(a)* ∵ Every year divisible by 4 is a leap year.

∴ 800, 1200 and 2000 are divisible by 4, so these are leap year. But 700 is not divisible by 4. Hence, 700 is not a leap year.

8. *(b)* Given, $x = r\cos\theta$ ...(i)

$$y = r\sin\theta \quad \ldots(ii)$$

On square Eq. (i) and Eq. (ii), and then adding then, we get

$$\Rightarrow \quad x^2 + y^2 = r^2\cos^2\theta + r^2\sin^2\theta$$

$$\Rightarrow \quad x^2 + y^2 = r^2(\cos^2\theta + \sin^2\theta) \quad [\because \cos^2\theta + \sin^2\theta = 1]$$

$$\Rightarrow \quad x^2 + y^2 = r^2$$

$$\Rightarrow \quad r = \sqrt{x^2+y^2} \quad \ldots(iii)$$

On differentiating Eq. (iii) w.r.t. x, we get

$$\frac{\partial r}{\partial x} = \frac{1}{2\sqrt{x^2+y^2}} \cdot 2x = \frac{x}{\sqrt{x^2+y^2}}$$

$$\Rightarrow \quad \left(\frac{\partial r}{\partial x}\right)^2 = \frac{x^2}{x^2+y^2} \quad \ldots(iv)$$

Again, differentiating Eq. (iii), w.r.t. y, we get

$$\frac{\partial r}{\partial y} = \frac{1}{2\sqrt{x^2+y^2}} \cdot 2y = \frac{y}{\sqrt{x^2+y^2}}$$

$$\Rightarrow \quad \left(\frac{\partial r}{\partial y}\right)^2 = \frac{y^2}{x^2+y^2} \quad \ldots(v)$$

Hence, $\left(\frac{\partial r}{\partial x}\right)^2 + \left(\frac{\partial r}{\partial y}\right)^2 = \frac{x^2}{x^2+y^2} + \frac{y^2}{x^2+y^2}$ [from Eqs. (iv) and (v)]

$$= \frac{x^2+y^2}{x^2+y^2} = 1$$

9. *(b)* We have,

$$u = \tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$$

$$\Rightarrow \quad \tan u = \frac{x^3+y^3}{x+y}$$

Let $f(u) = \tan u$

$$\therefore \quad f(u) = \frac{x^3+y^3}{x+y}$$

Which is a homogeneous function of degree 2.

∴ By Euler theorem,

$$x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y} = nf$$

$$\Rightarrow \quad x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y} = 2f \quad [\because n = 2]$$

$$\Rightarrow \quad x\frac{\partial(\tan u)}{\partial x} + y\frac{\partial(\tan u)}{\partial y} = 2\tan u$$

$$x\sec^2 u\frac{du}{dx} + y\sec^2\frac{du}{dy} = 2\tan u$$

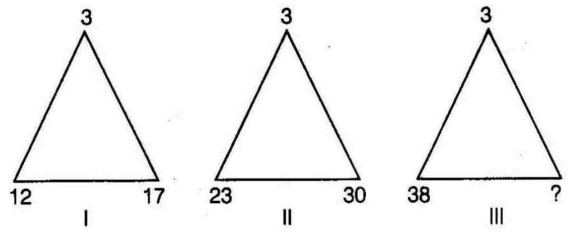
$$\Rightarrow \quad x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{2\tan u}{\sec^2 u}$$

$$\Rightarrow \quad x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$$

10. *(a)* Full form of SQL is

Structural Query Language.

11. *(d)*



I Triangle $\Rightarrow 12+3+2=17$

II Triangle $\Rightarrow 23+3+4=30$

Therefore, III triangle $\Rightarrow 38+3+6=47$

$\therefore \quad x=47$

12. *(a)* Let $I=\int \log x\, dx$

$$\Rightarrow \quad I=\int \underset{\text{II}}{1}\cdot \underset{\text{I}}{\log x}\, dx=\log x\cdot x\int x\cdot\frac{1}{x}dx$$

$$=x\log x-\int 1\cdot dx=x\log x-x$$

$$=x(\log x-1)$$

$$=x(\log x-\log_e^e) \qquad [\because \log e=1]$$

$$=x\log\left(\frac{x}{e}\right) \qquad \left[\because \log a-\log b=\log\left(\frac{a}{b}\right)\right]$$

13. *(c)* Given series is

$$8,\ 6,\ 9,\ 23,\ 87$$

$$8,\ 8\times1-2,\ 6\times2-3,\ 9\times3-4,\ 23\times4-5$$

Above series can be re-written as

Therefore, the last term should be $87\times5-6$ i.e. 429.

14. *(a)* Given, $\quad y=x^{x^{x^{x\ldots\infty}}}$

$\therefore \quad y=x^y$

Taking log both sides,

$\Rightarrow \quad \log y=y\log x$

On differentiate w.r.t. x both sides, we get

$$\Rightarrow \quad \frac{1}{y}\cdot\frac{dy}{dx}=y\cdot\frac{1}{x}+\log x\cdot\frac{dy}{dx}$$

$$\Rightarrow \quad \left(\frac{1}{y}-\log x\right)\frac{dy}{dx}=\frac{y}{x}$$

$$\Rightarrow \quad x\frac{dy}{dx}=\frac{y}{\left(\frac{1}{y}-\log x\right)}$$

$$\Rightarrow \quad x\frac{dy}{dx}=\frac{y^2}{(1-y\log x)}$$

15. *(d)* Let $A=\begin{bmatrix}1&0&5\\0&6&9\\1&0&5\end{bmatrix}$

$$\Rightarrow \quad |A|=\begin{vmatrix}1&0&5\\0&6&9\\1&0&5\end{vmatrix}$$

$$=1(30-0)-0(0-9)+5(0-6)$$

$$=30-0-30=0$$

Since, $\quad |A|=0$

Hence, the number of solution of given system of equation is infinite.

16. *(a)* $\dfrac{1}{\log_4 120}+\dfrac{1}{\log_5 120}+\dfrac{1}{\log_6 120}$

$$=\log_{120}4+\log_{120}5+\log_{120}6 \qquad \left[\because \log_b a=\frac{1}{\log_a b}\right]$$

$$=\log_{120}(4\cdot5\cdot6) \qquad [\because \log a+10gb=\log ab]$$

$$=\log_{120}\cdot120=1 \qquad [\because \log_a a=1]$$

17. *(a)*

18. *(a)* Given, vectors $\vec{a}$ and $\vec{b}$ are unit vectors

$\therefore \quad |\vec{a}|=1 \quad$ and $\quad |\vec{b}|=1$

We know that, $|\vec{a}-\vec{b}|^2=(\vec{a}-\vec{b})\cdot(\vec{a}-\vec{b})$

$$\Rightarrow \quad |\vec{a}-\vec{b}|=|\vec{a}|^2+|\vec{b}|^2-2\vec{a}\cdot\vec{b}$$

$$\Rightarrow \quad |\vec{a}-\vec{b}|=1+1-2|\vec{a}||\vec{b}|\cos\theta=2-2|\vec{a}||\vec{b}|\cos\theta$$

$$\Rightarrow \quad |\vec{a}-\vec{b}|=2-2\cos\theta=2-2\left(1-2\sin^2\frac{\theta}{2}\right)$$

$$\Rightarrow \quad |\vec{a}-\vec{b}|=2-2+4\sin^2\frac{\theta}{2}$$

$$\Rightarrow \quad |\vec{a}-\vec{b}|=|\vec{a}-\vec{b}|^2=4\sin^2\frac{\theta}{2}$$

$$\Rightarrow \quad |\vec{a}-\vec{b}|=2\sin\frac{\theta}{2}$$

$$\Rightarrow \quad \sin\frac{\theta}{2}=\frac{1}{2}|\vec{a}-\vec{b}|$$

19. *(b)* We have, $\dfrac{1+i}{1-i}=\dfrac{1+i}{1-i}\times\dfrac{1+i}{1+i}=\dfrac{(1+i)^2}{2}=\dfrac{2i}{2}=i$

$$\therefore \quad \left(\frac{1+i}{1-i}\right)^n=1 \quad\Rightarrow\quad (i)^n=(i)^4 \quad\Rightarrow\quad n=4 \qquad [\because i^4=1]$$

20. *(d)*

21. *(c)* We have,

$$x(x-y)\,dy+y^2dx=0$$

$$\Rightarrow \quad \frac{dy}{dx}=\frac{-y^2}{x(x-y)}$$

$$\Rightarrow \quad \frac{dy}{dx}=\frac{y^2}{xy-x^2} \qquad \ldots(i)$$

Which is a homogeneous differential equation.

Put $y=vx$ and $\dfrac{dy}{dx}=v+x\dfrac{dv}{dx}$ in Eq. (i), we have

$$v+\frac{xdv}{dx}=\frac{v^2x^2}{vx^2-x^2}$$

$$\Rightarrow \quad v+x\frac{dv}{dx}=\frac{v^2}{v-1}$$

$$\Rightarrow \quad \frac{xdv}{dx}=\frac{v}{v-1}$$

$$\Rightarrow \quad \int\frac{v-1}{v}dv=\int\frac{dx}{x}$$

$$\Rightarrow \quad \int\left(1-\frac{1}{v}\right)dv=\int\frac{dx}{x}$$

$$\Rightarrow \quad v-\log v=\log x+\log c'$$

$$\Rightarrow \quad v=\log x+\log v+\log c'$$

$$\Rightarrow \quad \frac{y}{x} = \log c' y$$

$$\Rightarrow \quad c' y = e^{y/x}$$

$$\Rightarrow \quad y = \frac{1}{c'} e^{y/x}$$

$\Rightarrow y = ce^{y/x}$, where $c' = c$

Which is required solution.

22. ***(a)*** If, set A and B have n common elements then.

The number of common elements in $(A \times B)$ and $(B \times n)$ is n^2.

Hence, required number of common element = 5^2

23. ***(d)*** HCF of $(3^5 \times 2^7)$ and $(3^{11} \times 5^7) = 3^5$

24. ***(a)*** We have, $x = -1$ is one of the root of $x^3 - 4x^2 - 89x - 84 = 0$.

$\therefore (x + 1)$ will be factor of $x^3 - 4x^2 - 89x - 84 = 0$

Now,

$$x+1\overline{)x^3 - 4x^2 - 89x - 84}\,(x^2 - 5x - 84$$

$$x^3 + x^2$$

$$- \quad -$$

$$-5x^2 - 89x - 84$$

$$-5x^2 - 5x$$

$$+ \quad +$$

$$-84x - 84x$$

$$-84x - 84x$$

$$+ \quad +$$

$$\times$$

Clearly, $(x + 1)(x^2 - 5x - 84) = 0$

For the other root

$$\Rightarrow \quad x^2 - 5x - 84 = 0$$

$$\Rightarrow \quad x^2 - 12x + 7x - 84 = 0$$

$$\Rightarrow \quad (x - 12)(x + 7) = 0$$

$$\Rightarrow \quad x = 12, -7$$

Hence, the other root is 12.

25. ***(c)*** Since bud is unopened flower but other option is type of flowers.

26. ***(b)*** Pages 1-9 requires = 1 digit per page = 9 digits

Pages 10-99 requires = 2 digit per page × 90 pages

$= 90 \times 2 = 180$ digits

Pages 100-366 requires = 3 digit per page × 267 inclusive pages

$= 3 \times 267 = 801$ digits

$\therefore$ Total number of digits = 9 + 180 + 801 = 990 digits

27. ***(d)*** 'Break' statement not simply use in "if-else".

28. ***(a)*** The possible number of committee of 3 persons out of 10 persons = ${}^{10}C_3$

$$= \frac{10!}{3!7!}$$

$$= \frac{10 \cdot 9 \cdot 8 \cdot 7!}{3 \cdot 2 \cdot 1 \cdot 7!} = 120$$

29. ***(*)*** We have, $y = -2(x + 1)^2 + 1$

$$\Rightarrow \quad (x + 1)^2 = -\frac{1}{2}(y - 1)$$

$$\therefore \quad 4a = \frac{1}{2} \Rightarrow a = \frac{1}{8}$$

The coordinates of the focus of this parabola are

$$\left(-1, \frac{-1}{8} + 1\right) = \left(-1, \frac{-7}{8}\right)$$

[**Note** This question is wrong, so no-option match]

30. ***(d)*** $y = \sin(ax + b)$

On differentiating w.r. t. x, we get

$$y_1 = \cos(ax + b) \cdot a$$

$$y_1 = \sin\left[\frac{\pi}{2} + (ax + b)\right] \cdot a$$

Similarly, $\quad y_2 = \sin\left[\frac{2\pi}{2} + (ax + b)\right] \cdot a^2$

Hence, n^{th} derivative

$$y_n = \sin\left[\frac{n\pi}{2} + (ax + b)\right] \cdot a^n$$

$$y_n = a^n \sin\left[ax + b + \frac{n\pi}{2}\right]$$

31. ***(a)*** Value of $\sqrt{\frac{1}{2}} = \sqrt{\pi}$

32. ***(b)*** Pointer is pointing nothing is called 'Null pointer'.

33. ***(a)*** The sum of the products can be implemented by 'OR'.

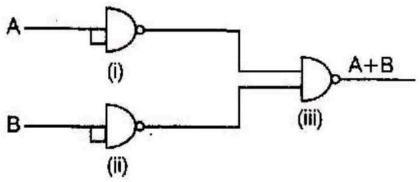
34. ***(d)*** Given, $m = a\cos\theta + b\sin\theta$ and $n = a\cos\theta - b\sin\theta$

$$m^2 + n^2 = (a\cos\theta + b\sin\theta)^2 + (a\cos\theta - b\sin\theta)^2$$

$$= a^2\cos^2\theta + b^2\sin^2\theta + 2ab\cos\theta\sin\theta + a^2\cos^2\theta + b^2\sin^2\theta - 2ab\cos\theta\sin\theta$$

$$= 2a^2\cos^2\theta + 2b^2\sin^2\theta = 2(a^2\cos^2\theta + b^2\sin^2\theta)$$

35. ***(c)*** Three NAND gate are used to make an OR gate.



36. ***(b)*** Zero is neither positive has negative.

37. ***(c)*** We have,

$\because \quad R = \{(x, y) : x + 2y = 10, x \in N, y \in N\}$

$N = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$\therefore \quad R = \{(8, 1), (6, 2) (4, 3) (2, 4)\}$

Not Reflexive $\Rightarrow$ Because (1, 1) (2, 2) ..... $\notin R$

Not symmetric,

$\because \quad (8, 1) \in R$

But $\quad (1, 8) \notin R$

Not Transitive,

$\therefore \quad (6, 2) \in R, (2, 4) \in R$

But $\quad (6, 4) \notin R$

Therefore, it is anti symmetric.

38. *(b)* Stack maintain is
'LIFO order' inside always
So,

D
C
B
A

Then, order of removal.
$\Rightarrow$ DCBA

39. *(a)* Let $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 3 \\ 1 & 1 & 4 \end{bmatrix}$

$|A| = 1[4-3] - 1[4-3] + 2[1-1] = 1 - 1 + 0$

$|A| = 0$

$\therefore$ A is singular.

40. *(d)* Let $A = \begin{bmatrix} 5 & 1 \\ -1 & 3 \end{bmatrix}$

For eigen vector $\Rightarrow (A - \lambda I) X_1 = 0$

$$\Rightarrow \quad \begin{bmatrix} 5-\lambda & 1 \\ -1 & 3-\lambda \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$\because$ $\lambda = 2$

$$\therefore \quad \begin{bmatrix} 3 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$$

$$\Rightarrow \quad 3x_1 + x_2 = 0 \qquad \ldots(i)$$

$$-x_1 + x_2 = 0 \qquad \ldots(ii)$$

On solving Eqs. (i) and (ii), we get

$$\Rightarrow \quad x_1 = 0, x_2 = 0$$

Therefore, $x_1 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$.

41. *(b)* Addition of $n \times n$ matrix hold commutative law.

42. *(a)* Let $S_n = \left[\frac{(-1)^n}{n}\right]$

Using cauchy's general principal, Let $\varepsilon > 0$

if $n \geq m$, then $\frac{1}{n} \leq \frac{1}{m}$ and

$$|S_n - S_m| = \left|\frac{(-1)^n}{n} - \frac{(-1)^m}{m}\right| \leq \left|\frac{(-1)^n}{n}\right| + \left|\frac{(-1)^m}{m}\right|$$

$$= \frac{1}{n} + \frac{1}{m} \leq \frac{1}{m} + \frac{1}{m} = \frac{2}{m}$$

$|S_n - S_m| < \varepsilon$, if ε i.e. $m > \frac{2}{\varepsilon}$

Let us choose a positive integer $m = \left[\frac{2}{\varepsilon}\right] + 1$, such that

$$|S_n - S_m| < \varepsilon, \forall\, n \geq m.$$

Hence, S_n is convergent.

43. *(d)* $\begin{vmatrix} 1 & 2 & 2 \\ 1 & 4 & 8 \\ 1 & 6 & 16 \end{vmatrix} = 1[64-48] - 2[16-8] + 2[6-4]$

$$= 16 - 16 + 4$$

$$= 0 + 4 = 4$$

None of the given option.

44. *(a)* Given, α, β are the roots of the equation

$$ax^2 + bx + c = 0$$

i.e $\quad \alpha + \beta = \frac{-b}{a}, \alpha\beta = \frac{c}{a}$

Then, $\quad \alpha^2 + \alpha\beta + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta + \alpha\beta$

$$= (\alpha+\beta)^2 - \alpha\beta$$

$$= \left(\frac{-b}{a}\right)^2 - \frac{c}{a}$$

$$= \frac{b^2}{a^2} - \frac{c}{a}$$

$$= \frac{b^2 - ac}{a^2}$$

45. *(a)* Table are the relational databases contains.

46. *(b)* We have, $\log \tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right) = \pi$

$$\Rightarrow \quad e^{\pi} = \frac{\tan\frac{\pi}{4} + \tan\frac{\theta}{2}}{1 - \tan\frac{\pi}{4}\tan\frac{\theta}{2}} \qquad \left[\because \tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a \tan b}\right]$$

$$\Rightarrow \quad e^{\pi} = \frac{1 + \tan\frac{\theta}{2}}{1 - \tan\frac{\theta}{2}}$$

$$\Rightarrow \quad e^{\pi} = \frac{\sin\frac{\theta}{2} + \cos\frac{\theta}{2}}{-\sin\frac{\theta}{2} + \cos\frac{\theta}{2}}$$

$$\Rightarrow \quad e^{\pi} = \frac{e^{h\frac{\theta}{2}}}{e^{-h\frac{\theta}{2}}}$$

Now, $\quad \tan h\frac{\theta}{2} = \frac{e^{\pi} - 1}{e^{\pi} + 1} = \frac{e^{h\frac{\theta}{2}} - e^{-h\frac{\theta}{2}}}{e^{h\frac{\theta}{2}} + e^{-h\frac{\theta}{2}}}$

47. *(a)* Blue beads = 3

Green beads = 2

Total beads = 3 + 2 = 5

$\therefore$ Ways for the arranged in a straight line

$$= \frac{5!}{3!2!} = \frac{5 \cdot 4 \cdot 3!}{3!\,2 \times 1} = 10$$

48. *(c)* We have, $f(x) = x^2 + \frac{x^2}{(1+x^2)} + \frac{x^2}{(1+x^2)^2} + \ldots$

It is G.P.

Here, $a = x^2, r = \frac{1}{1+x^2}$

Then, $S_\infty = \frac{a}{1-r}$

$$= \frac{x^2}{1-\frac{1}{1+x^2}}$$

$$= \frac{x^2(1+x^2)}{1+x^2-1}$$

$$= 1+x^2$$

Since, $(1+x^2)$ is polynomial function.

It will be continuous, $\forall\, x$ to ∞.

49. *(a)* 20 times do 2 come from,

Counting from 1 to 100.

Since, 3, 13, 23, 33, 43, 53, 63, 73, 83, 93

and 30, 31, 32, 33, 34, 35, 36, 37, 38, 39

Therefore, 3 come 20 times.

From 1 to 100 counting.

50. *(d)* We have,

$$\cos\theta = \frac{x+1}{x}$$

we know that

$$x + \frac{1}{x} \geq 2\sqrt{x \cdot \frac{1}{x}}$$

$$\Rightarrow \quad x + \frac{1}{x} \geq 2$$

$\therefore \cos\theta \geq 2$ which is not possible as $-1 \leq \cos\theta \leq 1$.

$\therefore$ No value of θ.

51. *(d)* Given, $a = (1, 2, -1), b = (0, 1, -1)$

Vector of product of a and b

$$\Rightarrow \quad \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & -1 \\ 0 & 1 & -1 \end{vmatrix}$$

$$\Rightarrow \quad \hat{i}(-2+1) - \hat{j}(-1-0) + \hat{k}(1-0)$$

$$\Rightarrow \quad -\hat{i} + \hat{j} + \hat{k}$$

52. *(b)* Given points are A (1, 2) and B (4, 8).

Here, $x_1 = 1, y_1 = 2, x_2 = 4$ and $y_2 = 8$

$\therefore$ Gradient (slope) $= \frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{8-2}{4-1} = \frac{6}{3} = 2$$

53. *(d)* We have, $A = \begin{bmatrix} 1 & -3 \\ 3 & 5 \end{bmatrix}$

The characteristic equation $|A - \lambda I| = 0$

$$\Rightarrow \quad |A - \lambda I| = \left| \begin{bmatrix} 1 & -3 \\ 3 & 5 \end{bmatrix} - \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix} \right| = 0$$

$$\Rightarrow \quad \begin{vmatrix} 1-\lambda & -3 \\ 3 & 5-\lambda \end{vmatrix} = 0$$

$$\Rightarrow \quad (1-\lambda)(5-\lambda) + 9 = 0$$

$$\Rightarrow \quad \lambda^2 - 6\lambda + 14 = 0$$

$$\Rightarrow \quad \lambda = \frac{6 \pm \sqrt{36 - 4 \times 14}}{2}$$

If $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Rightarrow \quad \lambda = \frac{6 \pm \sqrt{-20}}{2}$$

54. *(a)* Given, $\sin\theta + \cos\theta = 1$

On squaring both sides, we get

$$\Rightarrow \quad (\sin\theta + \cos\theta)^2 = (1)^2$$

$$\Rightarrow \quad \sin^2\theta + \cos^2\theta + 2\sin\theta \cdot \cos\theta = 1$$

$$\Rightarrow \quad 1 + \sin 2\theta = 1 \qquad \left[\because \sin^2\theta + \cos^2\theta = 1,\ 2\sin\theta\cos\theta = \sin 2\theta\right]$$

$$\Rightarrow \quad \sin 2\theta = 1 - 1$$

$$\Rightarrow \quad \sin 2\theta = 0$$

55. *(a)* Given that,

A fair dice is throwing twice.

$$\therefore \quad n(S) = 36$$

According to question : find the probability to getting on face of first dice is 6, where as the sum 8 on the second is not valid under consideration of question.

56. *(a)* The program is running currently. Then it called process. i.e. The process is program in the execution.

57. *(d)* Total number of event = 16

Probability of getting at least one head = 1 – Probability of zero head

$$= 1 - \frac{1}{16}$$

$$= \frac{16-1}{16} = \frac{15}{16}$$

58. *(b)* The complexity of worst case of quick sort is "$0(n^2)$".

59. *(d)* The number of process in memory is the degree of multiprogramming.

60. *(c)* To remove the table from the database (MySQL) use the command is drop table.

61. *(d)* $A + B * C$

$$\Rightarrow \quad A + BC *$$

Let $P = BC *$

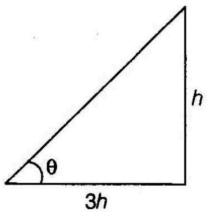
So $\Rightarrow \quad A + P$

$$\Rightarrow \quad AP +$$

Put the value of P

$$\Rightarrow \quad ABC * +$$

62. *(*)* Let height of the tree is h. Then according to question, shadow of tree $= 3h$.



$$\tan\theta = \frac{h}{3h}$$

$$\Rightarrow \quad \tan\theta = \frac{1}{3}$$

$$\Rightarrow \quad \theta = \tan^{-1}(1/3).$$

None option is correct.

63. *(c)* Let p be the event that know probability = 75%

and S be the event know statics = 30%

Then, $P(p) = 75\%$, $P(s) = 30$

and $P(p \cap s) = 20\%$

Now P(students that they know probability or statics)

$$\Rightarrow \quad P(p \cup s) = P(p) + P(s) - P(p \cap s)$$
$$= 75\% + 30\% - 20\%$$
$$= 105\% - 20\% = 85\%$$

64. *(d)* Given, $X = 1010100$

$$Y = 1000011$$
$$2\text{'s} = 0111100$$
$$\underline{\quad\quad +1}$$
$$0111101$$
$$\underline{+\ 1010100}$$
$$0010001$$

Ans. 10001

65. *(b)* Let the numbers of pineapple and watermelon be x and y, respectively.

Then, $7x + 5y = 38$

as $5y = 38 - 7x \Rightarrow y = \dfrac{38 - 7x}{5}$

Clearly, y is a whole number, only when $(38 - 7x)$ is divisible by 5. This happens when $x = 4$.

66. *(b)* $(256)^{0.16} \times (256)^{0.09} = (256)^{\frac{16}{100}} \times (256)^{\frac{9}{100}}$

$$= (256)^{\frac{16+9}{100}} = (256)^{\frac{25}{100}}$$

$$= (256)^{\frac{1}{4}} = (4^4)^{\frac{1}{4}}$$

$$= 4^{4\times\frac{1}{4}} = 4^1 = 4$$

67. *(a)* We know that,

$$1 \text{ byte} = 8 \text{ bit}$$

$$\Rightarrow \quad 2 \text{ byte} = 2 \times 8 \text{ bit} = 16 \text{ bit}$$

So, maximum unsigned maximum number of

$$2 \text{ byte} = 2^{\text{bits}} - 1 = 2^{16} - 1$$

68. *(c)* Case, auto, return are reserved keyword in C. But 'Main' is not a reserved keyword in C. Because Main is user defined function.

69. *(a)* Given equation are

$$x + 2y + z = 0$$
$$2x + y + 2z = 5$$
$$3x + 7y + 9z = 3$$

For find number of solution

$$\Rightarrow \quad \begin{vmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 3 & 7 & 9 \end{vmatrix}$$

$$\Rightarrow \quad 1(9 - 14) - 2(18 - 6) + 1(14 - 3)$$

$$\Rightarrow \quad -5 - 2(12) + 11$$

$$\Rightarrow \quad -5 - 24 + 11$$

$$\Rightarrow \quad -18 \neq 0$$

It has a unique solution.

70. *(c)* P ⊕ Q represents the *XOR* and its truth table given by

P	Q	P ⊕ Q
T	T	T
T	F	F
F	T	F
F	F	T

71. *(a)* Banker's algorithm is used to dead lock avoidance.

72. *(a)* Time Quantum is used in Round Robin scheduling.

73. *(d)* In any number, all the non-zero digits as well as zeroes between two non-zero digits are significant, even if there exists a decimal point between them. Further more, all the trailing zeroes after a decimal point are count significant.

Thus, the answer is 9.

74. *(c)* The Convergence of Newton Raphson method is sensitive to starting value.

75. *(a)*

A. (2) Newton Raphson method is used for root finding of given equations.

B. (3) Runge-Kutta method is well-Known rautine called the euler method, used in temporal discretization for the approximate solutions of ordinary differential equations.

C. (4) Gauss-Seidel method is used to solve the linear system equations.

D. (1) Simpson rule is another method for numerical integration prepared by Thomas Simpson.

Hence, $A \to 2, B \to 3, C \to 4, D \to 1$

76. *(b)* Given,

$$f(x) \Rightarrow x^2 - 2 = 0$$

By Newton Raphson technique,

$$x_{n+1} = \frac{1}{2}\left(x_n + \frac{a}{x_n}\right)$$

At $n = 0$,

$$x_1 = \frac{1}{2}\left(x_0 + \frac{a}{x_0}\right)$$

$$= \frac{1}{2}\left(1 + \frac{2}{1}\right) \quad [\because x_0 = 1 \text{ and } a = 2 \text{ given}]$$

$$= \frac{1}{2}(1 + 2) = \frac{3}{2} = 1.5$$