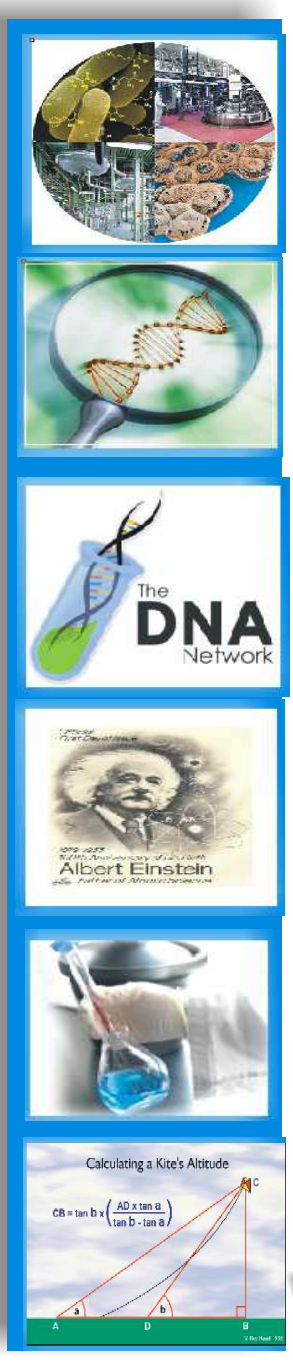


INDRAPRASTHA UNIVERSITY - MCA
MOCK TEST PAPER

- ***Attempt all the questions***
- ***This paper consists of 150 objective type questions.***
- ***Each question carries 4 marks.***

- ***Pattern of questions : MCQs***
- ***Total marks : 600***
- ***Duration of test : 2.5 Hours***

PART - A (MATHEMATICS)

1. What is wrong in the following computation ?

$$\begin{bmatrix}1 & 0.01\\ 1 & 1\end{bmatrix}^n = \left\{\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix} + 10^{-2}\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}\right\}^n$$

$$= \begin{bmatrix}1 & 0^n\\ 1 & 0\end{bmatrix} + n\times 10^{-2}\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}^{n-1}\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}$$

Since $\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}^k = \begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$ for $K \geq 2$

(A) $\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}^k = \begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$ for $K \geq 2$ is not true.

(B) computation of second term on R.H.S is not valid.

(C) First term should be calculated completely

(D) None of these.

2. In how many ways can the letters of the word "PROBLEM" be rearranged to make a 7 letter word such that none of the letters repeat?

(A) 7!

(B) ${}^7C_7$

(C) 7^7

(D) 49

3. At an election, a voter may vote for any number of candidates, not greater than the number to be elected. There are 10 candidates and 4 are to be elected. If a voter votes for at least one candidate, then the number of ways in which he can vote is

(A) 5040

(B) 385

(C) 6210

(D) 1110

4. If the integers m and n are chosen at random between 1 and 100, then the probability that a number of the form $7^m + 7^n$ is divisible by 5 equals.

(A) $\frac{1}{4}$

(B) $\frac{1}{7}$

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

(D) $\frac{1}{49}$

5. The function x, -x, $\frac{1}{x}$, $-\frac{1}{x}$, the law of combination being substitution of one function in another, is a group, the inverse element of $-\frac{1}{x}$ is-

(A) x

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

(C) –x

(D) $-\frac{1}{x}$

6. If $(R, +, \cdot)$ is a ring such that $x.x = x \ \forall x \in R$ then-

(A) $x + y = 0 \Rightarrow x = y$

(B) $x + x \neq 0$

(C) $x \neq y \Rightarrow x + y = 0$

(D) x + y = -1

7. If α and β are the roots of the equation $x^2 - px + q = 0$, then the equation whose roots are $(\alpha\beta + \alpha + \beta)$ and $(\alpha\beta - \alpha - \beta)$ is.

(A) $x^2 - 2qx + (q^2 - p^2)$

(B) $x^2 - 2qx + q^2 = 0$

(C) $x^2 - 2qx - p^2 = 0$

(D) $x^2 - px + p^2 = 0$

8. The volume generated by revolving the cardioid $r = a(1 + \cos\theta)$ about the initial line will be.

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

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

(C) $3\pi a^3$

(D) $2\pi a$

9. Evaluate $\int\int_R \frac{r\,dr\,d\theta}{\sqrt{a^2 + r^2}}$ over one loop of leminscate $r^2 = a^2\cos 2\theta$

(A) $2a\frac{\pi}{4}$

(B) $2a\left(1 - \frac{\pi}{4}\right)$

(C) $2a\left(1+\frac{\pi}{4}\right)$

(D) $3a\frac{\pi}{2}$

10. The area of the region enclosed by curves $x^2+y^2=a^2, x+y=a$ (in first quadrant)) is.

(A) $a^2(\pi-2)$

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

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

(D) $\frac{a^2}{4}(\pi-2)$.

11. The value of $\int_0^2 \int_0^{2x-4} \frac{2y-1}{x+1} dx\, dy.$

(A) $6(7\log 3-6)$

(B) $6(7\log 3+6)$

(C) $6(3\log 7-6)$

(D) $6(3\log 7+6)$.

12. For the L.P. Problem Max z = 3x + 2y subject to

$x+y\geq 1, y-5x\leq 0, x-y\geq -1, x+y\leq 6, x\leq 3$ and $x, y\geq 0$

(A) x = 3

(B) y = 3

(C) z = 15

(D) All of the above

13. If odds against solving a question by three students are 2 :1, 5 : 2 and 5 : 3 respectively, then probability that the question is solved only by one student is

(A) 31/56

(B) 24/56

(C) 25/56

(D) 24/13

14. From a pack of 52 cards two cards are drawn in succession one by one without replacement. The probability that both are aces is

(A) 2/13

(B) 1/51

(C) 1/221

(D) 2/21

15. One root of $x^3 - x - 4 = 0$ lies in (1, 2). In bisection method, after first iteration the root lies in the interval

(A) (1, 1.5)

(B) (1.5, 2.0)

(C) (1.25, 1.75)

(D) (1.75, 2)

16. A river is 80 metre wide. Its depth *d* metre and corresponding distance *x* metre from one bank is given below in table-

x :	0	10	20	30	40	50	60	70	80

d :	0	4	7	9	12	15	14	8	3

Then approximate area of cross-section of river by Trapezoidal rule, is

(A) 710 *sq. m*

(B) 730 *sq. m*

(C) 705 *sq. m*

(D) 750 *sq. m*

17. If for n = 3, the integral $\int_0^1 x^3\,dx$ is approximately evaluated by Trapezoidal rule

$\int_0^1 x^3\,dx = 3\left[\frac{1+10^3}{2}+\alpha+7^3\right]$, then

$\alpha =$

(A) 3^3

(B) 4^3

(C) 5^3

(D) 6^3

18. If f (x) $= \int_0^{x^2} \sqrt{\sin t + \cos t}\,dt$ then the derivative of f (x) with respect to x is-

(A) $\sqrt{\sin x^2 + \cos x^2}$

(B) $2x.\sqrt{\sin x^2 + \cos x^2}$

(C) $\frac{2x.\left(-\sin x^2 + \cos x^2\right)}{\sqrt{\sin x^2 + \cos x^2}}$

(D) None of these

19. $\int \frac{x^2+1}{x^4+1}dx$ is equal to-

(A) $\frac{1}{\sqrt{2}}\tan^{-1}\frac{x^2-1}{\sqrt{2}x}$

(B) $\frac{1}{\sqrt{2}}\sin^{-1}\frac{x^2-1}{\sqrt{2}x}$

(C) $\frac{1}{\sqrt{2}}\cos^{-1}\frac{x^2-1}{\sqrt{2}x}$

(D) $\frac{1}{\sqrt{2}}\sec^{-1}\frac{x^2-1}{\sqrt{2}x}$

20. $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)dy\,dx\,dz$ is equal to-

(A) 4

(B) -4

(C) 0

(D) 2

21. The area of the loop of the folium $x^3+y^3-3axy=0$ is given by-

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

(B) a^2

(C) $\frac{3}{2}a^2$

(D) $2a^2$

22. The area of the region bounded by the curve $y(x^2+2)=3x$ and $4y=x^2$ is given by-

(A) $\int_{0}^{1}\int_{y=0}^{x^2/4}dx\,dy$

(B) $\int_0^1 \int_{y=0}^{x^2/4} dy\ dx$

(C) $\int_0^2 \int_{y=x^2/4}^{3x/(x^2+2)} dy\ dx$

(D) $\int_{y=0}^1 \int_{y=x^2/4}^{3x/(x^2+2)} dx\ dy$

23. The general solution of the differential equation (D3 + 1)y = (ex + 1)2 is

(A) $y = C_1e^{-x} + e^{x/2}\left(C_2\cos\frac{1}{2}\sqrt{3}x + C_3\sin\frac{1}{2}\sqrt{3}x\right) + \frac{1}{9}e^{2x} + e^x + 1$

(B) $y = C_1 + e^{x/2}\left(C_2\cos\sqrt{3}x + C_2\sin\sqrt{3}x\right) + \frac{1}{9}e^{2x} + e^x + 1$

(C) $y = C_1e^{-x} + e^{x/2}\left(C_2\cos\frac{1}{2}\sqrt{3}x + C_2\sin\frac{1}{2}\sqrt{3}x\right) + e^{2x} + \frac{1}{3}e^x$

(D) None of these

24. The area bounded by the curve y = sin x, x - axis and the lines x = 0, x = π is revolved about x - axis. The surface of revolution is equal to-

(A) $4\pi\left[\sqrt{2} + \log\left(\frac{1+\sqrt{2}}{2}\right)\right]$

(B) $4\pi\left[\sqrt{2} + \log\left(1+\sqrt{2}\right)\right]$

(C) $\frac{\pi}{2}\left[\sqrt{2} + \log\left(\frac{1+\sqrt{2}}{2}\right)\right]$

(D) None of these

25. The curves for which the sum of the reciprocal of the polar sub normal and the radius vector is constant , are given by-

(A) θ = cr + K

(B) $r = c\theta + K$

(C) $\theta = cr - \log r + K$

(D) $r = c\theta - \log + K$

26. The integrating factor for the differential equation $(x^2y - 2xy^2)\,dx - (x^3 - 3x^2y)\,dy$ is given by-

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

(B) xy

(C) x^2y^2

(D) $\frac{1}{x^2y^2}$

27. The general solution of the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} - 4y = 0$

(A) $y = c_1^{e-x}$

(B) $y = c_2e^{4x}$

(C) $y = c_1e^{-x} + c_2e^{2x}$

(D) $y = c_1e^{-x} + c_2e^{4x}$

28. P.I. of the differential equation $(D^2 + 2)y = x^2e^{3x} + e^x\cos 2x$ is -

(A) $\frac{1}{121}e^{3x}\left(11x^2 - 12x + 50\right) + \frac{1}{17}e^x\left(4\sin 2x - \cos 2x\right)$

(B) $\frac{1}{121}e^{3x}\left(11x^2 - 12x + \frac{50}{11}\right) + \frac{1}{17}e^x\left(4\sin 2x - \cos 2x\right)$

(C) $\frac{1}{121}e^{3x}\left(x^2 - 12x + 50\right) + \frac{1}{17}e^x\left(\sin 2x - \cos 2x\right)$

(D) None of these

29. The matrix $\begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$ is a -

(A) Hermitian matrix

(B) Skew-Hermitian matrix

(C) Symmetric matrix

(D) Skew-Symmetric matrix

30. If $\vec{a}+\vec{b}+\vec{c}=0, |\vec{a}|=3, |\vec{b}|=5, |\vec{c}|=7$, the angle between the vectors will be -

(A) $\pi/2$

(B) $\pi/3$

(C) $\pi/6$

(D) $\pi/6$

31 If P (-1, 3, 5) and Q (2, 3, 6) be any two points in space, then which of the following is false -

(A) The direction ratios of $\overrightarrow{PQ}$ are 9, 0, 3

(B) The direction cosine of $\overrightarrow{PQ}$ are $3\sqrt{10}$,0,1

(C) The components of $\overrightarrow{PQ}$ are 6,0,2

(D) The unit vector along $\overrightarrow{PQ}$ is $\frac{3\hat{i}+\hat{k}}{\sqrt{10}}$

32. The volume of the arc intercepted between the plane x + y + z = 1 and the coordinate planes is-

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

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

(C) $\frac{1}{6}$

(D) None of these

33. The following relation is defined on the set of real numbers.

a R b iff $|a - b| > 0$; this relation is

(A) Reflexive

(B) Symmetric

(C) Bijective

(D) none

34. If A is orthogonal matrix, then

(A) A ' must be orthogonal

(B) A', A^{-1} may not be orthogonal

(C) A^{-1} must be orthogonal

(D) Both A and C

35. The basic one-way air fare for a child aged between 3 and 10 years costs half the regular fare for an adult plus a reservation charge that is the same on the child's ticket as on the adult's ticket. One reserved ticket for an adult costs \$216 and the cost of a reserved ticket for an adult and a child (aged between 3 and 10) costs \$327. What is the basic fare for the journey for an adult?

(A) \$111

(B) \$52.5

(C) \$210

(D) \$58.5

36. If $C_k \sum_{k=1}^{n} \left(\frac{kC_k}{C_k + C_{n-k}} \right)^2$ stands for ${}^nC_k$ then $\sum_{k=1}^{n} \left(\frac{kC_k}{C_k + C_{n-k}} \right)^2$ is equal to:

(A) $\frac{n(n+1)(2n+1)}{24}$

(B) $\frac{n^2(n+1)^2}{8}$

(C) $\frac{n^3(n+2)}{16}$

(D) $\frac{n^3(n+2)}{16}$

37. A quadrant of circle of radius a revolves about its chord, the volume of the spindle so formed is

(A) $\pi a^3(10-3\pi)$

(B) $\frac{\pi a^3}{6}(10-3\pi)$

(C) $\frac{\pi a^3}{6\sqrt{2}}(10-3\pi)$

(D) None of these.

38. $\int\int r^2 \sin\theta \cos\theta \, d\theta \, dr$ over the region bounded by the cardioid $r = a(1+\cos\theta)$ above the initial line is.

(A) $\frac{16}{15}a^4$

(B) $\frac{15}{16}a^4$

(C) $\frac{16}{15}a^2$

(D) $\frac{15}{16}a^2$

39. Find the surface of the solid formed by revolution about x-axis of the loop of the curve $x = t^2,\ y = t - \frac{1}{3}t^3.$

(A) π

(B) 2π

(C) 3π

(D) 4π.

40. Consider the following function with regard to the function $f(x) = \left(x^3 - 6x^2 + 12x - 8\right)e^x$

Assertion (A) - f(x) is neither maximum nor minimum at x = 2

Reason (R)- $f'(x) = 0, f''(x) = 0, f'''(x) \neq 0$ at x = 2

The correct answer is

(A) Both A and R are true and R is a correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true R is false

(D) A is false R is true

PART-B (COMPUTER AWARENESS)

41. Subtract 01110_2 from 10101_2 using complementary method.

(A) 00111

(B) 11100

(C) 010101

(D) 110110

42. NOR and NAND are,

$x \uparrow (y \downarrow z) \neq (x \uparrow y) \downarrow (x \uparrow z)$.

(A) Distributive.

(B) Not distributive.

(C) A and B both

(D) None of them

43. Find the binary equivalent of the decimal number 39.

(A) 100111

(B) 100101

(C) 111001

(D) 000111

44. Convert the hexadecimal number 4F2D to its binary equivalent.

(A) 0100111100101101

(B) 1101101101010010

(C) 0101110010111000

(D) 0010001101000111

45. Binary equivalent of hexadecimal number B4AC. DOE_{16} is

(A) 1011 0100 1100 1110. 1100 0000 1101

(B) 1011 0100 10101010. 1110 0001 0001

(C) 1011 0100 1010 1100. 1101 0000 1110

(D) 1100 0100 1100 1101. 1011 0000 1101

46. What is the output for the following 'c' program fragment?

```
# include <stdio.h>
# define a 10
 main ()
{
  print f("%d..", q);
  f1() i
  printf ("%d", a);
}
  void f1()
{
  # under a
  # define a 50
}
```

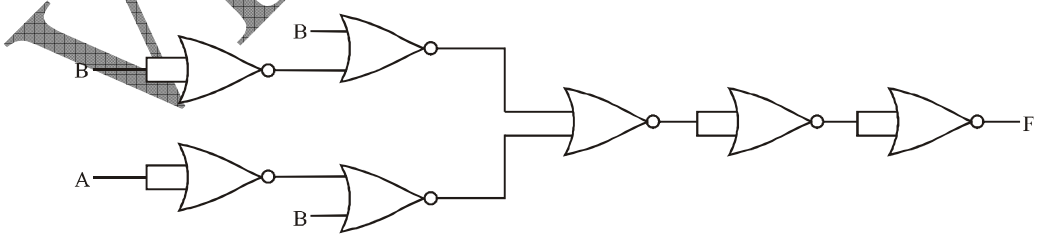
(A) 10 .. 50

(B) 10 .. 10

(C) Error

(D) 0

47. The Boolean expression for the following logic circuits is: -



(A) F = $A \oplus B$

(B) $F = A \odot B$

(C) F = AB

(D) F = A + B

48. What will the output for the following 'c' code ?

```
# include <stdio. h>
main ( )
{
  int x [3] [3] = {{1, 2, 3}, {4, 5, 6}, {7, 8, 9} ;
  print ("%d", x [2] [1]) ;
}
```

(A) 4

(B) 8

(C) compilation error

(D) Run time error

49. The solution to the differential equation

$$(x^2+1)y' + 3x(y-1) = 0, \qquad y(0) = 2$$

is

(A) $y = 1 + (x^2+1)^{-3/2}$

(B) $y = \ell n(x^2+1) + 2$

(C) $y = \exp\left((x^2+1)^{3/2}\right) + 2 - e$

(D) $y = \sqrt{x^2 + 1} + 1$

50. The equivalent octal number of 461 (decimal) is .

(A) 461

(B) 475

(C) 715

(D) 823

51. Convert the octal number 456 to hexadecimal.

(A) 12 E

(B) 15 F

(C) 13 C

(D) 14 A

52. Simplify Boolean function.

$y = A + \bar{A} . B$

(A) B + A

(B) A +B

(C) A and B both

(D) None of them

53. Minimize Boolean expression.

$y = A . (A + B) + B (\bar{A} + B).$

(A) A +B

(B) B+A

(C) A +B + C

(D) None of them

54. Which of the following thread transition is not legal ?

(i) BLOCKED to RUNNING

(ii) RUNNING to BLOCKED

(iii) RUNNABLE (READY) to BLOCKED

(A) only (i)

(B) only (ii)

(C) only (iii)

(D) None of these

55. Consider a paging system with the page table in memory. Each memory reference takes 200ns. The TLB has hit ratio of 75% and the time needed for searching TLB is almost negligible. What the effective page memory reference time ?

(A) 200ns

(B) 275ns

(C) 400ns

(D) 250ns

56. The decimal equivalent of the hexadecimal number 1 A5 D is

(A) 1449

(B) 3749

(C) 5749

(D) 6749

57. Using 10's complement subtraction of 72532 – 3250 is

(A) 69282

(B) 69285

(C) 75023

(D) 42350

58. Consider the following statement.

define hypotenuse (a, b) sqrt (a * a + b * b) ;

The macro-call hypotenuse (a + 2, b + 3) ;

(A) finds the hypotenuse of a triangle with sides a + 2 and b + 3

(B) finds the square root of $(a + 2)^2 + (b + 3)^2$

(C) is invalid

(D) finds the square root of 3 * a + 4 * b + 5

59. The minimum number of gates required to implement the boolean expression

AB + AB' + A'C is

(A) 1 AND gate and ⊥ OR gates

(B) 2 NAND gates

(C) 3 AND gates and 2 or gates

(D) 1 OR gate

60. What is the result after execution of the following code if a is 10, b is 5 and c is 10 ?

```
if ( (a>b)  &&  (a<=c))
        a = a  +  1;
else
        c = c + 1;
```

(A) a = 10, c = 10

(B) a = 11, c = 10

(C) a = 10, c = 11

(D) a = 11, c = 11

61. Find the odd one out

(A) abs ( )

(B) acos ( )

(C) asin ( )

(D) exp ( )

62. Solve the following boolean function

$$F = \bar{A}BC + A\bar{B}C + AB\bar{C} + ABC$$

(A) F = ABC + $A\overline{BC} + \overline{AB}C$

(B) F = ABC + $\overline{BA}$

(C) $F = AB + BC + CA$

(D) F = AB + BC

63. Which statement is true related to "MACROS" ?

(A) Used to rotate the task.

(B) Small software program

(C) New macro can be recorded from "tools mesh

(D) All above

64. Which of the following is an octal representation for $(111\ 111\ 00.\ 0111)_2$

(A) $(774.34)_8$

(B) $(771.31)_8$

(C) $(374.34)_8$

(D) $(371.31)_8$

65. What is an octal form for $(854.97)_{10}$?

(A) $(1256.\ 670)_8$

(B) $(1625.\ 706)_8$

(C) $(1265.\ 607)_8$

(D) $(1526.\ 760)_8$

66. Which of the following gives the maxterm form for the boolean expression

$$F = A\left(\bar{A}+B\right)\left(\bar{A}+B+\bar{C}\right)$$

(A) $F(A, B, C) = \Pi M(0, 2, 3, 4, 6)$

(B) $F(A, B, C) = \Pi M(0, 1, 2, 3, 4, 5)$

(C) $F(A, B, C) = \Pi M(0, 2, 3, 4)$

(D) $F(A, B, C) = \Pi M(0, 1, 2, 4, 5)$

67. The logic gate used in parity checkers is

(A) NAND gate

(B) NOR gate

(C) XOR gate

(D) X-NOR gate

68. Find the names, street, cities of resident of all employees who worked for SBI and earned more than 10000 rupees per annum.

given : $t_1 \leftarrow \pi_{empname}(\sigma_{compname = \text{“SBI”} \wedge Salary > 1000}(works))$

(A) $\pi_{employee.city,\ street,empname}(\sigma_{emp.empname = t1.empname}(t_1 \times emp))$

(B) $\pi_{emp.empname}(\pi_{emp.empname = t1.empname}(t_1 \times emp))$

(C) $\pi_{emp.empname}(\sigma_{emp.empname = t1.empname}(t_1 \times emp))$

(D) $\pi_{emp.empcity,\ street}(\sigma_{empname\ =\ t1.empname}(t_1 \times emp))$

69. Find the name of all employees in the data base, who live in the same city as the company for which they work.

given : $t_1 \leftarrow \pi_{works.empname,company.city}(\sigma_{works.compname\ =\ company.compname\ \wedge\ employee.city\ =\ t1.city}(works \times company))$

(A) $\pi_{emp.empname}(\sigma_{emp.empname\ =\ t1.empname}(t_1 \times emp))$

(B) $\pi_{emp.empname}(\sigma_{emp.empname\ =\ t1.empname}(t_1 \times works))$

(C) $\pi_{emp.empname}(\sigma_{emp.empname\ =\ empname}(company \times t_1))$

(D) $\pi_{emp.empname}(\sigma_{empname\ =\ emp.empname}(t_1 \times emp))$

70. How can you represent the following boolean function as similar to

$$F = \bar{A}\left(\bar{B}C + B\bar{C}\right) + A\left(\bar{B}\bar{C} + BC\right)$$

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

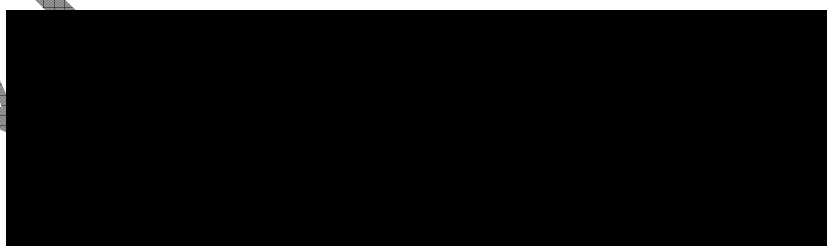
(B) $A \oplus B \oplus C$

(C) $A \odot B \odot C$

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

71-72. Common data question

consider the following relational database state corresponding to the company scheme



71. For the given database, the result for the query

SELECT ALL SALARY

FROM EMPLOYEE is

(A) SALARY

(B) SALARY

(C) SALARY

(D) None of these

72. From the given data base, the result of the query

SELECT FNAME LNAME

FROM EMPLOYEE

WHERE SUPERSSN IS NULL;

is

(A) F NAME LNAME

franklin wong

(B) FNAME LNAME

Alicia Zelaya

(C) FNAME LNAME

Ramesh Narayan

(D) None of these

73. The part of OSI where one most commonly finds data encryption, compression, and other encoding for network communication is–

(A) application (payer seven)

(B) session (layer five)

(C) presentation (layer six)

(D) none of these

74. Which of these network devices belongs at the OSI physical layer one?

(A) Repeater

(B) Router

(C) Switch

(D) Bridge

75. The ____field in the MIME header describes the method used to encode the data.

(A) Content–type

(B) Content -transfer - encoding

(C) Content – ID

(D) Content– description

76. Which of these is not a mail transfer phase?

(A) Connection establishment

(B) Message transfer

(C) Acknowledgment

(D) Connection termination

77. Which is not a service of UA?

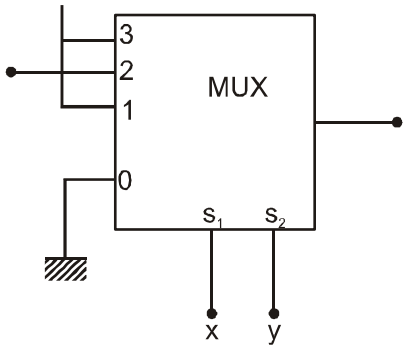
(A) Composing message

(B) Delivering message

(C) Replying message

(D) Reading message

78. The output f of the 4-to-1 MUX shown in the following figure is



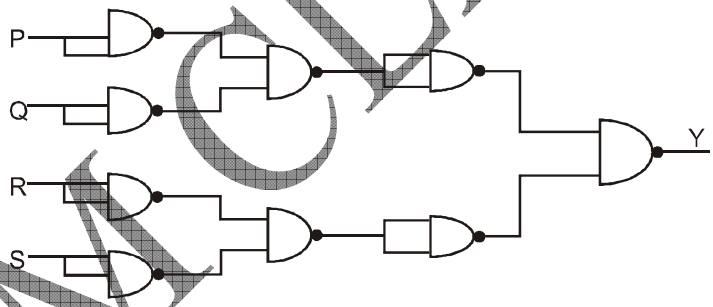
(A) $\overline{xy} + x$

(B) x + y

(C) $\bar{x} + \bar{y}$

(D) $xy + \bar{x}$

79. For the circuit shown in the figure, the Boolean expression for the output Y in terms of inputs, P, Q, R and S is



(A) $\bar{P} + \bar{Q} + \bar{R} + \bar{S}$

(B) P + Q + R + S

(C) $(\bar{P} + \bar{Q})(\bar{R} + \bar{S})$

(D) (P + Q) (R + S)

80. The result of subtraction $FE_{16} - 88_{16}$ is

(A) $5E_{16}$

(B) 10_{16}

(C) 75_{16}

(D) 76_{16}

PART-C (LOGICAL AND ANALYTICAL ABILITY)

Directions for questions 81 to 84

Each problem contains a question and two statements, I and II giving certain data. You have to select the correct answer from (a) to (d) depending on the sufficiency of data given in the statements to answer the question. Mark your answer as

(A) if statement I alone is sufficient and statement II alone is not sufficient to answer the question. OR if statement II alone is sufficient and statement I alone is not sufficient to answer the question.

(B) if each statement alone is sufficient to answer the question.

(C) if statements I and II together are sufficient but neither statement alone is sufficient to answer the question.

(D) if both the statements I and II together are not sufficient to answer the question and additional data specific to the problem are needed.

81. What is the area of the rectangle ABCD ?

I. The breadth of the rectangle is 3 cm and the length exceeds the breadth by 2 cm.

II. The length of the rectangle is less than 7 cm.

82. What is the average weight of a class of 30 students ?

I. The total weight of the class is 1200 kg.

II. There were 16 boys and 14 girls in the class.

83. What is the area of a rectangle ABCD ?

I. The length of the rectangle is greater than its breadth.

II. The length of the rectangle is 5 cm, while its breadth is 3 cm.

84. What is the average weight of the class ?

I. The average weight of the boys is greater than the average weight of the girls.

II. The number of students in the class is 30 and their total weight is 1200 kg.

Directions for questions 85 to 89: Read the data given below carefully answer the questions that follow.

Seven boys–Rajan, Shyam, Vardhan, Mithra, Vimal, Raj and Kishan–are sitting in a row. Shyam sits to the immediate left of Vardhan and third to the right of Rajan, whereas Mithra, who sits at the left extreme, is next to Kishan.

85. Who is sitting to the immediate right of Shyam?

(A) Mithra

(B) Kishan

(C) Vimal

(D) Vardhan

86. If Vardhan and Kishan exchange places with each other without changing the rest of the arrangement that is already done, who will be sitting to the immediate left of Rajan?

(A) Kishan

(B) Raj

(C) Vimal

(D) Vardhan

87. If only Shyam sits between Raj and Vardhan, who is exactly in the middle of the row ?

(A) Raj

(B) Vardhan

(C) Vimal

(D) Rajan

88. Which of the following cannot confirm the seating arrangement of all the boys ?

(A) Raj is to the immediate right of Rajan, whereas Vimal is to the left of Shyam.

(B) Mithra and Raj have two persons between them.

(C) Raj and Kishan have two persons between them.

(D) Rajan and Shyam have two persons in between them.

89. After arranging all the boys as per the conditions given in the data, if Rajan now exchanges his place with Mithra, and Vardhan exchanges his place with Vimal, then how many persons will be there between Vimal and Rajan?

(A) Three

(B) Two

(C) Five

(D) Cannot be determined

90. In the following series, choose the alternative which contains the numerals to be filled in the marked spaces, in the correct order :

B __ __ D __ __ C A B D A C B

__ __ 4 1 3 2 __ __ __ ? ? ? ?

a __ a __ b c __ c __ __ __ __ __

(A) 1, 2, 3, 4

(B) 2, 3, 1, 4

(C) 1, 2, 4, 3

(D) 2, 1, 4, 3

Direction for Questions 91-94 : In each of the following questions, choose one number which is similar to the numbers in the given set.

91. Given set : 992, 733, 845, 632

(A) 114

(B) 326

(C) 425

(D) 947

92. Given set : 134, 246, 358

(A) 372

(B) 460

(C) 572

(D) 684

93. Given set : 538, 725, 813

(A) 814

(B) 712

(C) 328

(D) 219

94. Given set : 4718, 5617, 6312, 8314

(A) 2715

(B) 3410

(C) 5412

(D) 6210

95. In a certain code, TEACHER is written as VGCEJGT. How is CHILDREN written in that code ?

(A) EJKNEGTP

(B) EGKNFITP

(C) EJKNFGTO

(D) EJKNFTGP

96. In a certain code language, RUSTICATE is written as QTTUIDBSD. How would STATISTIC be written in that code ?

(A) RSBUJTUHB

(B) RSBUITUHB

(C) RSBUIRSJD

(D) TUBUITUMB

Directions (Questions 97 to 100) : Study the following information and answer the questions given below :

'P = Q' means 'Q is the father of P';

'P ★ Q' means 'P is the sister of Q';

'P ? Q' means 'Q is the mother of P';

'P $ Q' means 'P is the brother of Q';

'P £ Q' means 'Q is the son of P';

'P $ Q' means 'P is the daughter of Q';

97. Which of the following is not correct ?

(A) R × S ? T means R is the granddaughter of T.

(B) P = Q ? R means R is the grandmother of P.

(C) L $ M ★ O means O is the sister of L.

(D) M ★ O £ P = Q means Q and O are husband and wife

98. Which of the following is correct ?

(A) V × T ★ P means P is the maternal uncle of V.

(B) D ? V × T means D is the granddaughter of T.

(C) L £ M $ R means R is the paternal uncle of L.

(D) M £ R ★ D ? V means M is the son of V.

99. Which of the following indicates 'A is the grandfather of B' ?

(A) M × A = N = B

(B) B $ L × Q × A

(C) B × L × A

(D) L ★ B = S $ Q = A

100. Which of the following means 'F is the paternal uncle of G' ?

(A) G × L $ F $ N

(B) N $ F $ L × G

(C) G × M ★ F $ L

(D) L = F $ Q £ Q

Directions (Questions 101 to 105) : Study the following information carefully and answer the questions given below it :

A sales representative plan to visit each of six companies M, N, P, Q, R and S exactly once during the course of one day. She is setting up her schedule for the day according to the following conditions.

(i) She must visit M before N and R.

(ii) She must visit N before Q.

(iii) The third company she visits must be P.

101. Which of the following must be true of the sales representative's schedule ?

(A) She visits M before Q

(B) She visits N before R

(C) She visits P before M

(D) She visits P before S

102. If the sales representative visits S first, which company must she visit second ?

(A) M

(B) N

(C) P

(D) Q

103. The sales representative could visit any of the following companies immediately after P except :

(A) S

(B) R

(C) M

(D) N

104. If the sales representative visits Q immediately before R and immediately after S, she must visit Q :

(A) first

(B) second

(C) fourth

(D) fifth

105. Which of the following could be the order in which the sales representative visits the six companies ?

(A) M, S, P, N, R, Q

(B) Q, N, P, R, S, M

(C) M, R, N, Q, P, S

(D) P, S, M, R, Q, N

Directions (Questions 106 to 107) : Study the following information carefully to answer these questions :

A number sorting machine when given an input of numbers, rearranges them in a particular manner step-by-step as indicated below till all the numbers are arranged. Given below is an illustration of this arrangement.

And Step VI is the last step for this input.

106. What will be Step III for the following input ?

Input : 68 182 39 93 129 46 21 58

(A) 21 39 68 129 96 46 58 182

(B) 21 39 68 93 129 46 58 182

(C) 21 68 39 93 129 46 58 182

(D) Cannot be determined

107. Given below is the fifth step of an input. What will be the third step ?

Step V : 17 32 43 82 69 93 46 56 99 106

(A) 17 32 82 43 69 93 49 56 99 106

(B) 17 32 82 69 43 96 49 56 99 106

(C) 17 32 82 69 93 43 49 56 99 106

(D) Cannot be determined

108. A man is facing west. He turns 45° in the clockwise direction and then another 180° in the same direction and then 270° in the anti-clockwise direction. Which direction is he facing now ?

(A) South

(B) North-west

(C) West

(D) South-west

109. If you are facing north-east and move 10 m forward, turn left and move 7.5 m, then you are

(A) north of your initial position

(B) south of your initial position

(C) east of your initial position

(D) 12 m from your initial position

110. How many such pairs of letters are there in the word INSTRUCTION which have as many letters between them in the word as in the English alphabet ?

(A) One

(B) Two

(C) Three

(D) Four

111. How many such pairs of letters are there in the word CORPORATE each of which has as many letters in the same sequence between them in the word as in the English alphabet ?

(A) None

(B) One

(C) Two

(D) Three

112. δ = β F 2 ★ K S 7 5 # $ P L V 8 @ M U E 6 ↑ Q G © 9 3 & T Y £

If all the elements after the middle element in the above arrangement are written in the reverse order, which of the following will be seventh towards right of the twelfth element from the left end ?

(A) U

(B) 2

(C) T

(D) 6

113. Three persons A, B and C are standing in a queue. There are five persons between A and B and eight persons between B and C. If there are three persons ahead of C and 21 behind A, then what could be the minimum number of persons in the queue ?

(A) 27

(B) 28

(C) 40

(D) 41

114. Satish remembers that his brother's birthday is after fifteenth but before eighteenth of February whereas his sister Kajal remembers that her brother's birthday is after sixteenth but below nineteenth of February. On which day in February is Satish's brother's birthday ?

(A) 16th

(B) 17th

(C) 18th

(D) 19th

115. If × stands for –, ÷ stands for ÷, + stands for ÷ and – stands for ×, which one of the following equations is correct ?

(A) 15 – 5 ÷ 5 × 20 + 10 = 6

(B) 8 + 10 – 3 ÷ 5 × 6 = 8

(C) 6 × 2 + 3 ÷ 12 – 3 = 15

(D) 3 ÷ 7 – 5 × 10 + 3 = 10

116. A group consisting of 25 teachers, 20 engineers, 18 doctors and 12 salesmen visited a fair and spent Rs. 1330 altogether. It was found that 5 teachers spent as much as 4 engineers,

12 engineers spent as much as 9 doctors and 6 doctors spent as much as 8 salesmen. If every person in a professional group spent the same amount, find the amount spent by each engineer.

(A) Rs. 14

(B) Rs. 17.50

(C) Rs. 18

(D) Rs. 21

117.

18	24	32
12	14	16
3	?	4
72	112	128

(A) 2

(B) 3

(C) 4

(D) 5

118. What should come in the place of question mark (?) in the following letter sequence?

AZB, CYD, EXF, ?, IVJ, KUL

(A) FYH

(B) GWG

(C) HWH

(D) None of these

119. What should come in the place of question-mark (?) in the following series?

ATTRIBUTION, TTRIBUTIO, RIBUTIO, IBUTI,?

(A) BUT

(B) UTI

(C) UT

(D) IBU

120. The positions of the first and the eighth letters in the word WORKINGS are interchanged. Similarly, the positions of the second and the seventh letters are interchanged, the positions of the third letter and the sixth letter are interchanged, and the positions of the remaining two letters are interchanged with each other. Which of the following will be the third letter to the left of R after the rearrangement?

(A) G

(B) S

(C) I

(D) N

121. Antonym of HIRSUTE

(A) Scaly

(B) Bald

(C) Erudite

(D) Quiet

122. Antonym of SHRINK

(A) Contract

(B) Spoil

(C) Expand

(D) Stretch

123. Synonym of STERILE

(A) Barren

(B) Arid

(C) Childless

(D) Dry

124. Synonym of ABJECT

(A) Challenge

(B) Miserable

(C) Deny

(D) Disobey

Directions :- Look at the underlined part of each sentence. Below each sentence are given four possible substitutions of the underlined part. If one of them (A), (B), (C) or (D) is better than the underlined part then indicate your response by choosing the correct option.

125. What are you looking upon in the dark .

(A) Over

(B) After

(C) For

(D) On

126. She prefers coffee to tea.

(A) Than

(B) Over

(C) For

(D) No improvement

127. Can you tell me where he has gone ?

(A) Where has gone he

(B) Where gone has he

(C) Where has he gone

(D) no improvement

128. The teacher asked me, <u>what is the matter</u>

(A) What was the matter

(B) What the matter was

(C) What the matter is

(D) No improvement

129. P. to produce a product

Q. to let the target market known about it

R. it is not just enough

S. but it is equally important

The correct sequence should be

(A) P R S Q

(B) R P Q S

(C) P R Q S

(D) P R S Q

130. There is

P. who might

Q. in this respect

R. be helpful

S. one person

The correct sequence should be

(A) Q R S P

(B) P Q R S

(C) S P R Q

(D) R S P Q

Direction : Pick out the most effective pair of words from the given pair of words to make the sentence/sentences meaningfully complete.

131. _____ the activities of moneylenders could have an adverse impact on those who _____ access to bank credit.

(A) encouraging, enjoying

(B) permitting, denied

(C) confining, entitled

(D) curbing, lack

132. The government has decided not to make any _____ changes in the country's tax _____.

(A) sweeping, regime

(B) transparent, hike

(C) drastically, net

(D) constitutional, revenue

Out of the four alternatives choose the one that can be substituted for the given words/sentences in the following questions.

133. A disease that spreads by means of germs carried in atmosphere_

(A) Infectious

(B) Epidemic

(C) Contagious

(D) Endemic

134. A Government that is carried on through officers _

(A) Bureaucracy

(B) Officiousness

(C) Class one

(D) Dictatorship

Choose from the answer choices given under each sentences, the phrase or words that, gives the same meaning as the words italicized in the given sentence.

135. Though defeated, Chechanya, the Separatist republic of Russia, would not *give in.*

(A) To yield

(B) To to negotiate

(C) To succeed

(D) No error

136. The family *took off* for Florida___

(A) Adopt

(B) Fly in sky

(C) start

(D) Parted

Passage 1

Most employees decide their working hours, set production quotas, improve products and processes, are responsible for their own quality and for approval of leadership appointments. Everyone votes on major corporate decisions and on how to split the profits.

As confidence in its novel approach has grown, Semco has happily abolished a lot more of the conventions by which businesses are usually run. No secretaries, receptionists or personal assistants. Reserved parking spaces and dining rooms, dress codes and almost all rules have gone, including those for travel and expenses.

137. From the passage it is clear that the novel approach referred to is

(A) bureaucratic

(B) democratic

(C) aristocratic

(D) autocratic

138. In the given passage, ' semco' is the name of

(A) brand of the product being produced

(B) a novel approach to things and affairs

(C) a business establishment

(D) The leader of secretaries, receptionists and personal assistants

139. The term ' leadership appointments' has been used in this passage to signify

(A) Selecting Company Directors

(B) Choosing trade union leaders

(C) appointing officers - in - charge of various units/ sections

(D) None of the above

140. The employees referred to are

(A) for essential services

(B) government employees

(C) employees of a public sector undertaking

(D) employees of a private company

Directions for question 141 to 144: In each of the following questions, there are sentences that form a paragraph. Identify the sentence(s) or part(s) of sentence(s) that is/are correct in terms of grammar and usage (including spelling, punctuation and logical consistency). Then, choose the most appropriate option.

141. A. In any criticle work, personal expressions of opinion, however dangerous, hardly can be avoided.

B. Effective exposition mean criticism and evaluation.

C. I do not think it is necessary to abstain from criticism in order that I may give a fair and impartial statement.

D. I can only hope that the subject is treated in a calm and dispassionate way.

(A) Only A

(B) Only D

(C) C and D

(D) A and B

142. A. The more subculture groupings in a society, the greater the potential freedom of the individual.

B. This is why pre-industrial man, despite romantic myths to contrary, suffered so bitterly from lack of choice.

C. Sentimentalists prattle about the supposedly unfettered freedom of the primitives.

D. But evidence collected by anthropologists and historians contradict them.

(A) Only A

(B) Only C

(C) A and D

(D) B and C

143. A. Most people remember the Emergency because it represented general loss of liberty.

B. They do not understand that suppressing economic liberty we destroyed growth and the future of two generations.

C. Our controls and red tapes stifled the entrepreneur and the farmer.

D. The command mentality of the bureaucrat continues till today to frustrate every effort at reform.

(A) Only A

(B) Only C

(C) A and B

(D) C and D

144. A. People everywhere want to feel superior than others, and all societies have some sort of hierarchy.

B. But this doesn't mean that they have a caste system.

C. In India, hierarchy has been institutionalized, carried much farther and has lasted much longer.

D. The question is whether India's deep-rooted obsession with ranking has suppressed our capacity to grow and develop.

(A) D

(B) A and C

(C) B and D

(D) C

Direction for questions 145 to 148: In each of the following sentences, four options of rewriting the sentence are given. You are required to identify the best way of writing the sentence in the context of the correct usage of standard written English. While doing so, you have to ensure that the message being conveyed remains the same in all the cases.

145. If she were to decide to go to a B-School, one would recommend that she go to IIM, Ahmedabad.

(A) If she has to decide to go to a B-School, one would recommend that she go to IIM, Ahmedabad.

(B) If she was to decide to go to a B-School, one would recommend that she go to IIM, Ahmedabad.

(C) Had she decided to go to a B-School, one would recommend that she go to IIM, Ahmedabad.

(D) In the event that she decides to go to a B-School, one would recommend that she go to IIM, Ahmedabad.

146. Except for him and I, everyone brought a present for the little birthday boy.

(A) Except for him and I, everyone brought a present for the birthday body.

(B) With the exception of you and I, everyone brought a present for the birthday boy.

(C) Except for you and I, everyone had brought a present for the birthday boy.

(D) Except for you and me, everyone brought a present for the birthday boy.

147. When one reads the English literature of the twentieth century, you find a striking contrast between the writings of Leo Tolstoy and later day writers of popular English fiction.

(A) When one reads the English literature of the twentieth century, you find a striking contrast between the writings of Leo Tolstoy and Later day writers of popular English fiction.

(B) when you read the English literature of the twentieth century, one finds a striking contrast between the writings of Leo Tolstoy and later day writers of popular English fiction.

(C) When one reads the English literature of the twentieth century, he finds a striking contrast between the writings of Leo Tolstoy and later day writers of popular English fiction.

(D) If one reads the English literature of the twentieth century, you find a striking contrast between the writings of Leo Tolstoy and later day writers of popular English fiction.

148. Because of his upper arm injury, Basheshar Lal has not and possibly never will be able to pick up the bow again.

(A) Because of his upper arm injury, Basheshar Lal has not and possibly never will be able to pick up the bow again.

(B) Because of his upper arm injury, Basheshar Lal has not and possibly will never be able to pick up the bow again.

(C) Because of his upper arm injury, Basheshar Lal has not been and possibly never would be able to pick up the bow again.

(D) Because of his upper arm injury, Basheshar Lal has not been able to and possibly never will be able to pick up the bow again.

Direction for questions 149 & 150: Each of the given sentences has four numbered parts. One of them has a mistake. Mark the number of the wrong part as answer.

149. Her ability to / talk to strangers / is one of her / stronger points.

(A) (B) (C) (D)

150. The efforts / to eradicate the / disease has now reach its peak / no error.

(A) (B) (C) (D)

ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Answer	B	A	B	C	A	A	A	A	B	D	A	D	C	C	B	C	B	B	A	C
Question	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Answer	C	C	A	B	C	D	D	B	A	B	C	C	B	D	C	A	C	A	C	A
Question	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	A	B	A	A	C	B	B	C	A	C	A	A	A	B	D	D	A	D	D	B
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Answer	A	C	D	C	D	B	C	C	A	B	A	C	C	A	A	C	B	B	B	D
Question	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Answer	A	A	A	A	D	D	C	D	C	A	C	B	D	C	D	B	C	D	D	A
Question	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Answer	A	A	C	D	A	B	D	D	A	D	C	C	B	B	B	B	B	D	B	D
Question	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Answer	B	C	A	B	C	D	C	A	D	C	D	D	A	A	A	D	B	C	C	D
Question	141	142	143	144	145	146	147	148	149	150										
Answer	C	B	D	C	B	D	C	D	D	C										

HINTS & SOLUTIONS

1.(B) Take $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}; B = 10^{-2}\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$

$$AB = 10^{-2}\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} = 10^{-2}\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$$

$$BA = 10^{-2}\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix} = 10^{-2}\begin{bmatrix}1 & 1\\ 0 & 0\end{bmatrix}$$

$\therefore$ $AB \neq BA$

$\therefore$ computation of second term on R.H.S is not valid.

2.(A) There are seven positions to be filled.

The first position can be filled using any of the 7 letters contained in PROBLEM.

The second position can be filled by the remaining 6 letters as the letters should not repeat.

The third position can be filled by the remaining 5 letters only and so on.

Therefore, the total number of ways of rearranging the 7 letter word = 7*6*5*4*3*2*1 = 7! Ways.

3.(B) He can vote in ${}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 + {}^{10}C_4$ ways

= 10 + 10 . 9 /2 + 10 . 9 . 8 /(3 . 2) + 10 . 9 . 8 . 7 / (4 . 3 . 2) ways

= 10 + 45 + 120 + 210 = 385 ways

Hence option (b) is the correct answer.

4.(C) $7^2 = 49.\ 7^4 = 49 \times 49 = 2401$

$\therefore$ $7^6, 7^{10}, 7^{14}$ all end with 9.

$7^8, 7^{12}, 7^{16}$ all end with 1.

Now $7^m + 7^n$ will be divisible by 5 if one ends with 9 and other ends with 1 so that the sum has 0 in the end.

$\therefore$ m can be 2,6, 10, 14 .....98 (25)

n can be 4,8, 12, 16 .....100 (25)

$\therefore$ But m and n can { size 8 each } change.

$$P = 2.\frac{25\times 25}{100\times 100} = \frac{1}{8}$$

5.(A) x is the identity element of G.

$\therefore$ The inverse of $-\frac{1}{x}$ is $-\frac{1}{x}$, because

$\frac{-1}{(-1/x)} = x$ which is the identity element of G.

6.(A) $x \in R \Rightarrow x + x \in R$

Now, $(x+x)^2 = (x+x)$ (given)

$\Rightarrow$ $(x+x)(x+x) = x+x$

$\Rightarrow$ $(x+x)x + (x+x)x = x+x$ (Left distributive law)

$\Rightarrow$ $(x^2+x^2)x + (x^2+x^2) = x+x$ (Right distributive law)

$\Rightarrow$ $(x+x) + (x+x) = x+x$ $[\because x^2 = x]$

$\Rightarrow$ $(x+x) + (x+x) = (x+x) + 0$ $[\because x + 0 = x]$

$\Rightarrow$ ...(1)

{by left cancellation law for addition in R}

Now, $x + y = 0$

$\Rightarrow$ $x + y = x + x$ (from (1))

$\Rightarrow$ $y = x$ (by left cancellation law for addition in R)

7.(A) Here $\alpha + \beta = p$ and $\alpha\beta = q$

Since for the required equation,

the sum of the roots $= (\alpha\beta + \alpha + \beta) + (\alpha\beta - \alpha - \beta)$

$$= 2\alpha\beta = 2q$$

and the product of the roots $= (\alpha\beta + \alpha + \beta).(\alpha\beta - \alpha - \beta)$

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

$$= q^2 - p^2.$$

Hence the required quadratic equation is :

$$x^2 - 2qx + (q^2 - p^2) = 0.$$

8.(A) Volume $V = \pi\int_0^{\pi} r^2 \sin^2\theta \frac{dx}{d\theta} d\theta$

$$x = r\cos\theta = a(\cos\theta + \cos^2\theta)$$

$$\frac{dx}{d\theta} = -a(\sin\theta + 2\sin\theta\cos\theta)$$

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

Let $\cos\theta = t \qquad -\sin\theta\, d\theta = dt$

$$V = \pi\int_1^{-1} a^3(1+t)^2(1-t^2)(1+2t)dt$$

$$= -\pi a^3\int_{-1}^{1}\left[\left\{(1+t^2)(1-t^2) + 2t(1-t^2)\right\}(1+2t)\right]dt$$

$$= -\pi a^3\int_{-1}^{1}\{1-t^4-2t-2t^3\}(1+2t)dt$$

$$= -\pi a^3\int_{-1}^{1}\{1-t^4-2t^3-2t+2t-2t^5-4t^2-4t^4\}(1+2t)dt$$

$$= -\pi a^3 \left[2\int_0^1 \left(1 - 5t^4 - 4t^2\right) dt \right] + \text{integral of odd powers is zero, being odd function.}$$

$$= -2\pi a^3 \left[t - \frac{5t^5}{5} - \frac{4t^3}{3} \right]_0^1$$

$$= -2\pi a^3 \left[1 - 1 - \frac{4}{3} \right] = \frac{8}{3}\pi a^3 .$$

9.(B) The region of integration is the shaded portion of one loop of the curve as shown in the figure.

We integrate first w.r.t. r keeping θ constant, thus the strip OP, is formed. In this integration θ is kept constant

and r varies from r = 0 to $r = a\sqrt{\cos 2\theta}$ on the curve, and limits of θ are obtained as follows

$$a^2 \cos 2\theta = 0 \;\Rightarrow\; \cos 2\theta = 0$$

$$\Rightarrow\; 2\theta = \pm\frac{\pi}{2} \quad \theta = \pm\frac{\pi}{4}$$

So lower and upper limits of θ are $-\frac{\pi}{4}$ and $\frac{\pi}{4}$ respectively.

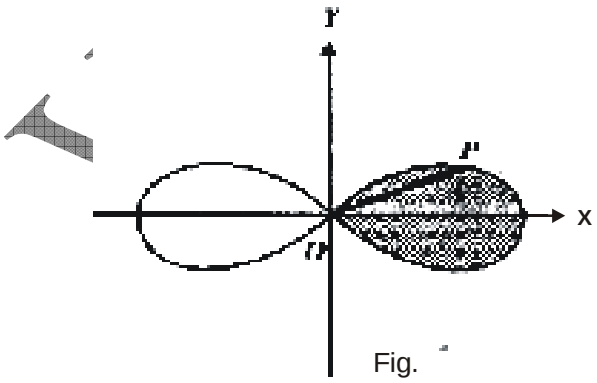


Fig.

So the double integral is written as

$$= \int_{-\pi/4}^{\pi/4} \int_{0}^{a\sqrt{\cos 2\theta}} \frac{r\,dr}{\sqrt{a^2+r^2}}\,d\theta$$

$$= \int_{-\pi/4}^{\pi/4} \left(\sqrt{a^2+r^2}\right)_{0}^{a\sqrt{\cos\theta}} d\theta$$

$$= 2\int_{0}^{\pi/4} \left(a\left[1+\cos\theta\right]^{1/2} - a\right) d\theta$$

$$= 2a\int_{0}^{\pi/4} \left(\sqrt{2}\cos\theta - 1\right) d\theta$$

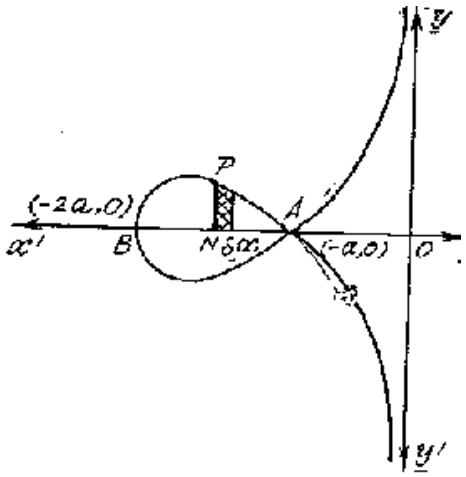
$$= 2a\left[\sqrt{2}\sin\theta - \theta\right]_{0}^{\pi/4}$$

$$= 2a\left[\sqrt{2}\times\frac{1}{\sqrt{2}} - \frac{\pi}{4}\right]$$

$$= 2a\left(1 - \frac{\pi}{4}\right).$$

10.(D) The curve $x^2 + y^2 = a^2$ is a circle with centre 0 (0, 0) and radius a.

The equation x + y = a or (x/a) + (y/a) = 1 represents a straight line which cuts off intercepts a and a from positive directions of x and y axes.



Hence the points of intersection of $x^2 + y^2 = a^2$ and x + y = a are A (a, 0) and B (0, a) respectively. So the area under consideration is the area AQPBP' Q' A.

$\therefore$ The required area

$$= \int_{x=0}^{a} \int_{y=P'N}^{PN} dx\, dy,$$

where $PN = \sqrt{(a^2 - x^2)}$ and P'N = a – x

$$= \int_{x=0}^{a} \int_{y=(a-x)}^{\sqrt{(a^2-x^2)}} dx\, dy = \int_0^a [y]_{(a-x)}^{\sqrt{(a^2-x^2)}}\, dx$$

$$= \int_0^a \left[\sqrt{(a^2 - x^2)} - (a - x)\right] dx$$

$$= \left[\left\{\tfrac{1}{2}x\sqrt{(a^2 - x^2)} + \tfrac{1}{2}a^2 \sin^{-1}(x/a)\right\} - ax + \tfrac{1}{2}x^2\right]_0^a$$

$$= \left[\tfrac{1}{2}a^2\left(\tfrac{1}{2}\pi\right) - a^2 + \tfrac{1}{2}a^2\right] = \tfrac{1}{2}a^2\left(\tfrac{1}{2}\pi - 1\right) = \tfrac{1}{4}a^2(\pi - 2).$$

11.(A) $\int_0^2 \int_0^{2x-4} \frac{2y-1}{x+1} dx\, dy = \int_0^2 \frac{1}{x+1}\left(y^2 - y\right)_0^{2x-4} dx$

$$= \int_0^2 \frac{(2x-4)^2-(2x-4)}{x+1}dx = \int_0^2 \frac{4x^2-18x+20}{x+1}dx$$

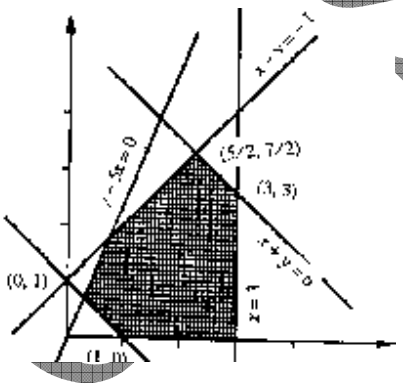
$$= \int_0^2 \left(4x-22+\frac{42}{x+1}\right)dx = \left[2x^2-22x+42\log(x+1)\right]_0^2$$

$$= \left[\left\{2(2^2)-22(2)+42\log 3\right\}-\left\{0+42\log 1\right\}\right]$$

$$= 8-44+42\log 3 = 6\left[7\log 3-6\right]$$

12.(D) The shaded region represents the bounded region.

(3, 3) satisfies, so x = 3, y = 3 and z = 15.



13.(C) The probability of solving the question by these three students are $\frac{1}{3}, \frac{2}{7}$ and $\frac{3}{8}$ respectively.

$P(A) = \frac{1}{3}; P(B = \frac{2}{7}) ; P(C) = \frac{3}{8}$

Then probability of question solved by only one student

$$= P(A\bar{B}\bar{C} \text{ or } \bar{A}B\bar{C} \text{ or } \bar{A}\bar{B}C$$

$$= P(A)P(\bar{B})\,P(\bar{C}) + P(\bar{A})P(B)\,P(\bar{C}) + P(\bar{A})P(\bar{B})\,P(C)$$

$$=\frac{1}{3},\frac{5}{7}.\frac{5}{8}+\frac{2}{3}.\frac{2}{7}.\frac{5}{8}+\frac{2}{3}.\frac{5}{7}.\frac{3}{8}=\frac{25+20+30}{168}=\frac{25}{56}$$

14.(C) Required probability $=\frac{4}{52}.\frac{3}{51}=\frac{1}{221}$.

15.(B) Let a = 1, b = 2, so $c=\frac{a+b}{2}=\frac{1+2}{2}$ = 1.5 $f(1.5)$ = -2.125 < 0 and $f(2)$ = 2 > 0 Hence roots lie in (1.5, 2)

16.(C) According to trapezoidal rule,

$$\int_0^{80} x\,dx=\frac{80-0}{8\times 2}\left\{0+2\left(4+7+9+12+15+14+8\right)+3\right\}$$ = 5 (141) = 705 sq. m.

17.(B) $h=\frac{10-1}{3}=3$

$y=x^3$

$$\int_1^{10} x^3\,dx=\frac{3}{2}\left[\left(1+10^3\right)+2\left(4^3+7^3\right)\right] \quad =3\left(\frac{1+10^3}{2}+4^3+7^3\right)$$; Clearly $\alpha=4^3$

18.(B) Given that

$$f(x)=\int_0^{x^2}\sqrt{\sin t+\cos t}.dt$$

Let us have a problem of this type

$$y=\int_{\phi_1(x)}^{\phi_2(x)} f(t)\,dt$$

To find $\frac{dy}{dx}$

For Let $\int F(t)\,dt = \psi(t)$

$\therefore \quad F(t) = \psi'(t)$

Now, $y = \psi(\phi_2(x)) - \psi(\phi_1(x))$

$$\frac{dx}{dy} = t'\left(d_2(x) f_2' t\, x\right) - x'\left(f.(x)\right) f_1'(x)$$

$$\frac{dy}{dx} = F(\phi_2(x))\phi_2'(x) - F(\phi_1(x))\phi_1'(x)$$

Treat it is a formula.

In the given problem $\phi_1(x) = 0, \phi_2(x) = x^2$

and $F(t) = \sqrt{\sin t + \cos t}$

Now, $\frac{dy}{dx} = \sqrt{\sin x^2 + \cos x^2}.2x - \sqrt{\sin 0 \cos 0.0} = 2x\sqrt{\sin x^2 + \cos x^2}$.

19.(A) $\int \frac{x^2+1}{x^4+1}dx$

$$= \int \frac{1+\frac{1}{x^2}}{x^2+\frac{1}{x^2}}dx \qquad = \int \frac{1+\frac{1}{x^2}}{\left(x^2+\frac{1}{x^2}-2\right)+2}dx \qquad = \int \frac{1+\frac{1}{x^2}}{\left(x-\frac{1}{x}\right)+\left(\sqrt{2}\right)^2}dx$$

Let $x-\frac{1}{x} = t \Rightarrow \left(1+\frac{1}{x^2}\right)dx = dt$

$$= \int \frac{dt}{t^2+\left(\sqrt{2}\right)^2} \qquad = \frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{t}{\sqrt{2}}\right) \qquad = \frac{1}{\sqrt{2}}\tan^{-1}\frac{x-\frac{1}{x}}{\sqrt{2}}$$

$$= \frac{1}{\sqrt{2}} \tan^{-1} \frac{x^2 - 1}{\sqrt{2}x}$$

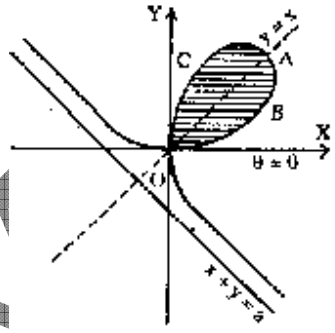
20.(C) $\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} (x+y+z)\,dy\,dx\,dz = \int_{-1}^{1} \int_{0}^{z} \left[\left(\frac{(x+y+z)^2}{2} \right) \right]_{x-y}^{x+z} dx\,dz$

$$= \int_{-1}^{1} \int_{0}^{z} \left[\frac{(2x+2z)^2}{2} - \left(\frac{2x}{2} \right)^2 \right] dx\,dz = 2\int_{-1}^{1} \left[\int_{0}^{3} \left((x+z)^2 - x^2 \right) dx \right] dz$$

$$= 2\int_{-1}^{1} \left[\frac{(x+z)^2}{3} - \frac{x^3}{3} \right]_0^z dz \qquad = \frac{2}{3}\int_{-1}^{1} \left[(2z)^3 - z^3 - z^3 \right] dz$$

$$= \frac{2}{3}\int_{-1}^{1} 6z^3\,dz = 4\left[\frac{z^4}{4} \right]_{-1}^{1} \qquad = 4\left(\frac{1}{4} - \frac{1}{4} \right) = 0$$

21.(C) The curve is $x^3 + y^3 - 3axy = 0$



Changing the curve into polar form by substituting x = r cos , y = r sin , we get

$$r = \frac{3a \sin\theta \cos\theta}{\cos^3\theta + \sin^3\theta}$$

∴ Required area of the curve is given by

$$A = 2 \times \text{area of OBAO} \quad = 2\int_0^{\pi/4} \frac{1}{2} r^2 d\theta \quad = \int_0^{\pi/4} \frac{9a^2 \sin^2\theta \cos^2\theta}{\left(\sin^3\theta + \cos^3\theta\right)^2} d\theta \quad = 9a^2 \int_0^{\pi/4} \frac{\tan^2\theta . \cos^2\theta}{\left(1 + \tan^3\theta\right)^2} d\theta$$

Putting $1+\tan^3\theta = t$

$\Rightarrow \quad 3\tan^2\theta\sec^2\theta\, d\theta = dt$

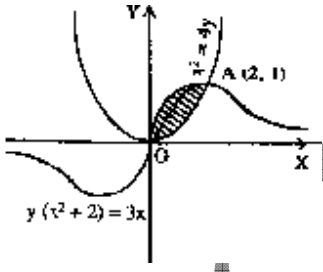
$\therefore \quad A = 3a^2\int_1^2 \frac{dt}{t^2} = 3a^2\left(-\frac{1}{t}\right)_1^2$

$= \frac{3}{2}a^2$

22.(C) The equations of given curves are $y\left(x^2+2\right)=3x$ ...(i)

and $4y = x^2$ ...(ii)

The curve (i) and (ii) intersect at A (2, 1)



$\therefore$ The required area

$$A = \int_{x=0}^{2}\int_{y=x^2/4}^{3x/\left(x^2+2\right)} dy\,dx = \int_{x=0}^{2}[y]_{y=x^2/4}^{3x/\left(x^2+2\right)}dx = \int_0^2\left[\frac{3x}{x^2+2}-\frac{x^2}{6}\right]dx = \frac{3}{2}\int_0^2\left[\frac{2x}{x^2+2}-\frac{x^2}{6}\right]dx$$

$$= \frac{3}{2}\left[\log\left(x^2+2\right)-\frac{x^3}{18}\right]_0^2 = \frac{3}{2}\left[(\log 6-\log 2)-\frac{4}{9}\right] = \frac{3}{2}\log 3-\frac{2}{3}$$

23.(A) A.E of the given equation

(D3 + 1)y = (ex + 1)2 is-

m3 + 1 = 0

$\Rightarrow$ (m + 1)(m2 - m +1) = 0

$\Rightarrow$ m = -1, m = $\frac{1\pm\sqrt{3}i}{2}$

$\therefore$ C.F. = C1e–x + ex/2 $\left(C_2\cos\frac{\sqrt{3}}{2}x + C_3\sin\frac{1}{2}\sqrt{3}x\right)$

and P.I. = $\frac{1}{D^3+1}.\left(e^x+1\right)^2 = \frac{1}{D^3+1}\left(e^{2x}+2e^x+1\right)$

$= \frac{1}{2^3+1}e^{2x} + 2\cdot\frac{1}{1^3+1}e^x + \frac{1}{0^3+1} = \frac{1}{a}e^{2x} + e^x + 1$ ...(1)

Hence general solution of the given equation is

y = C1e–x + ex/2 $\left(C_2\cos\frac{\sqrt{3}}{2}x + C_3\sin\frac{\sqrt{3}}{2}x\right) + \frac{1}{9}e^{2x} + e^x + 1$

24.(B) The equation of the curve is y = sin x

$\therefore$ The required surface area

$S = 2\pi\int_0^{\pi} \sin x\sqrt{1+\cos^2 x}dx$

$\left(\because S = 2\pi\int_0^{\pi} y\frac{ds}{dx}dx\right)$ $= 4\pi\int_0^{\pi/2} \sin x\sqrt{1+\cos^2 x}\,dx$

Put cos x = t $\Rightarrow -\sin x\,dx = dt$

$\therefore$ $S = 4\pi\int_1^0 \sqrt{1+t^2}(-dt)$ $= 4\pi\int_1^0 \sqrt{1+t^2}dt$ $= 4\pi[t\sqrt{1+t^2} + \log\left(t+\sqrt{1+t^2}\right)]_0^1$

$= 4\pi[\sqrt{2} + \log\left(1+\sqrt{2}-\log 1\right)] = 4\pi\left[\sqrt{2} + \log\left(1+\sqrt{2}\right)\right]$

25.(C) According to given problem

$\frac{1}{r} + \frac{d\theta}{dr} = c$

$\Rightarrow$ $\int d\theta = \int\left(c - \frac{1}{r}\right)dr$

or, $\theta = cr - \log r + K$

26.(D) $(x^2y - 2xy^2)\,dx - (x^3 - 3x^2y)\,dy = 0$

This is homogeneous and

$Mx + Ny = (x^2y - 2x^2y^2) - (x^3y - 3x^2y^2)$

$= x^2y^2 \neq 0$

$\therefore \quad I.F = \dfrac{1}{Mx+Ny} = \dfrac{1}{x^2y^2}$

27.(D) The given equation is

$(D^2 - 3D - 4)\,y = 0$

roots of the auxiliary equation are -1 and 4

$\therefore$ The solution is $y = c_1e^{-x} + c_2e^{4x}$.

28.(B) $P.I. = \dfrac{1}{D^2+2}x^2e^{3x} + \dfrac{1}{D^2+2}e^x\cos 2x$

$= e^{3x}\dfrac{1}{(D+3)^2+2}x^2 + e^x\dfrac{1}{(D+1)^2+2}\cos 2x$

$= e^{3x}\dfrac{1}{D^2+6D+11}x^2 + e^x\dfrac{1}{D^2+2D+3}\cos 2x$

$= e^{3x}\dfrac{1}{11}\left(1+\dfrac{6}{11}D+\dfrac{D^2}{11}\right)^{-1}x^2 + e^x\dfrac{1}{-2^2+2D+3}\cos 2x$

$= \dfrac{1}{11}e^{3x}\left(1-\dfrac{6}{11}D+\dfrac{25}{121}D^2+\ldots\right)x^2 + e^x\dfrac{1}{2D-1}\cos 2x$

$= \dfrac{1}{11}e^{3x}\left(x^2-\dfrac{6}{11}(2x)+\dfrac{25}{121}(2)\right) + e^x\dfrac{2D+1}{4D^2-1}\cos 2x$

$$= \frac{1}{11}e^{3x}\left(x^2 - \frac{12}{11}x + \frac{50}{121}\right) + e^x \frac{2D+1}{4\left(-2^2\right)-1}\cos 2x$$

$$= \frac{1}{11}e^{3x}\left(x^2 - \frac{12}{11}x + \frac{50}{121}\right) - e^x \frac{1}{17}(-4\sin 2x + \cos 2x)$$

$$= \frac{1}{121}e^{3x}\left(11x^2 - 12x + \frac{50}{11}\right) + e^x \frac{1}{17}(4\sin 2x - \cos 2x)$$

29.(A) $A = \begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$

$$\bar{A} = \begin{bmatrix} 0 & -i \\ +i & 0 \end{bmatrix}$$

and $A\text{-}T = \begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix} = A$

$\because$ $A\text{-}T = A$

$\therefore$ A is Hermitian.

30.(B) $\vec{a} + \vec{b} + \vec{c} = 0$

$\Rightarrow$ $\vec{c} = -(\vec{a} + \vec{b})$

$\Rightarrow$ $(\vec{c})^2 = (\vec{a} + \vec{b})^2$

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

$\Rightarrow$ $|\vec{c}|^2 = |\vec{a}|^2 + |\vec{b}|^2 = 2|\vec{a}|\cdot|\vec{b}|\cos\theta$

$\Rightarrow$ $49 = 9 + 25 + 2.3.5\cos\theta$

$\Rightarrow$ $\cos\theta = \frac{1}{2} = \cos\frac{\pi}{3}$

$\Rightarrow \qquad \theta = \frac{\pi}{3}$

31.(C) $\overrightarrow{PQ}$ = p.v. of Q - p.v. of P

$= 2\hat{i} + 3\hat{j} + 6\hat{k} - \left(-\hat{i} + 3\hat{j} + 5\hat{k}\right)$

$= 3\hat{i} + \hat{k}$

$\therefore$ Direction Ratios of $\overrightarrow{PQ}$ are 3,0,1 i.e.

$\therefore$ (A) is correct statement

Direction Cosines of $\overrightarrow{PQ}$ will be $\frac{3}{\sqrt{10}}0, \frac{1}{\sqrt{10}}$

$\therefore$ (B) is correct statements.

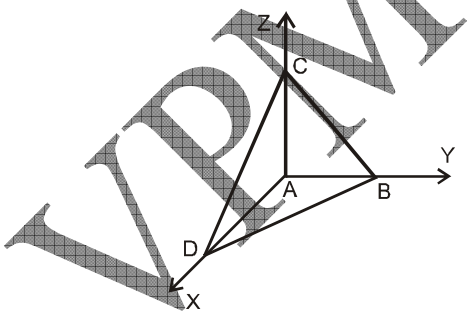
components of PQ are 3,0,1 hence statement (C) is false.

Unit vector along $\overrightarrow{PQ}$ is $\frac{3\hat{i} + \hat{k}}{\sqrt{10}}$,

$\therefore$ (D) is correct statements.

32.(C) The equation of the plane is $x + y + z = 1$

$\therefore \qquad z = 1 - x - y$



$\therefore$ The required volume = volume of BCD

$$V = \int_0^1\int_0^{1-x}(1-x-y)dy\,dx = \int_0^1(y - xy - \frac{1}{2}y^2)_0^{1-x}dx = \int_0^1\left[(1-x) - x(1-x) - \frac{1}{2}(1-x)^2\right]dx$$

$$= \frac{1}{2}\int_0^1(1-x)^2dx$$

$$= \frac{1}{2}\int_0^1(x^2 - 2x + 1)dx \quad = \frac{1}{6}$$

∴ The correct answer is (C).

33.(B) R is not reflexive since |a – a| = 0 and so |a – a| not greater than 0. thus a (~R) a for any real number a R a is symmetric since if |a – b| > 0, then |b – a| = |a – b| > 0. Thus a R b ⇒ b R a is not transitive. For example consider the numbers, 3, 7, 3. Then we have 3 R 7 since |3 – 7| = 4 > 0 and 7 R 3 since |7 – 3| = 4 > 0. But 3(~R)3 since|3 – 3| = 0 so that |3 – 3| not greater than 0.

34.(D) Since A is orthogonal

∴ $AA' = A'A = I$

∴ $(AA')' = (A'A)' = I$

⇒ $(A')'A' = A'(A') = I$

⇒ A' is orthogonal, ∴ (a) holds.

Again $AA' = A'A = I$

⇒ $(AA')^{-1} = A'A = I$

⇒ $(AA')^{-1}A^{-1} = A^{-1}(A')^{-1} = I$

∴ $(A')A^{-1} = A^{-1}(A^{-1})' = I$

∴ A^{-1} is orthogonal. ∴ (c) holds.

∴ (b) is false

35.(C) Let the basic fare for the child be $X.

Therefore, the basic fare for an adult = \$2X.

Let the reservation charge per ticket be \$Y

Hence, an adult ticket will cost 2X + Y = \$216

And ticket for an adult and a child will cost 2X + Y + X + Y = 3X + 2Y = 327

Solving for X, we get X = 105.

The basic fare of an adult ticket = 2X = 2*105 = \$210

36.(A) ${}^{n}C_{r} = {}^{n}C_{n-r} \Rightarrow D^{r} = C_{k} + C_{k} = {}^{2}C_{k}$

$$\therefore \quad E = \sum_{k=1}^{n} \left(\frac{kC_k}{2C_k}\right)^2 = \sum_{k=1}^{n} \left(\frac{k}{2}\right)^2 = \frac{1}{4}\sum n^2$$

$$= \frac{1}{4}.\frac{n(n+1)(2n+1)}{6}$$

$$= \frac{n(n+1)(2n+1)}{24}$$

37.(C) Let OAB be the quadrant of the circle. Take the bisector of the quadrant to be the x axis. Let the circle be $x^2 + y^2 = a^2$. The arc ACB revolves about the chord AB which is perpendicular to x axis and at a distance a cos 45^0 from the y axis. Due to symmetry about x axis,

Required Volume $V = 2\int_{0}^{\pi/4} \pi\left(x - a\cos 45^0\right)^2 dy$

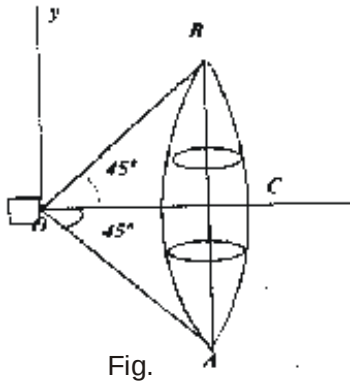


Fig.

$$V = 2\pi \int_0^{a/\sqrt{2}} \left(x^2 + \frac{a^2}{2} - \frac{2a}{\sqrt{2}} x \right) dy$$

$$= 2\pi \int_0^{a/\sqrt{2}} \left\{ a^2 - y^2 + \frac{a^2}{2} - a\sqrt{2}\sqrt{a^2 - y^2} \right\} dy$$

$$= 2\pi \left[\frac{3a^2}{2} y - \frac{y^3}{3} - \frac{a\sqrt{2}}{2} \left\{ y\sqrt{a^2 - y^2} + a^2 \sin^{-1} \frac{y}{a} \right\} \right]_0^{a/\sqrt{2}}$$

$$= 2\pi \left[\frac{3a^3}{2\sqrt{2}} - \frac{a^3}{6\sqrt{2}} - \frac{a\sqrt{2}}{2} \left(\frac{a}{\sqrt{2}} \right)^2 - \frac{a^3}{\sqrt{2}} \frac{\pi}{4} \right]$$

$$= \frac{2\pi a^3}{6\sqrt{2}} \left[9 - 1 - 3 - \frac{3\pi}{2} \right] = \frac{\pi a^3}{6\sqrt{2}} (10 - 3\pi).$$

38.(A) The region of integration is the shaded portion OAB of the cardioid above the initial line, as shown in figure.

So limits of integration are r = 0 to r = a $(1+\cos\theta)$ and θ = 0 to $\theta = \pi$

$\therefore$ The integral is

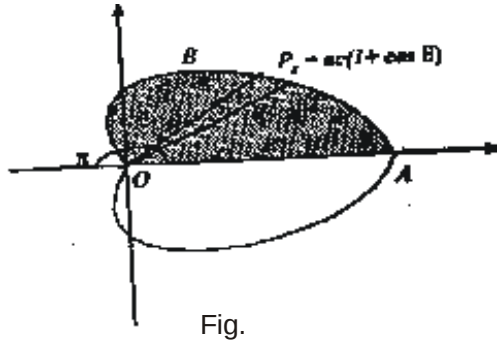


Fig.

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

$$= \frac{1}{4} \int_0^{\pi} \left(r^4\right)_0^{a(1+\cos\theta)} \sin\theta \cos\theta \, d\theta$$

$$= \frac{a^4}{4} \int_0^{\pi} (1+\cos\theta)^4 \sin\theta \cos\theta \, d\theta$$

put $1+\cos\theta = t$ so $-\sin\theta \, d\theta$

$$= \frac{a^4}{4} \int_2^0 t^4 . (t-1) (-dt)$$

$$= \frac{a^4}{4} \left[\frac{t^6}{6} - \frac{t^5}{5} \right]_0^2 = \frac{a^4}{4} \left(\frac{2^6}{6} - \frac{2^5}{5} \right)$$

$$= \frac{a^4}{4} . 2^5 \left(\frac{2}{6} - \frac{1}{5} \right)$$

$$= 8a^4 \left(\frac{10-6}{30} \right)$$

$$= \frac{16}{15} a^4 .$$

39.(C) The equations of the curve are $x = t^2,\ y = t - \frac{1}{3}t^3$

$\therefore dx/dt = 2t$ and $dy/dt = (1 - t^2)$

Hence $\frac{ds}{dt} = \sqrt{\left\{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right\}} = \sqrt{\left\{4t^2 + (1-t^2)^2\right\}} = \sqrt{(1+t^2)^2}$

or $ds/dt = (1 + t^2)$

Also for the loop (putting y = 0) t varies from 0 to $\sqrt{3}$.

$\therefore$ The required surface $= 2\pi\int_{t=0}^{\sqrt{3}} y\, ds = 2\pi\int_{t=0}^{\sqrt{3}} y.\frac{ds}{dt}dt$

$= 2\pi\int_{t=0}^{\sqrt{3}} \left(t - \frac{1}{3}t^3\right)(1+t^2)\, dt$

$= \frac{2\pi}{3}\int_0^{\sqrt{3}} \left(3t + 2t^3 - t^5\right)dt = \frac{2\pi}{3}\left[\frac{3}{2}t^2 + \frac{1}{2}t^4 - \frac{1}{6}t^6\right]_0^{\sqrt{3}}$

$= \frac{2}{3}\pi\left[(9/2) + (9/2) - (9/2)\right] = 3\pi.$

40.(A) Given that

$f(x) = (x^3 - 6x^2 + 12x - 8)e^x$

$\therefore f'(x) = e^x(3x - 12x + 12) + (x^3 - 6x^2 + 12x - 8).e^x$

$= 3e^x(x - 2)^2 + (x - 2)^3 e^x$

$= e^x(x - 2)^2(x + 1)$

$f''(x) = e^x(x + 1).2(x - 2) + m(x - 2)^2.[e^x + (x + 1)e^x]$

$= e^x(x-2)(x+2x-2)$

$$f'''(x) = e^x(x-2).(2x+2) + \left(x^2+2x-2\right)\left[e^x + (x-2)e^x\right]$$

$$= e^x.x(x^2 + 2x - 5)$$

For maximum and minimum

$$f'(x) = 0$$

$$\Rightarrow e^x(x-2)^2(x+1) = 0$$

$$\Rightarrow \quad x = 2.\ x = -1$$

At x = 2, $f''(x) = 0$

but $f'''(x) \neq 0$

$\therefore$ At x = 2, f(x) is neither maximum nor minimum.

$\therefore$ Both assertion (A) and reason (R) are correct and R is the correct explanation of A.

Aliter- Put $f'(x) = 0$

$\Rightarrow$ $x = 2, x = -1$

When $x < 2$, $f'(x) = e^x(x-2)^2(x+1) > 0$

and for $x > 2$, $f'(x) = e^x(x-2)^2(x+1) > 0$

since the sign of $f'(x)$ does not change as x varies for left of x = 2 to right of x = 2, hence f(x) has neither maximum nor minimum

41.(A)

10101
10001 [Complement of 01110]
100110
1 (add the carry of 1)
00111

Result $=(00111)_2$

42.(B)

$$x \uparrow (y \downarrow z) = (x \uparrow y) \downarrow (x \uparrow z)$$

Consider $x \uparrow (y \downarrow z) = x \uparrow \left(\overline{y+z}\right)$

$$= \left(\overline{x+y}\right)$$

$$= \overline{x} + (y+z)$$

and $(x \uparrow y) \downarrow (x \uparrow z) = (\overline{xy}) \downarrow (\overline{xz}) = (\overline{xy} + \overline{xz})$

$$= xyxz$$

$$= xyz$$

Hence NOR and NAND are not distributive

43.(A)

	QUOTIENT	REMAINDER	REMARK
Divide 39 by 2.	19	1 (LSB)	There is one 1 and nineteen 2s.
Divide 19 by 2. (This is equivalent to division by 4).	9	1	There is one 2 and nine 4s.
Divide 9 by 2. (It is equivalent to division by 8).	4	1	There is one 4 and four 8s.
Divide 4 by 2. (It is equivalent to division by 16).	2	0	There is zero 8 and two 16s.
Divide 2 by 2. (It is equivalent to division by 32).	1	0	There is zero 16 and one 32.
Divide 1 by 2. (It is equivalent to division by 64)	0	1 (MSB)	There is one 32 and zero 64.

The binary number is 100111.

The last remainder is MSB and the 1st remainder LSB.

Conversion of a Decimal Number to Octal Number.

For the conversion of a decimal number to an octal number, the technique of division by 8 can be used.

44.(A) $(4F2D)_{16}$ = (0100) (1111) (0010) (1101)

1 4 F 2 D

= **$(0100111100101101)_2$**

Hexadecimal numbers are used with microprocessors and microcomputers for the convenience of the programmer. But the microprocessor accepts the binary equivalent of a hexadecimal number. There is a provision for such machine language conversion in the microprocessor-based system.

45.(C) Hexadecimal for B 4 A C . D 0 E

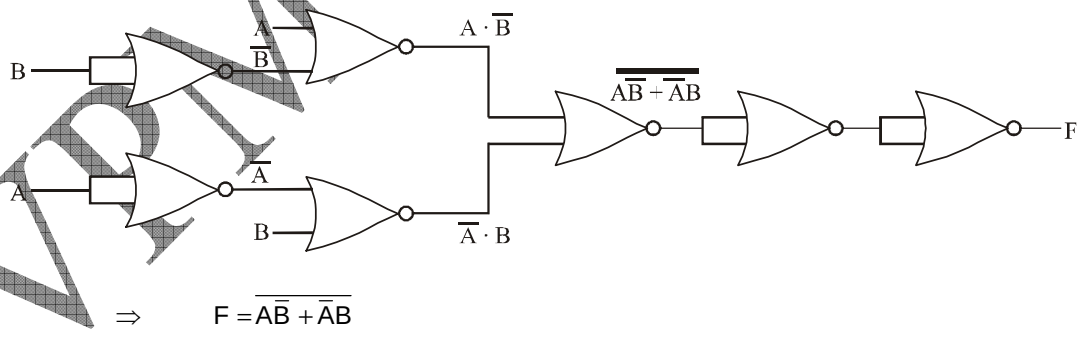
4-bit binary form:

1011 0100 1010 1100. 1101 0000 1110

Result in $(1011\ 0100\ 1010\ 1100.\ 1101\ 0000\ 1110)_2$

46.(B) "10.." printed after 1st "printf" statement & function f1 definition doesn't make any change to 'a' variable's values so it remains 10, answer will be "10..10".

47.(B)



$\Rightarrow \quad F = \overline{A\overline{B} + \overline{A}B}$

$\Rightarrow \quad F = \overline{\overline{A\overline{B} + \overline{A}B}}$

$\Rightarrow \quad F = \overline{\overline{A\overline{B} + \overline{A}B}}$

$\Rightarrow$ $F = \overline{A\bar{B} + \bar{A}B}$ (involution law)

$\Rightarrow$ $F = A \odot B$ (X NOR)

48.(C) Incorrect array definition is provided as missing parenthesis between the last parenthesis (}) and semicolon (;) which should be like :

<DT> a [ ] [ ] = { { } ,

{ } ,

{ } } ;

49.(A) The equation is separable. Separating the variables we get

$$\frac{dy}{y-1} = -\frac{3x\,dx}{x^2+1}.$$

Therefore

$$\int \frac{dy}{y-1} = -\int \frac{3x\,dx}{x^2+1}$$

which after integration on both sides gives

$$\ln(y-1) = -\frac{3}{2}\ln(x^2+1) + c,$$

where c is a constant of integration. We can determine c from the initial condition y(0) = 2. Substituting x = 0 in the previous formula we get ln $(2-1) = -\frac{3}{2}\ln(0^2+1) + c$, i.e. $c = 0$.

Hence

$$\ln(y-1) = -\frac{3}{2}\ln(x^2+1).$$

Exponentiating both sides gives

$$y - 1 = \left(x^2+1\right)^{-\frac{3}{2}}$$

or $\boxed{y = 1 + \left(x^2 + 1\right)^{-\frac{3}{2}}}$

The correct answer is (A)

50.(C)

8	461	Remainder
8	57	5(least significant digit)
8	7	1
	0	7(most significant digit)

51.(A) 456 (octal) = (100) (101) (110)

4 5 6

= 100101110 (binary).

Now the equivalent binary number is divided into groups of 4 bits to get the equivalent hexadecimal number.

100101110 (binary) = (1) (0010) (1110)

= (0001) (0010) (1110)

= (1) (2) (E)

= **12 E (hex).**

52.(A)

$$y = A.(B+1) + \bar{A}.B$$
$$= A.B + A + \bar{A}.B$$
$$= (A + \bar{A}).B + A$$
$$= B + A$$

53.(A)

$$y = A.A + A.B + \bar{A}.B + B$$
$$= A + A.B + \bar{A}.B + B$$
$$= A + (A + \bar{A}).B + B$$
$$= A + B + B$$
$$= A + B$$

54.(B) A thread can't change from the RUNNABLE state to the BLOCKED state without first being scheduled and taking an action that causes it to block

55.(D) 200ns to access the memory.

If TLB miss then 2 memory access is needed i.e. (200 + 200) = 400 ns needed.

So effective access time = 200x .75 x .25 = 100 + 150 = 250ns

56.(D) 1A5D (hex) = $1 \times 16^3 + A \times 16^2 + 5 \times 16^1 + D \times 16^\circ$

= 4096 + 10 × 256 + 80 + 13 × 1

= 4096 + 2560 + 80 + 13

= 6749 (decimal)

57.(A) M = 72532 72532

N = 03250

10's complement of N = 96750 + 96750

end carry → 1 69282

69282

58.(D) sqrt (a * a + b * b) ;

Hence, sqrt (a+2 * a+2 + b + 3* b + 3)

Here operator precedence works.

Therefore , sqrt (a + 2a + 2 + b + 3b + 3)

& sqrt (3a + 4b + 5)

or, sqrt (3*a + 4*b + 5)

59.(D) In expression

AB + AB' + A'C

= A (B + B') + A'C

= A (1) + C

So, one needs just a single OR gate

60.(B) a = 10

b = 5

c = 10

So if (10 > 5) && (10 <=10)

then a = 11,

c = 10

61.(A) Abs (i) Returns absolute value of i included in "stdlib.h" but rest otherS are mathematical functions part of "math. h%.

62.(C) + + A + ABC

F = + + + ABC + ABC + ABC (Idempotent law)

F = (commutative law)

F = BC + AC () + AB

F = BC.1 + AC.1 + AB.1 ∴ (Inverse law))

F = BC + AC + AB ∴ (Identity law)

F = AB + BC + CA ∴ (Commutative law)

63.(D) A macro is a small software program which is a series of instructions written in a computer language to execute a specific task. A macro is a series of word command which have been grouped together as a single command used to perform any operation repetitively.

64.(C) Grouping into there bits : $\frac{11}{3}\ \frac{111}{7}\ \frac{100}{4}\ \frac{011}{3}\ \frac{1}{4}$

Result is $= (374.34)_8$

65.(D) Successive Division Remainder

8	854
8	106
8	13
8	1
	0

6
2
5
1 ↑

$\Rightarrow (854)_{10} = (1526)_8$

for decimal places

.97 * 8 = 7.76

.76 *8 = 6.08

. 08*8 = 0.64 ↓

So, $(0.97)_{10} = (0.760)_8$

Result in = $(1526.760)_8$

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

$\therefore \quad A = M_0 . M_1 . M_2 . M_3$

$\therefore \quad (\bar{A}+B) M_4 . M_5$

$\therefore \quad (\bar{A}+B+\bar{C}) = MS$

So, $A.(\bar{A}+B).(\bar{A}+B+\bar{C}) = M_0 . M_1 . M_2 . M_3 . M_4\ M_s$

$= \Pi M (0, 1, 2, 3, 4, 5)$

67.(C) The XOR logic gate is used in parity checker or parity (odd/ even) is being counted by the number of 1's in a bit combination. As XOR - truth table represents '1' only if all bits are either (all) zero's or (all) one's

A	B	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

68.(C) $t_1 = \Pi_{empname}\ (\sigma_{compname = \text{"SBI"}\ salary > 1000}(words))$

$\Pi_{emp.empname}\ (\sigma_{emp.empname = t1.\ empname}\ (t_1 \times emp))$

Cartesian operation is binary operation

performs on two relation.

there are two relations t1, 4 emp.

and both σ (emp. ename = t1 . empname.)

69.(A) There is two relation - emp and company $\Pi_{emp.empname}\ (\sigma_{emp.empname = t1.empname}\ (t_1 \times emp))$

find the name of all company for which they work.

there is t1 $\rightarrow$ returns the city of company .

70.(B) $F = \bar{A}\left(\bar{B}C + B\bar{C}\right) + A\left(\bar{B}\bar{C} + BC\right)$

$= \bar{A}(B \oplus C) + A\left(\overline{B \oplus C}\right)$

$= A \oplus B \oplus C$ XOR formation as $\left(\bar{A}B + A\bar{B} = A \oplus B\right)$

71.(A) As in this query we have to select the salary from the employee table so the results is as follows

SALARY

30,000
40,000
25,000
43,000
38,000

72.(C) In this query we have to retrieve the names of all employes who do not have supervisors.

Hence we have the query as

```
SELECT    FNAME , LNAME
FROM      EMPLOYEE
WHERE     SUPERSSN IS NULL;
```

So, the results will be

FNAME	LNAME
Ramesh	Narayan

73.(C) Unlike some other layers of OSI, the presentation layer does not generally correspond to many particular network protocol. The presentation layer instead deals with data formats. For example, GIF (Graphic Interchange Format) and JPEG (Joint Photographic Experts Group) image formats fit into the presentation layer.

74.(A) Repeaters operate on the electrical signals of network communication. They regenerate signals by amplifying their strength and sometimes reconstructing to recover from distortion. An active hub is perhaps the most common physical manifestation of a repeater. Being at the lowest level of OSI, repeaters lack the intelligence of higher-level, devices like bridges and routers.

75.(A) *Content transfer-encoding* : header field in MIME alert the receiving user agent that message body has been ASCII – encoded and indicate type of encoding used.

76.(C) Rest all the phases are mail transfer phase.

Acknowledgment phase has confirmation information about the messages sent by client.

This is dynamically generated

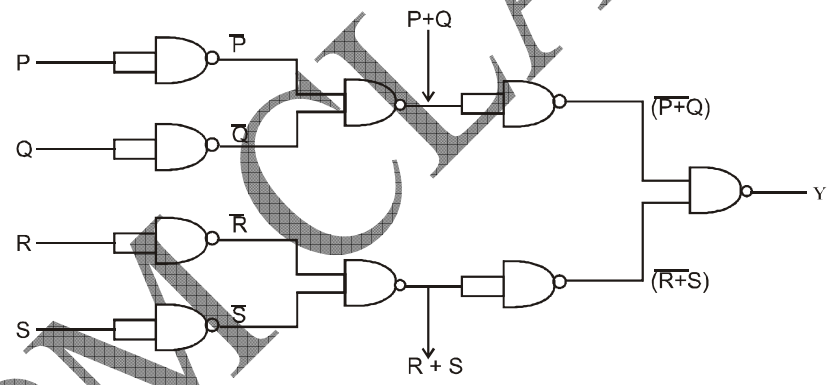
77.(B) *UA* **-** is the electronic mail program associated with a specific operating system that allow a user to type & edit message

78.(B) $F = xy + \bar{x}y + x\bar{y}$

x	y	x.y	$\bar{x}$	$\bar{y}$	$\bar{x}\cdot\bar{y}$	$\bar{x}y$	$x\bar{y}$	$\bar{x}y + \bar{x}y + x\bar{y}$
0	0	0	1	1	1	0	0	0
0	1	0	1	0	0	1	0	1
1	0	0	0	1	0	0	1	1
1	1	1	0	0	0	0	0	1

x	y	x + y
0	0	0
0	1	1
1	0	1
1	1	1

79.(B)



$\therefore y = \overline{(P+Q)}.\overline{(R+S)}$

$y = \overline{\overline{(P+Q)}} + \overline{\overline{(R+S)}}$ $\therefore$ (Demorgan's law)

$= (P + Q) + (R + S) = P + Q + R + S$ $\therefore$ (Involution law)

80.(D)

$$\begin{array}{cc} 1111 & 1110 \\ 1000 & 1000 \\ \hline 0111 & 0110 \\ \underbrace{}_{7} & \underbrace{}_{6} \end{array}$$

81.(A) To answer the question, consider statement I. It is mentioned in the statement that the breadth = 3 cm and the length + 2 = 3 + 2 = 5 cm. We know that the area of a rectangle is defined as the product of its length and breadth. Therefore the area of the rectangle is $3 \times 5 = 15$ cm^2.

Now let us consider statement II. In this statement, it is mentioned that the length of the rectangle is less than 7 cm. and no mention of the breadth of the rectangle is made. Since we need to have both length and breadth to calculate the area of the rectangle, the data provided in statement II is not sufficient to answer the question.

Since we are able to answer the question using statement I alone, and we cannot answer the question using statement II alone, the answer choice is (a).

82.(A) The average weight is defined as

$$\frac{\text{Total weight of the class}}{\text{Total number of students}}$$

We have the total number of students as 30 from the main statement, and the total weight of the class as per statement I is 1200 kg. So, we have the average weight of the class as $\frac{1200}{30} = 40$ kg.

Considering statement II, which does not give the total weight of the class, the average weight of the class cannot be calculated from it (statement II) alone.

Hence, the answer choice is (a).

83.(A) Consider statement I. Since the dimension of the length and breadth of a rectangle are not given, the area cannot be computed.

Consider statement II. Since the dimension of the length (5 cm.) and breadth (3 cm.) are specified, the area of the rectangle $(1 \times b) = 5 \times 3 = 15$ cm^2 can be calculated.

Since I alone is not sufficient to answer the question and II alone is sufficient to answer, choice is (a).

84.(A) By using statement I, we would not be able to compute the average weight of the class, since nothing is mentioned about the number of students and their total weight.

By using statement II, we can compute the average weight, i.e.,

$$= \frac{\text{Total weight}}{\text{The number of students}}$$

$$= \frac{1200}{30} = 40 \text{ kg.}$$

Statement II alone is sufficient to answer the question and statement I alone is not sufficient; hence, the answer choice is (a).

Solutions for questions 85 to 89:

Let us denote Left and Right as shown below :

• L • R

Now, let us represent the data given in pictorial form (We use R for Raj and Rn for Rajan; Va for Vardhan; Vi for Vimal; S for Shyam; M for Mithra and K for Kishan).

Mithra sits at the left extreme – next to Kishan → M K – – – – – –.

Shyam sits to the immediate left of Vardhan and third to the right of Rajan → Rn – – S Va.

Putting both the above together, Va can go only to extreme right position. Thus, we have the arrangement as M K Rn – – S Va.

Raj and Vimal occupy the two vacant seats between Rajan and Shyam.

85.(D) From the seating arrangement above, Vardhan is to the immediate right of Shyam. Choice (d)

86.(D) If Kishan and Vardhan exchange places, as can be seen from the arrangement, the person to the immediate left of Rajan will be Vardhan. Choice (d)

87.(C) If Shyam sits between Raj and Vardhan, then the seating arrangement is as follows: Mithra, Kishan, Rajan, Vimal, Raj, Shyam, Vardhan. Then, Vimal will be exactly in the middle of the row.

88.(D) Statement (1) makes the arrangement as:

Mithra, Kishan, Rajan, Raj, Vimal, Shyam, Vardhan

Statement (2) gives the seating arrangement as:

Mithra, Kishan, Rajan, Raj, Vimal, Shyam, Vardhan.

Statement (3) makes the seating arrangement as:

Mithra, Kishan, Rajan, Vimal, Raj, Shyam, Vardhan.

So, only statement (4) cannot make the seating arrangement unique while others can.

Important point to note is that on the basis of the given data, we know that the places of only Raj and Vimal have not been fixed. Hence, if there is an additional statement that we are considering to determine the arrangement uniquely, it SHOULD have at least one of the two people Raj and Vimal. In this case, choice (4) does not have either one of the two names and hence, this statement cannot help us determine the arrangement uniquely. So, this becomes the answer choices.

89.(C) The arrangement is

M K Rn R/Vi Vi/R S Va.

Rajan exchange his place with Mithra, and Vimal with Vardhan, then we have the following arrangement:

Rn K M R/Va Va/R S Vi.

While we still do not know the exact position of Vardhan (or which place Vimal sits), we can see that there are five persons between Rajan and Vimal.

90.(A) Clearly, in the second series, 1 occurs at the same position as D occurs in the first series So, 1 corresponds to D. Thus, the first question mark below D is to be replaced by 1. Now, in the third series, c at the eighth place corresponds to A in the first series, while c at the sixth place corresponds to 2 in the second series. So, 2 corresponds to A. Thus the second question mark below A is to be replaced by 2.

In the third series, a at the first place corresponds to B in the first series and a at the third place corresponds to 4 in the second series. So, 4 corresponds to B. Thus, the question mark below B is to be replaced by 4.

Now, only 3 remains. So, 3 corresponds to C. Thus, the question mark below C is to be replaced by 3. Thus, DACB corresponds to 1, 2, 3, 4.

Hence, the answer is (a).

91.(C) In all the numbers, the middle digit is the sum of the digits of the product of other two digits.

Now, $9 \times 2 = 18$, $1 + 8 = 9$ (middle digit in 992);

$7 \times 3 = 21$, $2 + 1 = 3$ (middle digit in 733);

$8 \times 5 = 40$, $4 + 0 = 4$ (middle digit in 845) and so on.

92.(B) The first digits of the numbers form the series 1, 2, 3, 4. The second digits of the numbers form the series 3, 4, 5, 6.

The last digits of the numbers form the series 4, 6, 8, 0.

93.(D) In all the numbers, (1st digit + 3rd digit) – middle digit = 10.

Thus, $5 + 8 - 3 = 10$, $7 + 5 - 2 = 10$, $8 + 3 - 1 = 10$.

94.(C) In all the numbers, the product of the first and last digits is a multiple of the sum of the middle two digits.

Thus, $4 \times 8 = 32$ is a multiple of $(7 + 1)$, i.e., 8,

$5 \times 7 = 35$ is a multiple of $(6 + 1)$, i.e., 7 and so on.

95.(D) Clearly, each letter in the word TEACHER is moved two steps forward to obtain the corresponding letter of the code.

T	E	A	C	H	E	R
+2 ↓	+2 ↓	+2 ↓	+2 ↓	+2 ↓	+2 ↓	+2 ↓
V	G	C	E	J	G	T

Similarly, we have :

C	H	I	L	D	R	E	N
+2↓	+2↓	+2↓	+2↓	+2↓	+2↓	+2↓	+2↓
E	J	K	N	F	T	G	P

So, the desired code is EJKNFTGP. Hence, the answer is (d).

96.(B) Clearly, the middle letter of the word remains unchanged in the code. Each of the first two and the last two letters of the word is moved one step backward, while each of the remaining letters is moved one step forward to obtain the corresponding letters of the code.

R	U	S	T	I	C	A	T	E
–1↓	–1↓	+1↓	+1↓	↓	+1↓	+1↓	–1↓	–1↓
Q	T	T	U	I	D	B	S	D

Similarly, we have:

S	T	A	T	I	S	T	I	C
–1↓	–1↓	+1↓	+1↓	↓	+1↓	+1↓	–1↓	–1↓
R	S	B	U	I	T	U	H	B

So, the required code is RSBUITUHB. Hence, the answer is (b).

97.(C) R × S ? T means R is the daughter of S whose mother is T i.e. R is the granddaughter of T.

P = Q ? R means R is the mother of Q who is the father of P i.e. R is the grandmother of P.

L $ M ★ O means L is the brother of M who is the sister of O i.e. L is the brother of O i.e. O is the brother of sister of L.

M ★ O £ P = Q means Q is the father of the son (P) of O i.e. Q is the father and O is the mother of P i.e. Q and O are husband and wife.

98.(D) V × T ★ P means V is the daughter of T who is the sister of P i.e. P is the brother/sister of the mother of V i.e. P is either maternal uncle or maternal aunt of V.

D ? V × T means V is the mother of D and daughter of T i.e. D is the son/daughter of T's daughter i.e. D is the grandson or grand daughter of T.

L £ M $ R means M is the son of L and the brother of R i.e. R is the son of L.

M $ R ★ D ? V means M is the brother of R who is the sister of D whose mother is V i.e. M is the brother of R who is the daughter of V i.e. M is the son of V.

99.(D) M × A = N = B means B is the father of N who is the father of A i.e. B is the grandfather of A.

B $ L × Q × A means B is the brother of L who is the daughter of Q who is the daughter of A i.e. A is the grandfather or grandmother of B.

B × L × A means B is the daughter of L who is the daughter of A i.e. A is the grandfather or grandmother of B.

L ★ B = S $ Q = A means A is the father of Q whose brother is S who is the father of B i.e. A is the father of B's father i.e. A is the grandfather of B.

100.(A) G × L $ F $ N means G is the daughter of L who is the brother of F who is the brother of N i.e. F is the brother of L who is the father of G i.e. F is the paternal uncle of G.

N $ F $ L × G means N is the brother of F who is the brother of L who is the daughter of G i.e. F is the brother of L who is the daughter of G i.e. F is the son of G.

G × M ★ F $ L means G is the daughter of M who is the sister of F who is the brother of L i.e. F is the brother of the mother of G i.e. F is the maternal uncle of G. L = F $ Q £ G means G is the son of Q whose brother is F i.e. F is either maternal or paternal uncle of G.

101.(A) Clearly, she visits M before N and N before Q. So she must visit M before Q.

102.(A) Of the six companies if S is first, P is third and the orders M N Q and M R are followed. Clearly, M must be visited second.

103.(C) Since P is at third place and orders M N Q and M R are to be followed, so immediately after P she can visit any company except M and which may occupy first or second place because Q, R and N cannot precede it.

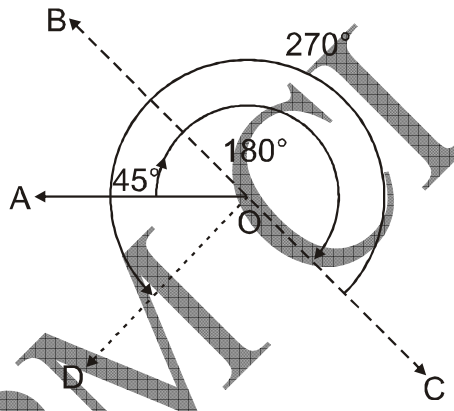
104.(D) If Q is visited just before R and immediately after S, the order followed will be M N S Q R. Since P must be in 3rd place, so we have M N P S Q R i.e., Q will be visited fifth.

105.(A) According to information, P must be in third place and the order M, N and Q must not be violated. This followed only in the arrangement M S P N R Q.

106.(B)	**Input**	**:**	68	182	39	93	129	46	21	58
	Step I	**:**	21	68	182	39	93	129	46	58
	Step II	**:**	21	68	39	93	129	46	58	182
	Step III	**:**	21	39	68	93	129	46	58	182

107.(D) Since the numbers may be rearranged in several possible ways, so it is not possible to determine any of the previous steps.

108.(D) Clearly, the man initially faces in the direction OA. On moving 45° clockwise, he faces in the direction OB. On further moving 180° clockwise, he faces in the direction OC. Finally on moving 270° anti-clockwise, he faces in the direction OD, which is South-west. Hence, the answer is (d).



109.(A) Clearly, the narrator starts from A, moves towards north-east a distance of 10 m upto B, turns left (90° anti-clockwise) and moves 7.5 m upto C.

Clearly, C lies to the north of A.

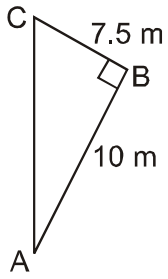
Also, ΔABC is right-angle at B.

So, $AC^2 = AB^2 + BC^2 = (10)^2 + (7.5)^2$

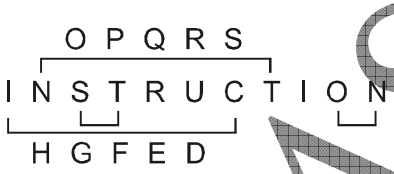
$= 100 + 56.25 = 156.25.$

$\Rightarrow$ AC $= (\sqrt{1256.25})$ m = 12.5 m.

Thus, the narrator is 12.5 m to the north of his initial position.



110.(D) Clearly, we have :



As depicted above, C and I have five letters between them in the given word as well as in English alphabet; N and T again have five letters between them and each of the pairs (S and T) and (N and O) have no letter between them.

Thus, there are four such pairs. Hence, the answer is (d).

111.(C)

Three pairs – (P, R), (R, T) and (P, O) have as many letters between them in the word as in the English alphabet. But since the letters must be in the same sequence in the word as in the English alphabet, so the desired pairs are (P, R) and (R, T) only.

Hence, the answer is (c).

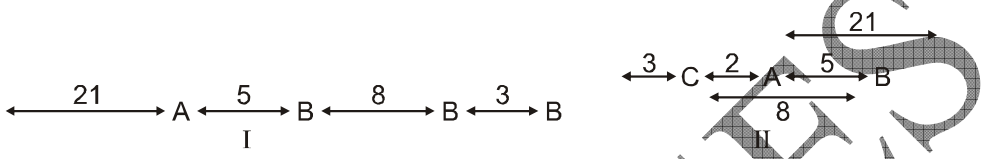
112.(C) The middle element in the given arrangement is 8. Writing all the elements after 8 in the reverse order, we get the following sequence :

δ = β F 2 ★ K S 7 5 # $ P L V 8 £ Y T & 3 9 © G Q ↑ 6 E U M @

Counting from the left in the above sequence, the twelfth element is $. The seventh element to the right of $ is T.

Hence, the answer is (c).

113.(B) As per the given conditions, there are two possible arrangements as shown below :



Clearly, for the minimum number of persons, we shall consider arrangement II.

In II, number of persons in the queue = (3 + 1 + 2 + 1 + 21) = 28.

Hence, the answer is (b).

114.(B) According to Satish, the brother's birthday is on one of the days among 16th and 17th February.

According to Kajal, the brother's birthday is on one of the days among 17th and 18th February.

Clearly, Satish's brother's birthday is on the day common to both the above groups, i.e. 17th February.

Hence, the answer is (b).

115.(B) Using the proper signs, we get :

Expression in (a) = 15 × 5 ÷ 5 – 20 ÷ 10 = 15 × 5 + 5 – 2 = 75 + 5 – 2 = 78.

Expression in (b) = $8 + 10 \times 3 \div 5 - 6 = 8 + 10 \times \frac{3}{5} - 6 = 8 + 6 - 6 = 8$.

Expression in (c) = $6 - 2 \div 3 + 12 \times 3 = 6 - \frac{2}{3} + 36 = 42 - \frac{2}{3} = \frac{124}{3}$.

∴ Statement (b) is true.

116.(B) Let the amount spent by a teacher, an engineer, a doctor and a salesman be Rs x, Rs y, Rs z and Rs w respectively. Then, we have :

$5x = 4y$, $12y = 9z$ and $6z = 8w$

$\Leftrightarrow 15x = 12y = 9z$ and $6z = 8w$

$\Leftrightarrow 30x = 24y = 18z = 24w = k$ (say)

$\Leftrightarrow x = \frac{k}{30}, y = \frac{k}{24}, z = \frac{k}{18}, w = \frac{k}{24}.$

Also, $25x + 20y + 18z + 12w = 1330$

$\Leftrightarrow 25 \times \frac{k}{30} + 20 \times \frac{k}{24} + 18 \times \frac{k}{18} + 12 \times \frac{k}{24} = 1330$

$\Leftrightarrow \frac{5}{6}k + \frac{5}{6}k + k + \frac{k}{2} = 1330 \Leftrightarrow \frac{19k}{6} = 1330 \Leftrightarrow k = \left(\frac{1330 \times 6}{19}\right) = 420.$

$\therefore$ Amount spent by each engineer = $y = \frac{k}{24}$ = Rs. $\left(\frac{420}{24}\right)$ = Rs. 17.50.

Hence, the answer is (b).

117.(B) In the first column, $12 \times (18 \div 3) = 72$.

In the third column, $16 \times (32 \div 4) = 128$.

Let the missing number be x. Then, in the second column, we have :

$14 \times (24 \div x) = 112 \Leftrightarrow 24 \div x = 8 \Leftrightarrow x = 3$.

Hence, the answer is (b).

118.(D) Observe the first letters of each group, These letters are alternate letters starting from A. Hence, the first letter of the missing group will be G. Similarly, observe second and third letters of each group. Hence, the required group is GWH.

119.(B) $\boxed{A}$TTRIBUTIO$\boxed{N} \Rightarrow$ TTRIBUTIO

T T RIBUTIO ⇒ RIBUTIO

R IBUTI O ⇒ IBUTI

I B UTI ⇒ UTI

120.(D) After interchanging, the order of the letters in the word becomes as follows:

S G N I K R O W

The third letter to the left of R is N.

PART-D (ENGLISH)

121.(B) Hirsute :- Having or covered with hair.

Bald :- Lacking hair on all or most of the scalp or Without the natural or usual covering.

Thus 'Bald' is the antonym of 'Hirsute'.

122.(C) Shrink :- Decrease in size, range, or extent.

Expand :- Become larger in size, volume or quantity.

Thus 'Expand' is the antonym of Shrink.

123.(A) Sterile :- Incapable of reproducing.

Barren :- desolate and lifeless.

Thus 'Barren' is the synonym of 'Sterile'.

124.(B) Abject means :- Of the most contemptible kind, and miserable provides the same meaning.

125.(C) Upon will be replaced by For. Look upon is used to look on or to consider which does not go with the sentence. Instead for is the most suitable word for the sentence which means :- Try to locate or discover, or try to establish. The existence of. 'Look for' is a fixed preposition.

126.(D) Sentence is correct in itself so no need of improvement.

127.(C) Correct option is (C). In interrogative sentences helping verbs (i.e. 'has' here) are always used before subject.

Structure for Interrogative sentences:- Wh + HV + Sub.+ MV.+ Object

128.(A) Correct option is (A). The first sentence is in simple past tense so accordingly the later half sentence will also be in past tense.

129.(D) Correct sequence of sentence is given below:-

to produce a product it is not just enough but it is equally important to let the target market known about it.

130.(C) Correct sequence of sentence is given below:-

one person who might, be helpful in this respect.

131.(D) Correct pair of words is given in option (C).

Curbing means :- Restricting the scope or freedom of action.

Lack means :- to be devoid of certain privileges..

132.(D) Correct pair of words for this sentence is given in option (A).

Constitutional means :- any inherent change

Revenue means :- tax income

133.(A) Correct option is (A).

Infectious means :- Caused by infection or capable of causing infection.

134.(A) Correct option is (A).

Bureaucracy :- A government that is administered primarily by bureaus that are staffed with nonelective officials.

135.(A) Correct option is (A).

Give in :- Yield to another's wish or opinion.

136.(D) Correct option is (D).

Took Off :- Head for somewhere else or part away.

137.(B) The novel approach referred to in the passage is the democratic approach. The employees decide their own working hours, set production quotas etc.

138.(C) In the given passage, Semco is the name of a business establishment. It is evident in the second paragraph of the passage.

139.(C) " Leadership appointments" refers to appointing officers - in- charge of various units/ sections in the passage.

140.(D) The employees referred here are the employees of a private company. This can be inferred from the line " Everyone votes on major corporate decisions and on how to split the profits".

141.(C) In sentence A the adverb 'hardly' is wrongly positioned. It should be between the auxiliary verbs-can hardly be avoided. In sentence B, the verb should be means, not mean, to agree with the subject exposition. Sentences C and D are grammatically correct.

142.(B) In sentence A, it should be 'subcultural' (adj.) since it qualifies groupings. There are instances where a noun qualifies another noun and acts as an adjective but in such cases they are usually hyphenated. Sentence B has an error in that the definite article 'the' before 'contrary' is missing. In sentence D it should be 'contradicts' since the subject is 'evidence' not anthropologists or historians. Only sentence C is grammatically right.

143.(D) Sentence A must have the indefinite article 'a' before 'general' since it is 'a loss'. Sentence B must have 'by' before suppressing. Sentences C and D are grammatically correct.

144.(C) In sentence A, it should be 'superior to' not 'than'. (Some comparatives like senior, junior, superior, inferior, etc take 'to' not 'than'). In sentence C it should be 'further' not 'farther' (farther implies distance, further implies greater degree). B and D are grammatically right.

145.(B) Option (B) is the best way of expressing the idea. Here 'were' will be replaced by was as 'she' is a used for single person.

146.(D) Option (D) is the best way of expressing the idea.

147.(C) Option (C) is the best way of expressing the idea. The improper use of the pronouns one and you is corrected in Choice (c).

148.(D) The addition of the past participle "been" is corrected in Choice (d).

149.(D) One of her strong points or one of her strongest points, both the forms are acceptable. 'Stronger' is used when we are comparing two things.

150.(C) Error is in part (C) of the sentence. 'Reach' will be replaced by reached as sentence is in present perfect tense.