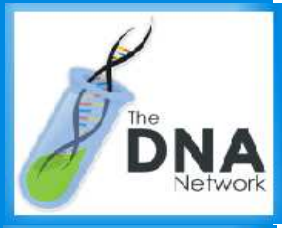
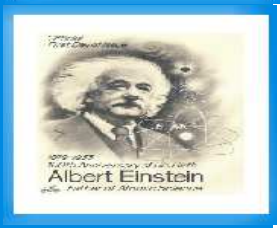
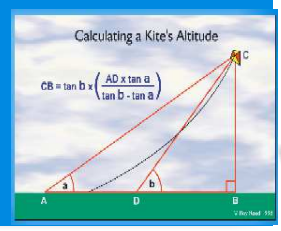






JMU-MCA

MOCK TEST PAPER

- **Attempt all the questions**
- **This paper consists of 100 objective type questions.**
- **Each question carries 4 marks. 1 mark will be deducted for each wrong answer.**

- **Pattern of questions : MCQs**
- **Total marks : 400**
- **Duration of test : 3 Hours**

MATHEMATICS (1-50)

1. Let A be an n × n invertible matrix with integer entries and assume that A^{-1} also has only integer entries. Then,

(A) det A = n

(B) det A = ± 1

(C) det A = n^2

(D) det A will depend on the entries of A and A^{-1}

2. The eigenvalues of $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ are

(A) cos θ and sin θ

(B) tan θ and cot θ

(C) $e^{i\theta}$ and $e^{-i\theta}$

(D) 1 and 2

3. $\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} =$

(A) tan 54°

(B) tan 36°

(C) tan 18°

(D) cot 18°

4. By graphical method, the solution of programming problem

Maximize $z = 3x_1 + 5x_2$

Subject to $3x_1 + 2x_2 \le 18,\ x_1 \le 4,\ x_2 \le 6,\ x_1 \ge 0, x_2 \ge 0$

(A) $x_1 = 2, x_2 = 0, z = 6$

(B) $x_1 = 2, x_2 = 6, z = 36$

(C) $x_1 = 4, x_2 = 3, z = 27$

(D) $x_1 = 4, x_2 = 6, z = 42$

5. A fair coin is tossed 100 times. The probability of getting tails an odd number of times is

(A) $\frac{1}{2}$

(B) $\frac{1}{8}$

(C) $\frac{3}{8}$

(D) none of these

6. Let A and B be two independent events such that their, probabilities are $\frac{3}{10}$ and $\frac{2}{5}$. The probability of exactly one of the events happening, is

(A) $\frac{23}{50}$

(B) $\frac{1}{2}$

(C) $\frac{31}{50}$

(D) none of these

7. The Newton-Raphson iteration $x_{n+1} = \frac{1}{2}\left(x_n + \frac{R}{x_n}\right)$ can be used to compute the

(A) square of R

(B) Reciprocal of R

(C) Square root of R

(D) Logarithm of R

8. The table below gives the values of tan x for $0.10 \le x \le 0.30$.

x	0.10	0.15	0.20	0.25	0.30
y = tan x	0.1003	0.1511	0.2027	0.2553	0.3093

tan 0.12 =

(A) 0.0205

(B) 0.1205

(C) 0.2662

(D) 0.3662

9. By Simpson's rule,If

$$\int_0^1 \frac{1}{1+x^2}dx = \frac{1}{12}[3.1+4(a+b)]$$

when the interval [0, 1] is divided into 4 sub intervals and a and b are the values of $\frac{1}{1+x^2}$ at two of its division points then

(A) $a = \frac{1}{1.0625}, b = \frac{1}{1.25}$

(B) $a = \frac{1}{1.0625}, b = \frac{1}{1.5625}$

(C) $a = \frac{1}{1.25}, b = 1$

(D) $a = \frac{1}{1.5625}, b = \frac{1}{1.25}$

10. The value of f(x) is given only at x = 0, f(0) $= \frac{1}{3}, \frac{2}{3}, 1.$ Which of the following can be used to evaluate $\int_0^1 f(x)dx$ approximately. ?

(A) Trapezoidal Rule

(B) Simpson Rule

(C) Trapezoidal as well as Simpson rule

(D) none of these

11. If $u = 3x^2yz + 2yz^3 + 6x^4$, then

$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$ is equal to–

(A) $6x^2yz + 4xy^3 + 12x^4$

(B) $3x^2yz + 2yz^3 + 6x^4$

(C) $12x^2yz + 6yz^3 + 12x^4$

(D) $12x^2yz + 8yz^3 + 24x^4$

12. The points of extrema of $f(x) = \int_0^x \frac{\sin t}{t} dt$ in the domain x > 0 are

(A) $(2n+1)\frac{\pi}{2}; n = 1, 2, ...$

(B) $(4n+1)\frac{\pi}{2}; n = 1, 2, ...$

(C) $(2n+1)\frac{\pi}{4}; n = 1, 2, ...$

(D) $n\pi; n = 1, 2.....$

13. The value of the integral $\sum_{k=1}^{n}\int_0^1 f(k-1+x)dx$ is

(A) $\int_0^1 f(x)dx$

(B) $\int_0^2 f(x)dx$

(C) $\int_0^x f(x)dx$

(D) $b\int_0^1 f(x)dx$

14. The value of $\lim_{x\to\frac{\pi}{2}} \frac{\int_{\pi/2}^{x} t\,dt}{\sin(2x-\pi)}$ is

(A) ∞

(B) $\frac{\pi}{2}$

(C) $\frac{\pi}{4}$

(D) $\frac{\pi}{8}$

15. If area bounded by the curves $y^2 = 4ax$ and $y = mx$ is then the value of m is

(A) 2

(B) –2

(C) $\frac{1}{2}$

(D) None of these

16. Area bounded by curve $y = k \sin x$ between $x = \pi$ and $x = 2\pi$, is

(A) 2k sq. unit

(B) 0

(C) $\frac{k^2}{2}$ sq.unit

(D) k sq. unit

17. The volume of the solid generated by revolving the astroid

$$x^{2/3} + y^{2/3} = a^{2/3}$$

about the x-axis is equal to–

(A) $\frac{16}{35}\pi a^3$

(B) $\frac{16}{105}\pi a^3$

(C) $\frac{32}{105}\pi a^3$

(D) None of these

18. The volume of the solid generated by the revolution of $r = 2a \cos \theta$ about the initial line is given by

(A) $\frac{2}{3}\pi a^3$

(B) $\frac{4}{3}\pi a^3$

(C) $\frac{8}{3}\pi a^3$

(D) None of these

19. The denominator of a fraction number is greater than 16 of the square of numerator , then least value of the number is

(A) –1/4

(B) –1/8

(C) 1/12

(D) 1/16

20. Evaluate wronskian of functions e^{x}, e^{-x} and e^{2x}

(A) $6e^{2x}$

(B) $-6e^{2x}$

(C) $12e^{2x}$

(D) $-12e^{2x}$

21. The general solution of the differential equation $\frac{d^4y}{dx^4} - 6\frac{d^3y}{dx^3} + 12\frac{d^2y}{dx^2} - 8\frac{dy}{dx} = 0$ is–

(A) $y = c_1 + [c_2 + c_3x + c_4x^2]e^{2x}$

(B) $y = [c_1 + c_2x + c_3x^2]e^{2x}$

(C) $y = c_1 + c_2x + c_3x^2 + c_4x^3$

(D) $y = c_1 + c_2x^2 + c_3x^3 + c_3x^4$

22. Solution of the differential equation $(2D + 1)^2 y = 4e^{-x/2}$ is–

(A) $y = (c_1 + c_2x)\quad e^{-x/2}$

(B) $y = \left(c_1 + c_2x + \frac{1}{2}x^2\right)e^{-x/2}$

(C) $y = \left(c_1 + c_2x + \frac{1}{4}x^2\right)e^{-x/2}$

(D) None of these

23. What is the directional derivative of $f = x^2yz + 4xz^2$ at (1, –2, –1) in the direction $2\hat{i} - \hat{j} - 2\hat{k}$?

(A) $\frac{30}{7}$

(B) $\frac{31}{7}$

(C) $\frac{33}{3}$

(D) $\frac{37}{3}$

24. Consider $f(x, y, z) = x^2 - e^{xy} + z^2 - 1$

find gradient of f(xyz) at (1, 0, 1).

(A) (2, –1,2)

(B) (0, 0, 0)

(C) (2, 0, 0)

(D) (0, –1, –1)

25. The function f defined by $f(x) = (x + 2)e^{-x}$ is

(A) Decreasing for all x

(B) Decreasing in (–∞, –1)

(C) Increasing for all x

(D) Decreasing in (–1, ∞) and increasing in (–∞, –1)

26. The mapping between the set of integers and the set of natural numbers is/are–

(1) Identity (2) Injective

(3) Surjective (4) Bijective

Choose the correct answer using the codes given below :

(A) (1) and (2)

(B) (1) and (3)

(C) (1) and (4)

(D) (2), (3) and (4)

27. Let a, b and c be arbitrary real numbers. Let A be the matrix

$$\begin{pmatrix} 1 & a & b \\ 0 & 1 & c \\ 0 & 0 & 1 \end{pmatrix}$$

Let I be the 3 × 3 identity matrix. Then

(A) $A^2 - 3A + 3I = A^{-1}$

(B) $A^2 + 3A + 3I = A^{-1}$

(C) $A^2 + A + I = A^{-1}$

(D) A is not invertible.

28. Given matrix $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

Corresponding to highest eigenvalue the eigenvector is

(A) $\begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$

(B) $\begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}$

(C) $\begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$

(D) $\begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}$

29. The solution of set of constraints $x + 2y \geq 11, 3x + 4y \leq 30, 2x + 5y \leq 30, y \geq 0$ includes the point

(A) (2, 3)

(B) (3, 2)

(C) (3, 4)

(D) (4, 3)

30. The maximum value of P = 6x + 8y subject constraints $2x + y \le 30, x + 2y \le 24$ and $x \ge 0, y \ge 0$ is

(A) 90

(B) 120

(C) 96

(D) 240

31 Two distinct numbers are select at random from the first twelve natural numbers. The probability that the sum will be divisible by 3, is

(A) $\frac{1}{3}$

(B) $\frac{23}{66}$

(C) $\frac{1}{2}$

(D) none of these

32. Given that the sum of two non-negative quantities is 200, the probability that their product is not less than $\frac{3}{4}$ times their greatest product value, is

(A) $\frac{7}{16}$

(B) $\frac{101}{201}$

(C) $\frac{9}{16}$

(D) $\frac{10}{16}$

33. Certain corresponding value of x and $\log_{10} x$ are (300, 2,.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871) $\log_{10} 301$ will be

(A) 1.4786

(B) 2.4786

(C) 3.4786

(D) 4.47865

34. If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y_x = 7$, then x will be

(A) 1.42

(B) 1.68

(C) 1.86

(D) 1.98

35. The equation $x^3 - 3x + 4 = 0$ has only one real root. What is its first approximate value as obtained by the method of false position in (–3, –2) ?

(A) –2.125

(B) 2.125

(C) –2.812

(D) 2.812

36. If a and a + h are two consecutive approximate roots of the equation f(x) = 0 as obtained by Newtons Method, then h equal to

(A) $\frac{f(a)}{f'(a)}$

(B) $\frac{f'(a)}{f(a)}$

(C) $-\frac{f''(a)}{f(a)}$

(D) $-\frac{f(a)}{f'(a)}$

37. If y = 4x – 5 is tangent to the curve $y^2 = px^3 + q$ at (2, 3), then

(A) p = 2, q = –7

(B) p = –2, q = 7

(C) p = –2, q = –7

(D) p = 2, q = 7

38. If $y = a \log |x| + bx^2 + x$ has its extreme values at x = –1 and x = 2, then

(A) a = 2, b = –1

(B) a = 2, b = –1/2

(C) a = –2, b = –1/2

(D) None of these

39. Let be a differentiable function having $f(2) = 6, f'(2) = \left(\frac{1}{48}\right)$. Then $\lim_{x \to 2} \int_6^{f(x)} \frac{4t^3}{x-2} dt$ equals

(A) 12

(B) 18

(C) 24

(D) 36

40. Let $\frac{d}{dx}F(x) = \left(\frac{e^{\sin x}}{x}\right); x > 0$. If $\int_1^4 \frac{3}{x} e^{\sin x^3} dx = F(k) - F(1)$, then one of the possible value of k, is

(A) 15

(B) 16

(C) 63

(D) 64

41. The area bounded by the curves $y = \log_e x$ and $y = (\log_e x)^2$ is

(A) 3 – e

(B) e – 3

(C) $\frac{1}{2}(3-e)$

(D) $\frac{1}{2}(e-3)$

42. The sine and cosine curves intersects infinitely many times giving bounded regions of equal areas. The area of one of such region is

(A) $\sqrt{2}$

(B) $2\sqrt{2}$

(C) $3\sqrt{2}$

(D) $4\sqrt{2}$

43. The volume of the solid generated by the revolution of the cardioid $r = a(1 + \cos\theta)$ about the initial line is given by–

(A) $2\pi a^3$

(B) $\frac{2}{3}\pi a^3$

(C) $\frac{4}{3}\pi a^3$

(D) $\frac{8}{3}\pi a^3$

44. The segment of the circle $x^2 + y^2 = a^2$ cut off by the chord $x = b(0 < b < a)$ revolves about the x-axis and generated the solid known as a segment of a sphere. The volume of this solid is–

(A) $\frac{\pi(a-b)^2(2a+b)}{3}$

(B) $\frac{\pi(2a-b)^2(a+b)}{3}$

(C) $\frac{\pi(2a+b)^2(a-b)}{3}$

(D) $\frac{\pi(a+b)^2(2a-b)}{3}$

45. The orthogonal trajectory of the family $r^n \sin n\theta = a^n$, is

(A) $r^n \sin n\theta = \theta$

(B) $r^n \sin n\theta = c$

(C) $r^n \sin \theta = c$

(D) $r^n \cos n\theta = c$

46. Solve $(x^2 + y^2 + 2x)\,dx + 2y\,dy = 0$

(A) $e^x (x^2 + y^2 + c) = 0$

(B) $e^x (x^2 + y^2) = c$

(C) $(x^2 + y^2) = ce^x$

(D) None

47. The general solution of the differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = \frac{e^{2x}}{x}$ is :

(A) $C_1 + C_2x = x\log x - \frac{x^2}{2}e^{2x}$

(B) $(C_1 + C_2x + x\log x - x)e^{2x}$

(C) $C_1e^{2x} + C_2e^{-2x} + xe^{2x}\log x - \frac{x^2}{2}$

(D) $C_1e^{2x} + C_2e^{-2x} + xe^{2x}\log x - x$

48. y_1 = sin 3x and y_2 = cos 3x are two solutions of ,are

(A) Linearly dependent

(B) Linearly independent

(C) We can't say

(D) none of these

49. Find the directional derivatives of f = xyz^2 at (1, 0, 3) in the direction of the vector **i** - **j** + **k**.

(A) $\frac{a}{\sqrt{3}}$

(B) $3\sqrt{3}$

(C) $-3\sqrt{3}$

(D) 0

50. Find the directional directive of $P = 4e^{2x^2-y-z^2}$ at $(1,1,-1)$ point in a direction toward the point (–3, 5, 6).

(A) –4

(B) 5

(C) $4/\sqrt{70}$

(D) none of these

COMPUTER AWARENESS(51-70)

51. Multiplication of numbers $(13)_{10}$ and $(14)_{10}$ in binary form will be

(A) 11000110

(B) 10100110

(C) 10111110

(D) 10110110

52. What is 2's complement for 5 in 8-bit system ?

(A) 00000011

(B) 10000011

(C) 11111011

(D) 1111001

53. Convert 8-bit 2's complement binary number into decimal for

$(11000001)_2 = (?)_{10}$

(A) $(193)_{10}$

(B) $(64)_{10}$

(C) $-(64)_{10}$

(D) can't determine

54. Find the missing values of P & Q from the following -

$(69.5)_{10} = (P)_{16} = (Q)_8$

(A) $(45.6)_{16}$, $(54.8)_8$

(B) $(54.8)_{16}$, $(501.4)_8$

(C) $(45.8)_{16}$, $(105.4)_8$

(D) $(54.6)_{16}$, $(101.6)_8$

55. Find the addition of :-

$(273)_8 + (111000111)_2$

(A) $(1379)_8$

(B) $(1486)_8$

(C) $(1202)_8$

(D) $(1101)_8$

56. Which of the following is used to assign multiple blocks of memory of same size dynamically ?

(A) malloc ( )

(B) calloc ( )

(C) realloc ( )

(D) none of the above

57. Which of the following can not be referred as valid file I/0 function ?

(A) getc ( )

(B) putc ( )

(C) putw ( )

(D) All above are valid functions.

58. What "FILE" is being denoted in the following 'c' code –

FILE * P ;

(A) Data structure

(B) Data Type

(C) Erroneous code statement

(D) Special pointers Reference..

59. Find the odd one out –

(A) isanum ( )

(B) isdigit ( )

(C) exp ( )

(D) toascii ( )

60. Find the equal form of the following given Boolean expression.

$F = AB \oplus AC$

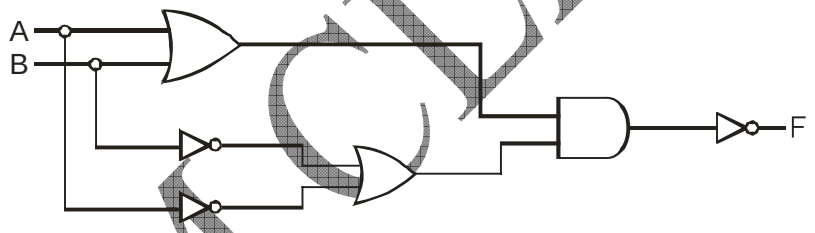
(A) $AB(\bar{A}+\bar{C})+(\bar{A}+\bar{B})AC$

(B) $AB.\overline{AC}+\overline{AB}.BC$

(C) $A(B \oplus C)$

(D) All above given are same

61. Determine the output for the following logic circuit diagram.



(A) $A \oplus B$

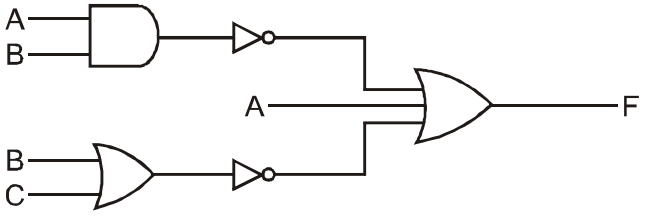
(B) $A \odot B$

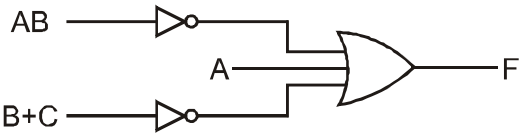
(C) $A \uparrow B$

(D) $A \downarrow B$

62. Which is the logic circuit diagram for the given Boolean Function ?

$F = \overline{AB}+A+\overline{B+C}$

(A) 

(B) 

(C) Either (A) or (B)

(D) None of the above

63. Find the complement of the given Boolean expression –

$$F = x \cdot (y \cdot z + \bar{y} \cdot \bar{z})$$

(A) $F = \bar{x} + ((\bar{y} + \bar{z}) \cdot (y + z))$

(B) $F = \bar{x} \cdot ((y + z) \cdot (\bar{y} \cdot \bar{z}))$

(C) $F = \bar{x} \cdot ((y \cdot z) + \overline{(y \cdot z)})$

(D) $F = \bar{x} + ((\overline{y + z}) \cdot (y + z))$

64. What is dual form for $(\bar{A}.B + A\bar{B})$?

(A) (A + B) $(\overline{A + B})$.

(B) (AB) + $\overline{(AB)}$

(C) $(\bar{A} + B) . (A + \bar{B})$

(D) $(\overline{AB}) . (AB)$

65. Convert 3476_{10} to hex.

(A) $(49B)_{16}$

(B) $(D49)_{16}$

(C) $(D94)_{16}$

(D) $(B94)_{16}$

66. Multiply (0.5) & (– 0.5) and show the result in binary form.

(A) 11110001

(B) 10001000

(C) 11110000

(D) 10111000

67. What type of approach does a 'stack' data structure prefers to operate on ?

(A) FIFO

(B) FCFS

(C) LCFS

(D) LIFO

68. Which statement will you add in the following program to work it correctly ?

```
# include <stdio.h>
  main ( )
{ printf (" % f, n", log (36.0)) ;
  return 0;
}
```

(A) # include < conio. h>

(B) # include <stdlib.h>

(C) # include < math.h>

(D) # include <string.h>

69. How many times the while loop will get executed if a short int is 2 byte wide ?

```
# include < stdio. h>
  main ( )
{  int j = 1 ;
```

```
    while (j < = 255)
  { printf (" % c % d\n", j , j) ;
    j ++ ;
  }
    return O ;
  }
```

(A) Infinite times

(B) 256 times

(C) 255 times

(D) 254 times

70. Add $C4_{16}$ & – $7B_{16}$ and find the result in binary from-

(A) 111001101

(B) 100011001

(C) 101001001

(D) 110001001

REASONING(71-90)

Direction (71-73): Find out the missing term in the given series below.

71. 2, 1, 2, 4, 4, 5, 6, 7, 8, 8, 10, 11 (?)

(A) 12

(B) 11

(C) 10

(D) 9

72. 11, 10, (?), 100, 1001, 1000, 10001

(A) 101

(B) 110

(C) 111

(D) 1101

73. 7, 12, 19, (?), 39

(A) 28

(B) 26

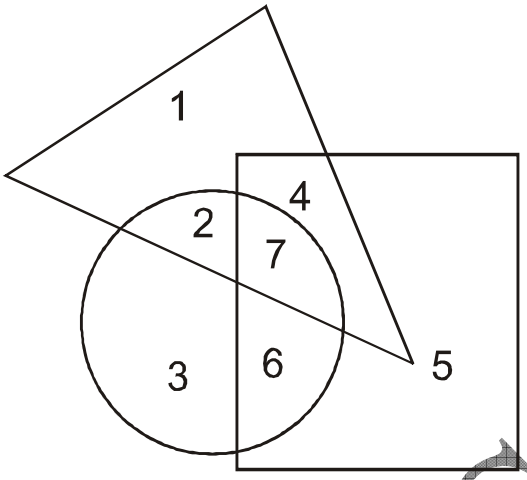
(C) 24

(D) 29

74. Which one of the given responses would be a meaningful order of the following?
(1) Infant, (2) Old, (3) Adult, (4) Adolescent, (5) Child.
(A) 5, 4, 3, 2, 1
(B) 3, 4, 2, 1, 5
(C) 1, 5, 4, 3, 2
(D) 2, 3, 4, 5, 1

75. Cattle : Herd : : sheep : ?
(A) Flock
(B) Swarm
(C) Shoal
(D) Mob

76. If Tall is equivalent to circle, Armymen to triangle and Strong to square, indicate which number will represent strong armymen ?



(A) 3

(B) 4

(C) 5

(D) 6

Direction (Qs. 77-80) Read the following information carefully and answer the question below.

△ means 'is greater than', % means 'is lesser than', □ means 'is equal to', = means 'is not equal to', + means 'is a little more than', × means 'is a little less than'.

77. If c = a and a = b, then

(A) b △ a

(B) c □ a

(C) b = a

(D) can't say

78. If a × b and b □ c, then

(A) c + a

(B) b △ c

(C) a + c

(D) c □ a

79. If c % b and b × a, then

(A) a △ c

(B) c □ a

(C) b △ c

(D) c △ a

80. If ac + bc then

(A) a □ c

(B) b △ c

(C) c △ b

(D) b % a

81. In a certain code language, 'kew xax huma deko' means 'she is eating apples', 'kew tepoqua' means 'she sells toys' and 'su lim deko' means 'I like apples'. Which word in that language mean she and apples ?

(A) xas and deko

(B) xas and kew

(C) kew and deko

(D) kew and xas

82. If 'gnr tag zog qmp' stands for 'Seoul Olympic Organising Committee,'hydo gnr emf' stands for 'Summer Olympic Games' and 'esm sdr hyto' stands for 'Modern Games History', which would be the code for Summer ?

(A) hyto

(B) gnr

(C) emf

(D) zog

Directions(83-85) - Read the following information carefully and answer the questions given below—

The following are the conditions for interview of the candidates selected for promotion from Assistants to officers cadre in the P.R.S. Group of Industries Ltd.

The candidates called for interview—

(i) Graduate with a minimum of 50% of marks.

(ii) He must have minimum five year's experience in the clerical cadre.

(iii) He must have at least 'C' rating in each of quality of work and speed of work for the last three years. [For this, of the five points A, B, C, D and E. A is the lowest and E is the highest, on which depends on Performance Appraisal Report (PAR)].

(iv) He must have at least 'D' rating in each of dependability and flexibility in approach towards work during last three years. (For this, of the seven points A, B, C, D, E, F and G. A is the lowest and G is the highest which depends on PAR).

Even then the candidates fulfils all eligibility requirement except—

(a) The (i) of the above but he must have passsed graduation and he must have secured minimum 'E' rating on dependability in PAR during last three years, then his case can be forwarded to the Asstt. General Manager (Personnel).

(b) The (ii) of the above, but he must have at least three years experience in the clerical cadre and he must have atleast 'D' ration in quality of work during last three years, then his case can be forwarded to Dy. General Manager (Personnel).

Based on these eligibility requirements and in the information given below you have to determine action to be taken in each of these cases. You have not to form any preconception of any type. If the data given in determining the action to be taken are inadequate, your answer will be the 'The data are inadequate'. All the candidates fulfill the age eligibility requirement if there is any.

Give answer(if decision is)

(A) The data are inadequate
(B) Should not be selected
(C) Selected for interview
(D) Forwarded to Asstt. General Manager
(E) Forwarded to the Dy. General Manager

83. Mohd. Seikh is a talented science post-graduate who has secured 63% and 55% marks in graduation and post-graduation respectively. He has secured 'E' rating on dependability and flexibility in the last four years. He has secured 'C' rating in quality of work and speed of work. He joined the bank four years back.

84. Kiran Bala is a young and active assistant who after having done graduation joined this organisation six years back. During the last four years she has secured 'D' rating in quality of work and 'C' rating in speed of work. She is one of the leaders of the clerical cadre employees. During the last 5 years she has obtained 'D' rating on flexibility.

85. Mandar Bhave has passed his graduation in science and Diploma in Business Management with 8% and 62% mark respectively. He is a good player of chess. His ratings on P.A.R. are 'D' for dependability and flexibility where as he has 'C' rating for quality of work' and 'B' rating for 'speed of work' for the last 4 years.

86. Fragile : Hardy
(A) awkward : clumsy
(B) orthodox : traditional
(C) amateur : professional
(D) cautious : flippant

87. Chapter : Book
(A) alcove : nook

(B) paragraph : sentence

(C) Page : rip

(D) room : house

88. Philanthropist : Generous

(A) curator : optimistic

(B) exhibitionist : excessive

(C) chef : hungry

(D) pacifist : unwarlike

89. Bolster : Support

(A) goad : urge

(B) deny : approve

(C) grovel : hack

(D) disagree : approve

90. 10, 20, 10, 9, 21, 11, 8, 22, 12 ?

(A) 5

(B) 7

(C) 8

(D) 11

GENERAL ENGLISH(91-100)

Direction(91-93): Write the indirect speech of the given direct speech.

91. Ronit said, 'He must be guilty!'

(A) Ronit said that he must have been guilty

(B) Ronit said that he must have be guilty

(C) Ronit said that he must has been guilty

(D) None of these

92. Aditi asked her, 'How long have you lived here?'

(A) Aditi asked her how long she has lived there

(B) Aditi asked her how long she lived there

(C) Aditi asked her how long she had lived there

(D) None of these

93. He said, 'I must get going. Otherwise, I'm going to be late.'

(A) He told me he had to get going. Otherwise, he was going to be late

(B) He told me he had to get going. Otherwise, I was going to be late

(C) He told me he has to get going. Otherwise, he was going to be late

(D) None of these

94. What is the antonym of EXECRATE ?

(A) loathe

(B) despise

(C) adore

(D) abhor

95. What is the antonym of SYCOPHANT ?

(A) servile

(B) first

(C) fawning

(D) supercilious

96. What is the synonym of Tart ?

(A) law

(B) acid

(C) angry

(D) desirable

97. What is the synonym of Corner ?

(A) display

(B) Nook

(C) paint

(D) hurry

Direction for questions (98): In the following question, a set of four words are given, marked (A) to (D). In each set a word has been spelt in four different ways, one of which is correct. Choose the word correctly spelt.

98. (A) Dolurous

(B) Dolorous

(C) Doloreus

(D) Delorious

99. Each report starts with a statement from the directors summarizing the growth pattern of the organisation over the past year and outlines the company's ____.

(A) future prospects

(B) plans

(C) ideas and ideals

(D) associates

100. ____ is to be distinguished from the activity of desire itself, as a stimulus or ____ to its determination.

(A) Aversion ... provocation

(B) Concupiscence ... incitement

(C) Urging ... node

(D) Motive ... bidding

ANSWER KEY

[redacted]

HINTS AND SOLUTION

1.(B) A be an n × n invertible matrix with integer entries and A^{-1} also has only Integer entries

Since $A^{-1} = \frac{\text{adj}(A)}{|A|}$

If A^{-1} have each entry integer then adj A must contain each entry divided exactly by |A| or, |A| = ± 1

But It is not possible that each entry of adj (A) divided exactly by |A|

so |A| = ± 1

2.(C) Since $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

then it's characteristic equation is

$$\begin{vmatrix} \cos\theta - \lambda & -\sin\theta \\ \sin\theta & \cos\theta - \lambda \end{vmatrix} = 0$$

$$(\cos\theta - \lambda)^2 + \sin^2\theta = 0$$

$$\lambda^2 - 2\lambda\cos\theta + 1 = 0$$

$$\lambda = \frac{2\cos\theta \pm \sqrt{4\cos^2\theta - 4}}{2}$$

$$= \cos\theta \pm \sqrt{\cos^2\theta - 1}$$

$$= \cos\theta \pm i\sin\theta$$

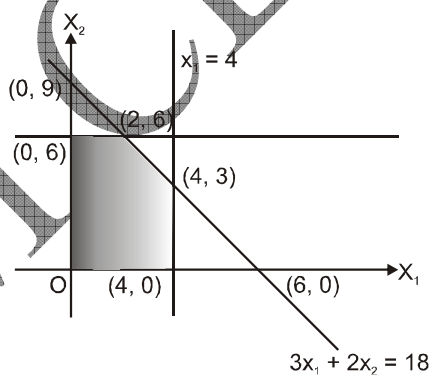
$$= e^{i\theta}, e^{-i\theta} \quad [\because\ e^{i\theta} = \cos\theta + i\sin\theta \text{ and } e^{i\theta} = \cos\theta - i\sin\theta]$$

3.(A) $\dfrac{\cos 9° + \sin 9°}{\cos 9° - \sin 9°}$

$$= \frac{1 + \tan 9°}{1 - \tan 9°}$$

= tan(45° + 9°) = tan54°.

4.(B)



Here feasible region has vertices (0, 0); (4, 0); (4, 3); (2, 6) and (0, 6).

∴ Max z at (2, 6) = 3(2) + 5(6) = 36.

5.(A) Let X denote the number of tails. Then X is a binomial variate with parameters n = 100 and p = $\frac{1}{2}$. Therefore, $P(X = r) = {}^{100}C_r \left(\frac{1}{2}\right)^{100}$, r = 0, 1, 2, ..., 100.

Required probability

= P(X = 1) + P(X = 3) + ... + P(X = 99)

$$= . \left(\frac{1}{2}\right)^{100}\left[{}^{100}C_1 + {}^{100}C_3 + \ldots + {}^{100}C_{99}\right] = \frac{1}{2^{100}}\left[2^{99}\right] = \frac{1}{2}$$

Hence (A) is correct answer.

6.(A) The required probability

$$= P\left(A\bar{B} \cup \bar{A}B\right) = P(A)P\left(\bar{B}\right) + P\left(\bar{A}\right)P(B)$$

$$= \frac{3}{10}\left(1 - \frac{2}{5}\right) + \left(1 - \frac{3}{10}\right)\frac{2}{5} = \frac{23}{50}$$

Hence (A) is the correct answer.

7.(C) According to Newton-Raphson iteration,

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Let us convert the given expression to above form

$$x_{n+1} = \frac{x_n}{2} + \frac{R}{2x_n}$$

$$= x_n - \frac{x_n}{2} + \frac{R}{2x_n}$$

$$= x_n - \left(\frac{x_n}{2} - \frac{R}{2x_n}\right)$$

$$= x_n - \left(\frac{x_n - R}{2x_n}\right)$$

$\therefore$ $f(x) = x^2 - R$ and $f'(x) = 2x$

$\Rightarrow$ $x^2 = R$

$\Rightarrow$ $x = \sqrt{R}$

8.(B) Differences table

x	y	Δ	Δ^2	Δ^3	Δ^4
0.10	0.1003				
		0.0508			
0.15	0.1511		1.0008		
		0.0516		0.0002	
0.20	0.2027		0.0010		0.0002
		0.0526		0.0004	
0.20	0.2553		0.0014		
		0.054			
0.30	0.3093				

We have 0.12 = 0.10 + p(0.05)

which gives p = 0.4.

$$\therefore \quad \tan(0.12) = 0.1003 + 0.4(0.508) + \frac{0.4(0.4-1)}{2}(0.0008)$$

$$+\frac{0.4(0.4-1)(0.4-2)}{6}(0.0002) + \frac{0.4(0.4-1)(0.4-1)(0.4-3)}{24}(0.0002)$$

= 0.1205.

9.(B) From $h = \frac{b-a}{n}$, we have $h = \frac{1-0}{4} = 0.25$

x	0	0.25	0.5	0.75	1
$f(x) = \frac{1}{1+x^2}$	1	$\frac{1}{1.0625}$	$\frac{1}{1.25}$	$\frac{1}{1.5625}$	$\frac{1}{2}$
Ordinate	y_0	y_1	y_2	y_3	y_4

By Simpson's Rule

$$\int_0^1 f(x)dx = \frac{h}{3}\left[(y_0 + y_4) + 2y_2 + 4(y_1 + y_3)\right]$$

$$= \frac{1}{12}\left[\frac{3}{2} + 2(0.8) + 4\left(\frac{1}{1.0625} + \frac{1}{1.5625}\right)\right]$$

Comparing with given question

$$a = \frac{1}{1.0625}, b = \frac{1}{1.5625}.$$

Hence (B) is correct answer.

10.(A) Numbers of ordinates are 4 (y_0, y_1, y_2, y_3) Numbers of subdivisions = 3 (odd division)

"Only TRAPEZOIDAL RULE" can be used to evaluate

$$\int_0^1 f(x)\,dx$$

Because Simpson's rule can be used only for even subdivisions & Trapezoidal can be applied for any number of divisions (even, odd both).

Hence (A) is correct answer.

11.(D) Given that

$$u = 3x^2yz + 2yz^3 + 6x^4$$

This is homogeneous function of degree 4.

∴ By Euler Theorem.

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 4u$$

$$= 4(3x^2yz + 2yz^3 + 6x^4)$$

$$= 12x^2yz + 8yz^3 + 24x^4$$

12.(D) $f(x) = \int_0^x \frac{\sin t}{t}dt \rightarrow f'(x) = \frac{\sin x}{x}$

Put $f'(x) = 0 \Rightarrow \frac{\sin x}{x} = 0 \Rightarrow \sin x = 0$

$x = n\pi$, $n = 1, 2, 3, ...$

13.(C) Let $I = \int_0^1 f(k-1+x)\,dx$

$\Rightarrow\ I=\int_{k-1}^{k} f(t)dt,$ where t = k – 1 + x $\Rightarrow I=\int_{k-1}^{k} f(x)dx$

$\therefore\ \sum_{k=1}^{n}\int_{k-1}^{k} f(x)dx=\int_0^1 f(x)dx+\int_1^2 f(x)dx+.....+\int_{n-1}^{n} f(x)dx=\int_0^n f(x)dx$

14.(C) $y=\lim_{x\to\pi/2}\frac{\int_{\pi/2}^{x} t.dt}{\sin(2x-\pi)}\Rightarrow y=\lim_{x\to\pi/2}\frac{\left[\frac{t^2}{2}\right]_{\pi/2}^{x}}{\sin(2x-\pi)}$

$y=\lim_{x\to\pi/2}\frac{\left(\frac{x^2}{2}-\frac{\pi^2}{8}\right)}{\sin(2x-\pi)}\Rightarrow y=\lim_{x\to\pi/2}\frac{1}{8}\frac{(4x^2-\pi^2)}{\sin(2x-\pi)}$

$y=\lim_{x\to\pi/2}\frac{1}{8}\frac{(2x-\pi)(2x+\pi)}{\sin(2x-\pi)}$

$y=\frac{1}{8}\frac{\lim_{x\to\pi/2}(2x+\pi)}{\lim_{x\to\pi/2}\frac{\sin(2x-\pi)}{(2x-\pi)}},\qquad \left(\because \lim_{\theta\to 0}\frac{\theta}{\sin\theta}=1\right)$

$y=\frac{1}{8}\times 2\pi=\frac{\pi}{4}.$

15.(A) The two curves $y^2 = 4ax$ and $y = mx$ intersect at $\left(\frac{4a}{m^2},\frac{4a}{m}\right)$ and the area enclosed by the two curves is given by $\int_0^{4a/m^2}\left(\sqrt{4ax}-mx\right)dx.$

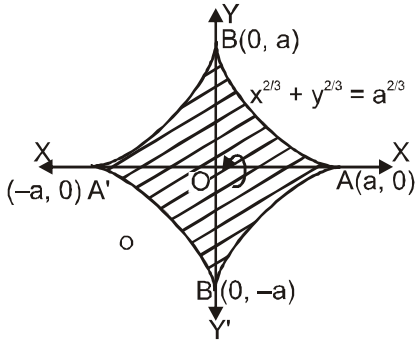
$\therefore\ \int_0^{4a/m^2}\left(\sqrt{4ax}-mx\right)dx=\frac{a^2}{3}$

$\Rightarrow\ \frac{8}{3}\frac{a^2}{m^3}=\frac{a^2}{3}\Rightarrow m^3=8\Rightarrow m=2.$

16.(A) Required area $=k\int_{\pi}^{2\pi}\sin x\,dx=k[-\cos x]_{\pi}^{2\pi}=-2k$

Hence, area = 2k sq. unit.

17.(C)



The required volume is generated by revolving the area ABA'OA about x-axis

= 2 × volume generated by revolving the area ABOA about x-axis

∴ Required Area $= 2\int_0^a \pi y^2\, dx$

$$= 2\int_0^a \pi\left(a^{2/3} - x^{2/3}\right)^3 dx \qquad \text{Putting } x = a\sin^3\theta$$

$$= 2\pi\int_0^{\pi/2} a^2\cos^6\theta . 3a\sin^2\theta\cos\theta\, d\theta$$

$$= 6\pi a^3\int_0^{\pi/2}\sin^2\theta\cos^7\theta\, d\theta$$

$$= 6\pi a^3\frac{\Gamma\left(\frac{3}{2}\right)\Gamma(4)}{2\Gamma\left(\frac{11}{2}\right)} = 6\pi a^3\cdot\frac{\frac{1}{2}\cdot\sqrt{\pi}.3.2.1}{2\cdot\frac{9}{2}\cdot\frac{7}{2}\cdot\frac{5}{2}\cdot\frac{3}{2}\cdot\frac{1}{2}\sqrt{\pi}}$$

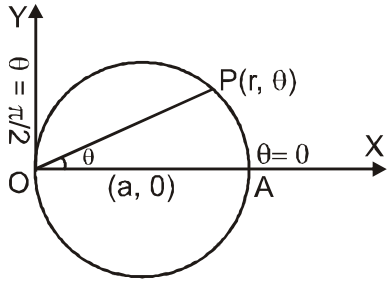
$$= \frac{32\pi a^3}{105}$$

∴ The correct answer is (C).

18.(B) The equation of the given curve is

$r = 2a\cos\theta$,

which is a circle with centre (a, 0) and radius a



∴ The required volume

$$= \int_0^{\pi/2} \frac{2}{3}\pi r^3 \sin\theta \, d\theta$$

$$= \frac{2}{3}\pi \int_0^{\pi/2} (2a\cos\theta)^3 \sin\theta \, d\theta$$

$$= \frac{16\pi a^3}{3} \int_0^{\pi/2} \cos^3\theta \sin\theta \, d\theta$$

$$= \frac{16\pi a^3}{3} \cdot \frac{\Gamma\left(\frac{4}{2}\right)\Gamma\left(\frac{2}{2}\right)}{2\Gamma\left(\frac{6}{2}\right)}$$

$$= \frac{16\pi a^3}{3} \cdot \frac{1}{2.2.1} = \frac{4\pi a^3}{3}$$

19.(B) The function $f(x) = \frac{x}{x^2+16}$

$$\Rightarrow f'(x) = \frac{(x^2+16).1 - x.(2x)}{(x^2+16)^2}$$

$$= \frac{x^2+16-2x^2}{(x^2+16)^2} = \frac{16-x^2}{(x^2+16)^2} \quad \text{... (i)}$$

Put f'(x) = 0 ⇒ $16 - x^2 = 0$ ⇒ x = 4, –4

Again, $f''(x) = \dfrac{(x^2+16)^2(-2x) - (16-x^2)2(x^2+16)2x}{(x^2+16)^4}$

At x = 4, f''(x) < 0 and at x = –4, f''(x) > 0

∴ at x = –4 f(x) has least value

∴ Least value of $f(x) = \dfrac{-4}{16+16} = -\dfrac{1}{8}$.

20.(B) $W(e^x, e^{-x}, e^{2x})$

$$= \begin{vmatrix} e^x & e^{-x} & e^{2x} \\ \frac{d}{dx}(e^x) & \frac{d}{dx}(e^{-x}) & \frac{d}{dx}(e^{2x}) \\ \frac{d^2}{dx^2}(e^x) & \frac{d^2}{dx^2}(e^{-x}) & \frac{d^2}{dx^2}(e^{2x}) \end{vmatrix}$$

$$= \begin{vmatrix} e^x & e^{-x} & e^{2x} \\ e^x & -e^{-x} & 2e^{2x} \\ e^x & e^{-x} & 4e^{2x} \end{vmatrix}$$

$$= e^x.e^{-x}.e^{2x} \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & 2 \\ 1 & 1 & 4 \end{vmatrix}$$

$$= e^{2x} \begin{vmatrix} 1 & 0 & 0 \\ 1 & -2 & 1 \\ 1 & 0 & 3 \end{vmatrix}, \text{ applying } C_2 \to C_2 - C_1 \text{ and } C_3 \to C_3 - C_1$$

$= -6e^{2x}$, on expanding w.r. to R_1.

21.(A) The given equation is

$$(D^4 - 6D^3 + 12D^2 - 8D)y = 0$$

or, $$D(D-2)^3 y = 0$$

A.E. is $m(m-2)^3 = 0$

$m = 0,2,2,2$

$\therefore$ The solution is

$$y = C_1 + [C_2 + C_3x + C_4x^2]\, e^{2x}.$$

22.(B) A.E. is $(2m + 1)^2 = 0 \Rightarrow m = -1/2, -1/2$

$\therefore$ C.F. is $y = (c_1 + c_2x)e^{-x/2}$

$$\text{P.I.} = \frac{1}{(2D+1)^2} 4e^{-x/2}$$

$$= x\frac{1}{4(2D+1)} 4e^{-x/2}$$

$$= x.\frac{1}{2D+1} e^{-x/2}$$

$$= x^2.\frac{1}{2}.e^{-x/2}$$

$$= \frac{1}{2}x^2e^{-x/2}$$

$\therefore$ Required solution is

$$y = \left(c_1 + c_2x + \frac{1}{2}x^2\right)e^{-x/2}$$

23.(D) $\nabla\phi = \nabla\left(x^2yz + 4xz^2\right)$

$$= 2xyz\,\hat{i} + \left(x^2z\right)\hat{j} + \left(x^2y + 8xz\right)\hat{k}$$

$$= -8\hat{i} - j - 10\hat{k} \text{ at } (1,-2,-1)$$

the unit vector in the direction of $2\hat{i} - \hat{j} - 2\hat{k}$ is

$$\hat{a} = \frac{2\hat{i} - \hat{j} - 2\hat{k}}{\sqrt{2^2 + 4^2 + (-2)^2}} = \frac{2}{3}\hat{i} - \frac{1}{3}\hat{j} - \frac{2}{3}\hat{k}$$

$$\nabla\phi\cdot\hat{a} = \left(8\hat{i}-\hat{j}-10\hat{k}\right)\left(\frac{2}{3}\hat{i}-\frac{1}{3}\hat{j}-\frac{2}{3}\hat{k}\right)$$

$$= \frac{16}{3}+\frac{1}{3}+\frac{20}{3} = \frac{37}{3}$$

24.(A) If $f(x, y, z) = x^2 - e^{xy} + z^2 - 1$

$$\nabla f = \left(\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z}\right)$$

$$\frac{\partial f}{\partial x} = 2x - y e^{xy} \Rightarrow \left(\frac{\partial f}{\partial x}\right)_{(1,0,1)} = 2$$

$$\frac{\partial f}{\partial y} = -x e^{xy} \Rightarrow \left(\frac{\partial f}{\partial y}\right)_{(1,0,1)} = -1$$

$$\frac{\partial f}{\partial z} = 2z \Rightarrow \left(\frac{\partial f}{\partial z}\right)_{(1,0,1)} = 2$$

Then $\nabla f = (2, -1, 2)$

25.(D) $f(x) = (x + 2)e^{-x}$

$f'(x) = e^{-x} - e^{-x}(x + 2)$

$f'(x) = -e^{-x}[x + 1]$

For increasing, $-e^{-x}(x + 1) > 0$ or $e^{-x}(x + 1) < 0$

$e^{-x} > 0$ $(x + 1) < 0$

$x \in (-\infty, \infty)$ and $x \in (-\infty, -1)$

$\therefore x \in (-\infty, -1)$

Hence, the function is increasing in $(-\infty, -1)$

For decreasing, $-e^{-x}(x + 1) < 0$ or $e^{-x}(x + 1) > 0$, $x \in (-1, \infty)$

Hence the function is decreasing in $(-1, \infty)$.

26.(D) Consider the mapping

$f : N \to Z$ defined as

f(n) = (n – 1)/2 when n is odd

f(n) = –n/2 when n is even

Here, $f(n_1) = f(n_2) \Rightarrow n_1 = n_2$

∴ f is injective

since every element of Z is the f-image of the elements of N.

f is surjective

∴ f is bijective

∴ The correct answer is (D).

27.(A) $A = \begin{bmatrix} 1 & a & b \\ 0 & 1 & c \\ 0 & 0 & 1 \end{bmatrix}$

it's characteristic equation $|A - \lambda I| = 0$

$$\Rightarrow \begin{vmatrix} 1-\lambda & a & b \\ 0 & 1-\lambda & c \\ 0 & 0 & 1-\lambda \end{vmatrix} = 0$$

$$\Rightarrow (1-\lambda)\left[(1-\lambda)^2\right] = 0$$

$$\Rightarrow (1-\lambda)^3 = 0$$

$$-\lambda^3 + 3\lambda^2 - 3\lambda + 1 = 0$$

By C–H theorem

$$-A^3 + 3A^2 - 3A + I = 0$$

$$\Rightarrow A^3 - 3A^2 + 3A = I \quad \{I \text{ is identity matrix}\}$$

$\Rightarrow A^{-1} = A^2 - 3A + 3I$

Hence (A) is correct option

28.(D) Let the initial eigenvector be $\begin{bmatrix}1\\0\\0\end{bmatrix} = X^{(0)}$. Then we have

$$AX^{(0)} = \begin{bmatrix}1 & 6 & 1\\1 & 2 & 0\\0 & 0 & 3\end{bmatrix}\begin{bmatrix}1\\0\\0\end{bmatrix} = \begin{bmatrix}1\\1\\0\end{bmatrix} = X^{(1)}\,(\text{say})$$

Hence an approximate eigenvalue is 1 and an approximate eigenvector is $X^{(1)}$.

$$\therefore \qquad AX^{(1)} = \begin{bmatrix}1 & 6 & 1\\1 & 2 & 0\\0 & 0 & 3\end{bmatrix}\begin{bmatrix}1\\1\\0\end{bmatrix} = \begin{bmatrix}7\\3\\0\end{bmatrix} = 3\begin{bmatrix}23\\1\\0\end{bmatrix}$$

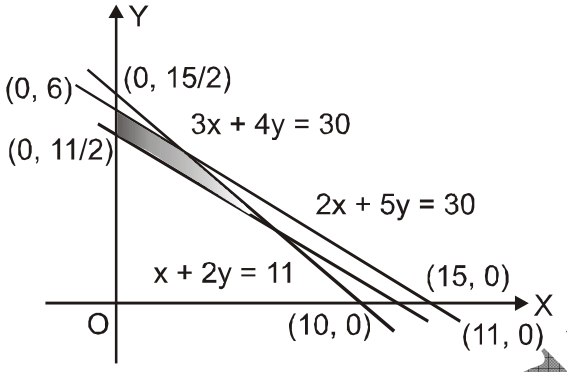
From which , we get $X^{(2)} = \begin{bmatrix}23\\1\\0\end{bmatrix}$ and that an approximate eigenvalue is 3.

Repeating the above procedure, we obtain successively

$$4\begin{bmatrix}2.1\\1.1\\0\end{bmatrix};4\begin{bmatrix}2.1\\1.1\\0\end{bmatrix};\begin{bmatrix}2\\1\\0\end{bmatrix};4\begin{bmatrix}2\\1\\0\end{bmatrix};4\begin{bmatrix}2\\1\\0\end{bmatrix}.$$

It follows that the largest eigenvalue is 4 and the corresponding eigen vector is $\begin{bmatrix}2\\1\\0\end{bmatrix}$.

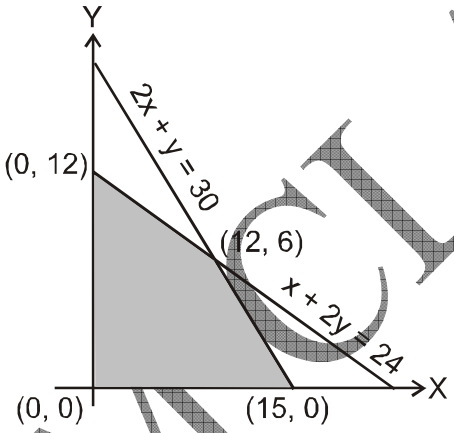
29.(C)



Obviously, solution set of constraints includes the point (3, 4).

Alter : directly put the option in the given equation and check. Answer (c) satisfies.

30.(B) Feasible region of constraints is shown in graph



Extreme points are , (0, 0), (15, 0), (0, 12) and (12, 6).

$P = 6x + 8y$

$P_{(12, 6)} = 72 + 48 = 120$

$P_{(0, 0)} = 0$, $P_{(15, 0)} = 90$, $P_{(0, 2)} = 16$

Clearly maximum P is 120 at (12, 6).

Hence (B) is the correct answer.

31.(A) Let E_3 = the event of the sum being 3.

Similarly, E_6, E_9, E_{12}, E_{15}, E_{18}, E_{21}.

$n(S) = {}^{12}C_2$

$n(E_3) = 1$, $n(E_6) = 2$, $n(E_9) = 4$, $n(E_{12}) = 5$, $n(E_{15}) = 5$, $n(E_{18}) = 3$, $n(E_{21}) = 2$.

$\therefore \quad P(E) = P(E_3) + ... + P(E_{21})$

$$= \frac{1+2+4+5+5+3+2}{{}^{12}C_2} = \frac{22\times 2}{12\times 11} = \frac{1}{3}$$

Alter : The sum of the numbers for every selection is divisible by 3 or leaves the remainder 1 or leaves the remainder 2. These are equally probable. So, the required probability $= \frac{1}{3}$,because the sum of the three probabilities is 1.

Hence (A) is the correct answer.

32.(B) Let x and y be the two quantities. When the sum of two non-negative quantities is fixed, the product will be maximum when they are equal.

So, the greatest product = xy = 10000 where x = y = 100.

Now, $xy \geq \frac{3}{4}\times 10000$

$\Rightarrow \quad xy \geq 7500 \Rightarrow x(200 - x) \geq 7500$

$\Rightarrow \quad x^2 - 200x + 7500 \leq 0$

$\Rightarrow \quad (x - 50)(x - 150) \leq 0 \Rightarrow 50 \leq x \leq 150$

So, favourable number of ways = 101

Total number of ways = 201.

Hence, required probability = $\frac{101}{201}$.

Hence (B) is correct answer.

33.(B)

$$\log_{10} 301 = \frac{(-3)(-4)(-6)}{(-4)(-5)(-7)}(2.4771) + \frac{(1)(-4)(-6)}{(4)(-1)(-3)}(2.4829)$$

$$+\frac{(1)(-3)(-6)}{(5)(1)(-2)}(2.4843) + \frac{(1)(-3)(-4)}{(7)(3)(2)}(2.4871)$$

$$= 1.2739 + 4.9658 - 4.4717 + 0.7106 = \mathbf{2.4786}$$

34.(C) $x = \frac{(-5)(-12)}{(-8)(-15)}(1) + \frac{(3)(-12)}{(8)(-7)}(3) + \frac{(3)(-5)}{(15)(7)}(4)$

$$= \frac{1}{2} + \frac{27}{14} - \frac{4}{7} = \mathbf{1.86}$$

35.(A) Method of false position for Ist approximation

$$x_2 = x_0 - \frac{(x_1 - x_0)f(x_0)}{f(x_1) - f(x_0)} \quad \text{... (1)}$$

Given $x_0 = -3$, $f(x_0) = f(-3) = -27 + 9 + 4 = -14$

$x_1 = -2$, $f(x_1) = f(-2) = -8 + 6 + 4 = 2$

$\therefore \quad x_2 = -3 - \frac{(-2+3)(-14)}{2-(-14)}$

$x_2 = -2.125.$

Hence (A) is correct answer.

36.(D) By Newton Raphson method

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} \quad \text{... (1)}$$

Given that a, a + h are consecutive roots

$\therefore \quad x_0 = a, x_1 = a + h$

From (1), $(a+h) = a - \frac{f(a)}{f'(a)} \Rightarrow h = -\frac{f(a)}{f'(a)}.$

Hence (D) is correct answer.

37.(A) Given curve $y^2 = px^3 + q$ ... (i)

Differentiate with respect to x, $2y.\frac{dy}{dx} = 3px^2$

$$\Rightarrow \frac{dy}{dx} = \frac{3p}{2}\left(\frac{x^2}{y}\right)$$

$$\therefore \left|\frac{dy}{dx}\right|_{2.3} = \frac{3p}{2} \times \frac{4}{3} = 2p$$

For given line, slope of tangent = 4

$\therefore$ 2p = 4 $\Rightarrow$ p = 2

From equation (i), 9 = 2 × 8 + q q = –7.

38.(B) Since $\log|x| = \begin{cases} \log(x); & x > 0 \\ \log(-x); & x < 0 \end{cases}$

$$\therefore \frac{d}{dx}\log|x| = \begin{cases} \frac{1}{x}; & x > 0 \\ \frac{1}{(-x)}(-1) = \frac{1}{x}; & x < 0 \end{cases}$$

y has extreme values at x = –1/2,

So $\left(\frac{dy}{dx}\right)_{(-1)} = \left(\frac{dy}{dx}\right)_{(2)} = 0$. Now $\frac{dy}{dx} = \frac{a}{x} + 2bx + 1$

$$\therefore \left(\frac{dy}{dx}\right)_{(-1)} = -a - 2b + 1 = 0$$

$$\left(\frac{dy}{dx}\right)_{(2)} = \frac{a}{2} + 4b + 1 = 0 \; ; \therefore \; a = 2, \; b = -\frac{1}{2}.$$

39.(B) $\lim_{x\to 2} \frac{\int_6^{f(x)} 4t^3 dt}{x-2} (0/0 \text{ form}) = \lim_{x\to 2} \frac{4\left(f(x)^3 \times f'(x)\right)}{1}$

$= 4\,(f(2))^3 \times f'(2) = 18.$

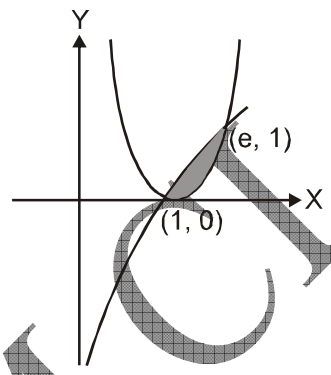
40.(D) $\frac{d}{dx}F(x) = \frac{e^{\sin x}}{x} \Rightarrow \int_1^4 \frac{3}{x} e^{\sin x^3} dx = \int_1^4 \frac{3x^2}{x^3} e^{\sin x^3 dx}$

Put $x^3 = t \Rightarrow 3x^2\,dx = dt$

$F(t) = \int_1^{64} \frac{e^{\sin t}}{t} dt = [F(t)]_1^{64} = F(64) - F(1)$

On comparing, k = 64.

41.(A) Required area $\int_1^e \left[\log x - (\log x)^2\right] dx$



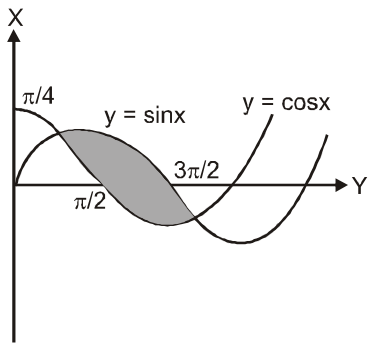
$A = \int_1^e \log x\,dx - \int_1^e (\log x)^2 dx$

$= [x\log x - x]_1^e - \left[x(\log x)^2 - 2x\log x + 2x\right]_1^e$

$= [e - e - (-1)] - [e(1)^2 - 2e + 2e - (2)]$

$= (1) - (e - 2) = 3 - e.$

42.(B) Point of intersection of y = sin x and y = cos x are $\frac{\pi}{4}, \frac{5\pi}{4}$.

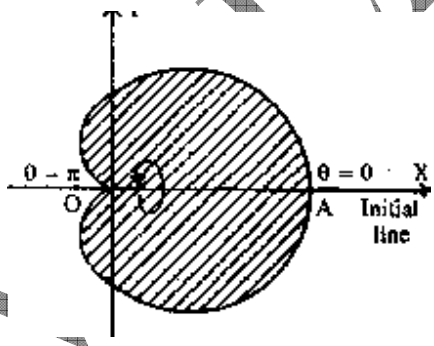


Since, $\sin x \geq \cos x$ on the interval $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$

$\therefore$ Area of one such region $= \int_{\pi/4}^{5\pi/4} (\sin x - \cos x)\,dx$

$= 2\sqrt{2}$ sq.unit.

43.(D) The curve is r = a(1 + cos θ)



Required volume

$$V = \int_0^{\pi} \frac{2}{3}\pi r^3 \sin\theta\, d\theta$$

$$= \frac{2}{3}\int_0^{\pi} a^3 (1+\cos\theta)^3 \sin\theta\, d\theta$$

Put 1 + cos θ = t

– sin θ dθ = dt

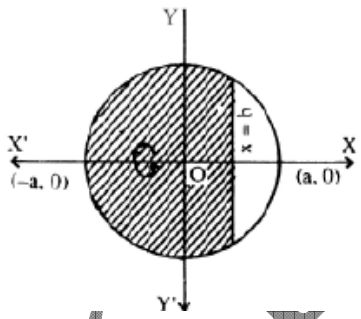
$$\therefore \qquad V = -\frac{2}{3}\pi a^3 \int t^3\, dt$$

$$= -\frac{2}{3}\pi a^3 \frac{t^4}{4}$$

$$= -\frac{2}{3}\pi a^3 \left[\frac{(1+\cos\theta)^4}{4}\right]_0^{\pi}$$

$$= \frac{8\pi a^3}{3}$$

44.(D) The curve bounded by $x^2 + y^2 = a^2$ and chord $x = b$ revolved about x-axis, then



The required volumes is given by

$$V = \int_{-a}^{b} \pi y^2\, dx$$

Put $y^2 = a^2 - x^2$, from given curve

$$= \int_{-a}^{b} \pi\left(a^2 - x^2\right) dx = \pi\left[a^2 x - \frac{1}{3}\right]_{-a}^{b}$$

$$= \pi\left[\left(a^2 b - \frac{1}{3}b^3\right) - \left(-a^3 + \frac{1}{3}a^3\right)\right]$$

$$= \pi\left[\frac{3a^2 b - b^3 + 2a^3}{3}\right]$$

$$= \frac{\pi(a+b)^2(2a-b)}{3}$$

45.(D) Here, given curve is $r^n \sin n\theta = a^n$

or, $r^n = a^n \operatorname{cosec} n\theta$

Now differentiating it w.r. to θ, we get

$$nr^{n-1}\frac{dr}{d\theta} = -a^n.n \operatorname{cosec} n\theta \cot n\theta$$

or, $r^{n-1}\frac{dr}{d\theta} = -r^n \cot n\theta$

or, $\frac{dr}{d\theta} = -r \cot n\theta$

For orthogonal trajectory, $\frac{dr}{d\theta} = -r^2\frac{d\theta}{dr}$

$\therefore$ $-r^2\frac{d\theta}{dr} = -r\cot n\theta$

or, $\frac{dr}{r} = \tan n\theta$

Now, Integrating it, we get

$$\log r = -\log\cos n\theta \cdot \frac{1}{n} + c$$

or, $n \log r + \log \cos n\theta = c$

or, $r^n \cos n\theta = c$

46.(B) Here, the given equation is

$(x^2 + y^2 + 2x)\,dx + 2y\,dy = 0$ ... (1)

Comparing with $M\,dx + N\,dy = 0$, we get

$M = x^2 + y^2 + 2x$ and $N = 2y$

It can be easily shown that the given equation is not exact.

Now consider $\frac{1}{N}\left[\frac{\partial M}{\partial y} - \frac{\partial M}{\partial x}\right] = 1$

$$\text{I.F.} = e^{\int 1dx} = e^x$$

Multiplying (1) be I.F., we get

$$e^x(x^2 + y^2 + 2x)\,dx + 2ye^x\,dy = 0 \qquad \text{... (2)}$$

Now $\quad M' = e^x(x^2 + y^2 + 2x)$

and $\quad N' = 2ye^x$

$\Rightarrow \quad \dfrac{\partial M'}{\partial y} = 2ye^x = \dfrac{\partial N'}{\partial x}$

$\Rightarrow$ Equation (2) is exact and its solution as usual shall be

$$e^x(x^2 + y^2) = c.$$

47.(B) Here, given differential equation is

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = \frac{e^{2x}}{x}$$

$\therefore$ AE will be $\quad D^2 - 4D + 4 = 0$

$\Rightarrow \quad (D-2)^2 = 0$

$\Rightarrow \quad D = 2, 2$

$\therefore$ C.F. of $y = (C_1 + C_2x)\,e^{2x}$

Now $\text{PI} = \dfrac{1}{D^2 - 4D + 4}\dfrac{e^{2x}}{x}$

$$= e^{2x}\frac{1}{(D+2)^2 - 4(D+2) + 4}\cdot\frac{1}{x}$$

$$= e^{2x}\cdot\frac{1}{D^2}\cdot\frac{1}{x}$$

$$= e^{2x}(x\log x - x)$$

$\therefore$ General solution will be

$$y = (C_1 + C_2x + x\log x - x)e^{2x}$$

48.(B) If y_1 (x) = sin 3x, then

$y_1'(x) = 3\cos 3x$ and $y_1''(x) = -9\sin 3x$

$\therefore$ $y_1''(x) + 9y_1(x) = -9\sin 3x + 9(\sin 3x) = 0$

and so $y_1(x)$ is a solution of y'' + 9y = 0

Similarly y_2 (x) = cos 3x is a solution of y'' + 9y = 0

Now Wronskian of $y_1(x)$ and $y_2(x)$ is

$$W(x) = \begin{vmatrix} y_1(x) & y_2(x) \\ y_1'(x) & y_2'(x) \end{vmatrix} = \begin{vmatrix} \sin 3x & \cos 3x \\ 3\cos 3x & -3\sin 3x \end{vmatrix}$$

$= -3(\sin^3 3x + \cos^2 3x)$, on expanding the determinant

$= -3 \neq 0$

Hence $y_1(x)$ and $y_2(x)$ are two linearly independent solutions of $\frac{d^2y}{dx^2} + 9y = 0$.

49.(C) Since grad $f = \mathbf{i}\frac{\partial f}{\partial x} + \mathbf{j}\frac{\partial}{\partial y} + \mathbf{k}\frac{\partial}{\partial z}$

$= \mathbf{i}yz^2 + \mathbf{j}xz^2 + \mathbf{k}2xyz$, $\because f = xyz^2$

= 9j at (1, 0, 3).

Now the unit vector t in the direction of the vector **i** - **j** + **k** is given by t = (i - j + k) / $\sqrt{3}$.

$\therefore$ the required directional derivatives is

$$\frac{\partial f}{\partial x} = \nabla f \cdot \mathbf{t} = 9\mathbf{j} \cdot \frac{1}{\sqrt{3}}(\mathbf{i} - \mathbf{j} + \mathbf{k}) = -\frac{9}{\sqrt{3}} = -3\sqrt{3} \quad .$$

50.(C) Here $P = 4e^{2x^2 - y - z^2}$

$$\nabla P = 4\left(\mathbf{i}\frac{\partial}{\partial x} + \mathbf{j}\frac{\partial}{\partial y} + \hat{\mathbf{k}}\frac{\partial}{\partial z}\right)e^{2x^2 - y - z^2}$$

$$= 4[\mathbf{i}2x - \mathbf{j} - 2z\mathbf{k}]e^{2x^2 - y - z^2}$$

∇P at (–1, 1, –1)

$$\nabla P = 4[2\mathbf{i} - \mathbf{j} + 2\mathbf{k}]$$

$$(\nabla P)\cdot\hat{\mathbf{r}} = 4[2\mathbf{i} - \mathbf{j} + 2\mathbf{k}]\frac{\left(-3\hat{i} + 5\hat{j} + 6\hat{k}\right)}{\sqrt{70}}$$

$$= \frac{4[-6 - 5 + 12]}{\sqrt{70}}$$

$$= \frac{4}{\sqrt{70}}$$

51.(D)

```
    1 1 0 1
    1 1 1 0
  ---------
    0 0 0 0
  1 1 0 1
1 1 0 1
1 1 0 1
-----------
1 0 1 1 0 1 1 0
```

52.(C) $\Rightarrow$ (100000000) – (00000101)

$\Rightarrow$ $(11111011)_2$

53.(C) Minus sign represented by bit - value "1" i.e. $-(64)_{10}$.

54.(C)

16	69	Rumainders
	4	5
	0	4

$\Rightarrow 0.5 * 16 = 8.0$

$\Rightarrow (0.5)_{10} = (0.8)_{16}$

$(69.5)_{10} = (45.8)_{16}$

8	69	Remainder
	8	5
	1	0
	0	1

$\Rightarrow$ 0.5 * 8 = 4.0

$(69.5)_{10} = (105.4)_8$

55.(C) $(111000111)_2 = (707)_8$

$(707)_8 + (273)_8 = (1202)_8$

56.(B) calloc() is used to allocate the memory, which will be equal to the value, "num*size". Function returns a pointer to the first byte of the allocated space.If there is no space to allocate, a "NULL" pointer is returned.

Syntax:

void *calloc(size_t num, size_t);

57.(D) ⇒ getc ( ) – Reads a character

⇒ putc ( ) – writes a character

⇒ putw ( ) – Writes an integer

58.(B) "FILE" is a type defined data type.The FILE data type gives access to files. Files can be opened in text or binary mode.

59.(C) ⇒ isalnum ( ), to ascii ( ), isdigit ( ) functions of < ctype.h>

⇒ exp ( ) function is in < math.h> header file.

60.(D) ⇒ $AB \oplus AC$

⇒ $AB \,.\, \overline{AC} + \overline{AB} \,.\, AC$

⇒ $AB(\bar{A} + \bar{C}) + (\bar{A} + \bar{B})AC$ ∴ (Demorgan's Law)

⇒ $AB\bar{C} + A\bar{B}C$ ∴ (Associative Law)

⇒ $A(B\bar{C} + \bar{B}C)$ ∴ (Distributive Law)

⇒ $A\,(B \oplus C)$

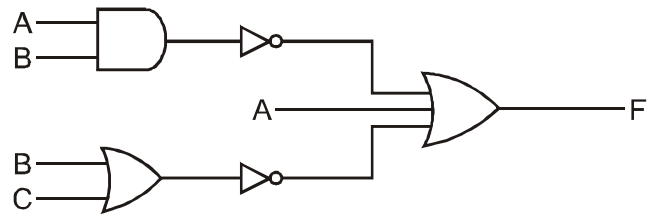
61.(B) ⇒ $\overline{A\bar{B} + \bar{A}B}$

⇒ $\overline{A \oplus B}$

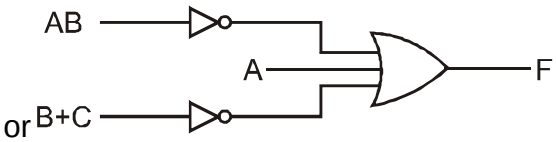
$\Rightarrow AB + \overline{A}\,\overline{B}$

$\Rightarrow A \odot B$

62.(C) **Either**



or



63.(A) $\Rightarrow x\,.\,(y \cdot z + \overline{y} \cdot \overline{z})$

$\Rightarrow \overline{x \cdot (y \cdot z + \overline{y} \cdot \overline{z})}$ $\therefore$ (Complementation)

$\Rightarrow \overline{x} + \overline{(y \cdot z + \overline{y} \cdot \overline{z})}$ $\therefore$ (Demorgan's law)

$\Rightarrow \overline{x} + ((1\overline{y \cdot z}) \cdot (\overline{\overline{y} \cdot \overline{z}}))$ $\therefore$ (Demorgan's law)

$\Rightarrow \overline{x} + ((\overline{y} + \overline{z}) \cdot (\overline{\overline{y}} + \overline{\overline{z}}))$ $\therefore$ (Demorgan's law)

$\Rightarrow x + ((\overline{y} + \overline{z}) \cdot (y + z))$ $\therefore$ (Demorgan's law)

64.(C) $\Rightarrow \overline{A}.B + A.\overline{B}$

$\Rightarrow \overline{\overline{A}.B + A.\overline{B}}$ $\therefore$ (Duality)

$\Rightarrow (\overline{\overline{A}.B}) \,.\, (\overline{A.\overline{B}})$ $\therefore$ (Demorgan's law)

$\Rightarrow (\overline{\overline{A}} + \overline{B}) \,.\, (\overline{A} + \overline{\overline{B}})$

$\Rightarrow (A + \overline{B}) \,.\, (\overline{A} + B)$ $\therefore$ (Involution law)

$\Rightarrow (\overline{A} + B) \,.\, (A + \overline{B})$ $\therefore$ (Commutative law)

65.(C)

16	3476
	217
	13
	0

Remainders		
4	=	4
9	=	9
13	=	D

$(3476)_{10} = (D94)_{16}$

66.(C)

$$\begin{array}{ll} 1100 & = (-0.5) \\ 0100 & = (+0.5) \\ \hline 0000 & \\ 0000 & \\ 111100 & \\ \hline 11110000 & \end{array}$$

67.(D) LIFO is an acronym that stands for last in, first out. In computer science and queueing theory this refers to the way items stored in some types of data structures are processed. By definition, in a LIFO structured linear list, elements can be added or taken off from only one end, called the "top". A 'stack' data structure prefers to operate on LIFO approach.

68.(C) "math.h" header file in the standard library is basically used for general mathematical functions.

69.(C) The loop will be executed 255 times. The size of short int doesn't affect program execution.

70.(C)

$C4_{16} = 1100\ 0100$

$-\ 7B_{16} = 1000\ 0101$

$$= \begin{array}{ll} 1100 & 0100_2 \\ 1000 & 0101_2 \\ \hline 10100 & 1001 \end{array}$$

71.(C)

+3 +3 +3

2, 1, 2, 4, 4, 5, 6, 7, 8, 8, 10, 11, $\boxed{10}$

+2 +2 +2 +2

There are three series.

72.(A) There are two series

(I) 11, 101, 1001, 10001

One zero is increased between two digits of 1 – 1.

(II) 10, 100, 1000, ...

One zero is increased in the end.

73.(A)

7 12 19 $\boxed{28}$ 39

+5 +7 +9 +11

74.(C) The correct order is :

Infant	Child	Adolescent	Adult	Old
1	5	4	3	2

75.(A) Herd is a group of cattle. Similarly, flock is a collection of sheep. Hence, the answer is (A).

76.(B) Strong armymen will be represented by the region which is common to the square and the triangle but lies outside the circle i.e., 4.

77.(C) c = a and a = b $\Rightarrow$ c $\neq$ a and a $\neq$ b

$\Rightarrow$ b $\neq$ a i.e. b = a

78.(A) a × b and b $\square$ c $\Rightarrow$ a is a little less than b and b = c.

$\Rightarrow$ a is a little less than c.

$\Rightarrow$ c is a little more than a i.e. c + a.

79.(A) c % b $\Rightarrow$ c < b

and b × a $\Rightarrow$ b is a little less than a.

$\Rightarrow$ c < a $\Rightarrow$ a > c i.e. a $\triangle$ c.

80.(D) ac + bc $\Rightarrow$ ac > bc $\Rightarrow$ a > b $\Rightarrow$ b < a i.e.

b % a.

81.(C) In the 1st and 2nd statements, the common code word is kew and the common word is she. So, kew means she. In the 1st and 3rd statements, the common code is deko and the common word is apples. So, deko means apples.

82.(C) In the first and second statements, the common code word is gnr and the common word is Olympic. So, gnr means Olympic. In the second and third statements, the common code is hyto and the common word is games. So, hyto means games. Thus, in the second statement, emf means summer.

83.(B) Mohd. Sheikh does not fulfil condition (ii) nor does his alternative (b) fulfils the condition because his rating in quality of work is not 'D'. Therefore, he cannot be selected.

84.(A) Kiran Bala does not fulfil condition (i) nor is there any information about her rating in respect of dependability according to alternative (a). Therefore, the data are inadequate.

85.(B) Mandar Bhave does not fulfil condition (ii) According to alternative (b) his rating in respect of quality of work is not 'D'. Therefore he will not be selected.

86.(C) Fragile is the opposite of hardy. Amateur is the opposite of professional.

87.(D) Chapters make up a book. Rooms make up a house.

88.(D) To be a philanthropist, one must be generous. To be a pacifist one must be peace-loving.

89.(A) To bolster means to support. To goad means to urge.

90.(B) Pattern is the combination of three series.

10, 9, 8, 7....,and 20, 21, 22, 23,.....

∴ Missing number = 7

91.(A) While converting a sentence from direct speech to indirect speech, it undergoes some changes.

That : Connective word

Future continuous : Future perfect continuous

Thus correct sentence is:-

Ronit said that he must have been guilty.

92.(C) While converting a sentence from direct speech to indirect speech, it undergoes some changes.

Present perfect :- Past perfect

You :- She

Thus correct sentence is :-

Aditi asked her how long she had lived there.

93.(A) He told me he had to get going. Otherwise, he was going to be late.

94.(C) **Execrate** means find repugnant which is antonym of **adore** which means Love intensely.

95.(D) **Sycophant** means a person who tries to please someone in order to gain a personal advantage, which is antonym of **supercilious** that means Having or showing arrogant superiority to and disdain of those one views as unworthy.

96.(B) **Tart** means pleasantly sharp or **acid** to the taste.

97.(B) **Corner** means "A place off to the side of an area" and Nook means "A sheltered and secluded place"**.** Thus Nook is the synonym of Corner.

98.(B) Correct spelling is "Dolorous" which means to show sorrow.

99.(A) The growth pattern is studied to estimate or outline the future prospects of the company. Thus (A) is the most logical fit. Hence, (A).

100.(B) Only ' Concupiscence' and ' motive ' make sense for the first half , but only ' incitement' agrees in the second half with " stimulus". Hence (B).