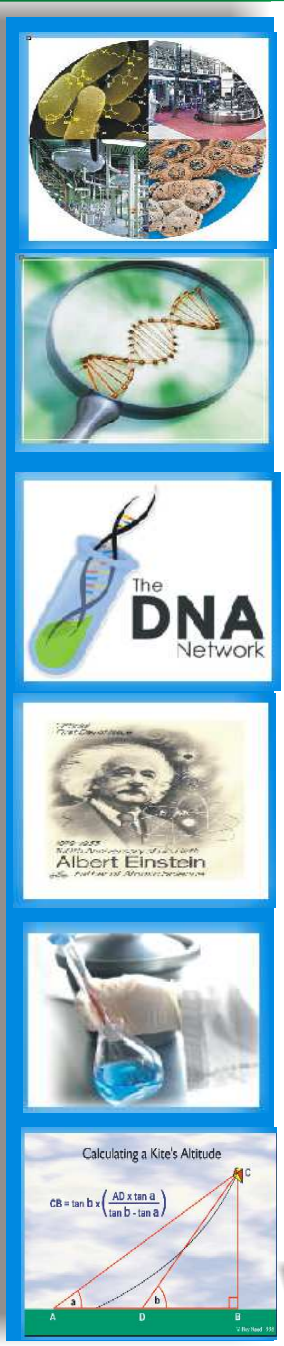

NIMCET - MCA

MOCK TEST PAPER

- ***Attempt all the questions***
- ***This paper consists of 120 objective type questions.***
- ***Each of these question carries 3 marks. 1 negative mark for each wrong answer.***

- ***Pattern of questions : MCQs***
- ***Total marks : 360***
- ***Duration of test : 3 Hours***

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MATHEMATICS

1. The function $f(x)=\begin{cases}x^3-1; 1<x<\infty\\ x-1; -\infty<x\le 1\end{cases}$ at $x=1$ is

(A) Continuous and differentiable

(B) continuous and not differentiable

(C) discontinuous and differentiable

(D) discontinuous and not differentiable

2. The value of $\int e^x \sec^2(e^x)\,dx$ is

(A) tan (e^x) + k

(B) tan (e^x). e + k

(C) e^x tan x + k

(D) $\frac{\tan(e^x)}{e^x}+k$

3. $\int x\sqrt{2x+3}\,dx =$

(A) $\frac{x}{3}(2x+3)^{3/2}+\frac{1}{15}(2x+3)^{5/2}+c$

(B) $\frac{x}{3}(2x+3)^{3/2}+\frac{1}{15}(2x+3)^{5/2}+c$

(C) $\frac{x}{2}(2x+3)^{3/2}+\frac{1}{6}(2x+3)^{5/2}+c$

(D) None of these

4. For all real x, the minimum value of $\frac{1-x+x^2}{1+x+x^2}$ is

(A) 0

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

(C) 1

(D) 3.

5. The max value of the function sin x (1 + cos x) is

(A) 3

(B) $3\sqrt{3}/4$

(C) 4

(D) $3\sqrt{3}$

6. The solution of differential equation $x^2\frac{dy}{dx} = x^2 + xy + y^2$ is

(A) $\tan^{-1}\left(\frac{y}{x}\right) = \log x + c$

(B) $\tan^{-1}\left(\frac{x}{y}\right) = \log x + c$

(C) $\tan^{-1}\left(\frac{x}{y}\right) = \log y + c$

(D) $\tan^{-1}\left(\frac{y}{x}\right) = \log y + c$

7. Solution of equation $x\frac{dy}{dx} - 2y = x^2 + \text{Sin}\left(\frac{1}{x^2}\right)$ is

(A) $\frac{y}{x^2} = \log x + \frac{1}{2}\text{Sin}\frac{1}{x^2} + c$

(B) $\frac{y}{x^2} = \log y + \frac{1}{2}\text{Cos}\frac{1}{x^2} + c$

(C) $\frac{y}{x^2} = \log x + \frac{1}{2}\text{Cos}\frac{1}{x^2} + c$

(D) None of these

8. IF of equation Sin y $\frac{dy}{dx}$ = Cos y (1 - x Cos y) is

(A) x

(B) log x

(C) e^{-x}

(D) None of these

9. By false positioning the second approximation of a root of equation f(x) = 0 is (where x_0, x_1 are initial and first approximation respectively)

(A) $x_0 - \frac{f(x_0)}{f(x_1) - f(x_0)}$

(B) $\frac{x_0 f(x_1) - x_1 f(x_0)}{f(x_1) - f(x_0)}$

(C) $\frac{x_0 f(x_0) - x_1 f(x_1)}{f(x_1) - f(x_0)}$

(D) $x_1 \frac{f(x_0)}{f(x_1) - f(x_0)}$

10. If by Simpson's rule

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

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

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

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

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

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

11. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and A^2 is an identity matrix, then x =

(A) 1

(B) 2

(C) 3

(D) 0.

12. If a matrix A is such that $4A^3 + 2A^2 + 7A + I = O$, then A^{-1} equals

(A) $(4A^2 + 2A + 7I)$

(B) $-(4A^2 + 2A + 7I)$

(C) $-(4A^2 - 2A + 7I)$

(D) $(4A^2 + 2A - 7I)$

13. The maximum value of P = x + 3y, such that $2x + y \le 20, x + 2y \le 20, x \ge 0, y \ge 0$ is

(A) 10

(B) 60

(C) 30

(D) none of these

14. A unit vector in xy-plane that makes an angle 45° with the vector (**i** + **j**) and an angle of 60° with the vector (3i – 4j) is

(A) **i**

(B) $\frac{1}{\sqrt{2}}(\mathbf{i} - \mathbf{j})$

(C) $\frac{1}{\sqrt{2}}(\mathbf{i} + \mathbf{j})$

(D) None of these

15. If **a, b, c** are vectors such that [**a b c**] = 4, then [**a** × b b × **c c** × **a**] =

(A) 16

(B) 64

(C) 4

(D) 8

16. Minimize $z = \sum_{j=1}^{n}\sum_{i=1}^{n} C_{ij}x_{ij}$

subject to $\sum_{j=1}^{n} x_{ij} \le a_i, i = 1, ...,m$

$$\sum_{i=1}^{n} x_{ij} \le b_j, j = 2, ...,n$$

is a LPP with number of constraints

(A) m + n

(B) m – n

(C) mn

(D) $\frac{m}{n}$

17. If **a** = 3**i** – 2**j** + **k**, **b** = 2**i** – 4**j** – 4**k** and **c** = – **i** – 2 **j** + 2**k**, then the magnitude of 2**a** – 3**b** – 4**c** is

(A) 15

(B) $\sqrt{308}$

(C) 281

(D) 23

18. The equation of a line passing through (1, 2) and perpendicular to 3x + 4y + 5 = 0 is

(A) 4x – 3y + 2 = 0

(B) 4x – 3y + 3 = 0

(C) $4x - 3y + 4 = 0$

(D) $4x + 3y - 2 = 0$.

19. The condition that the line $x \cos \alpha + y \sin \alpha = P$ may touch the circle $x^2 + y^2 = a^2$ is

(A) $p = a \cos \alpha$

(B) $p = a \tan \alpha$

(C) $p^2 = a^2$

(D) $p \sin \alpha = a$

20. The equation of a circle that intersects the circle $x^2 + y^2 + 14x + 6y + 2 = 0$ orthogonally and whose centre is (0, 2) is

(A) $x^2 + y^2 - 4y - 6 = 0$

(B) $x^2 + y^2 + 4y - 14 = 0$

(C) $x^2 + y^2 + 4y + 14 = 0$

(D) $x^2 + y^2 - 4y - 14 = 0$

21. Let P (a sec θ, b tan θ) and Q (a sec ϕ, b tan ϕ), where $\theta + \phi = \frac{\pi}{2}$, be two points on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.

If (h, k) is the point of intersection of the normals at P and Q, then k is equal to

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

(B) $-\left(\frac{a^2+b^2}{a}\right)$

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

(D) $-\left(\frac{a^2+b^2}{b}\right)$

22. The number of terms of The A.P. 3, 7, 11, 15... to be taken so that the sum is 406 is

(A) 5

(B) 10

(C) 12

(D) 14

23. The sum 1(1!) + 2(2!) + 3(3!) + ... + n (n!) equals

(A) 3(n!) + n – 3

(B) (n + 1)! – (n – 1)!

(C) (n + 1)! – 1

(D) 2(n!) – 2n – 1

24. If p, q, r are in one geometric progression and a, b, c in another geometric progression, then cp, bq, ar are in

(A) A.P.

(B) H.P.

(C) G.P.

(D) None of these

25. $1+\frac{3}{2!}+\frac{6}{3!}+\frac{10}{4!}+....\infty =$

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

(B) 2 e

(C) 3 e

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

26. Using initial approximation $x_0 = -1$ zero $x = -2$ of polynomial $P(x) = x^5 + 5x^4 - 40x^2 - 80x - 48$ is obtained by Newton's method

Determine its order of convergence

(A) 1

(B) 2

(C) 3

(D) none

27. If all roots of the equation $x^3 - 3x + k = 0$ are real, then the range of values of k is

(A) (–2, 2)

(B) $(-\infty, -2) \cup (2, \infty)$

(C) $(2, \infty)$

(D) None of these

28. Let $f : G \to H$ be a group homomorphism from a group G into a group H with kernel K, If the order of G, H and K are 75, 45 and 15 respectively, then the order of the image f(G) is:

(A) 3

(B) 5

(C) 15

(D) 45

29. In a sample survey, the chances of young professionals courses MBA. degree MCA degree or both are 0.86, 0.35 and 0.29 respectively. What is the probability of owning either or both degree?

(A) 0.82

(B) 0.92

(C) 0.08

(D) 0.18

30. If A and A' are complementary events in a sample space S, then-

(A) $P(A)+P(A')=0$

(B) $P(A)-P(A')=0$

(C) $P(A)+P(A')=1$

(D) $P(A)-P(A')=1$

31. Out of n pairs of shoes 2r (< n) shoes are chosen at random. The probability that not a single pair is chosen is :

(A) $\frac{{}^{n}C_{2r}}{{}^{2n}C_{2r}}$

(B) $\frac{{}^{n}C_{2r} \times 2^{2r}}{{}^{2n}C_{2r}}$

(C) $\frac{{}^{n}C_{2r} \times 2^{r}}{{}^{2n}C_{2r}}$

(D) $\frac{{}^{n}C_{2r}}{{}^{2n}C_{r}}$.

32. If $x \sin\theta = y \sin\left(0 + \frac{2\pi}{3}\right) = z \sin\left(0 + \frac{4\pi}{3}\right)$, then xy + zx + yz is equal to.....

(A) 1

(B) 1/2

(C) 0

(D) None of these

33. If $\tan\alpha = p$ and $\tan\beta = q$, then $\cos(\alpha + \beta)$ is equal to

(A) $\frac{1}{\sqrt{1+p^2}\sqrt{1+q^2}}$

(B) $\frac{1-pq}{\sqrt{1+p^2}\sqrt{1+q^2}}$

(C) $\frac{pq}{\sqrt{1+p^2}\sqrt{1+q^2}}$

(D) None of these.

34. If $\tan\theta = \frac{a}{b}$, then $\frac{\sin\theta}{\cos^8\theta} + \frac{\cos\theta}{\sin^8\theta} =$

(A) $\pm\frac{(a^2+b^2)^4}{\sqrt{a^2+b^2}}\left(\frac{a}{b^8}+\frac{b}{a^8}\right)$

(B) $\pm\frac{(a^2+b^2)^4}{\sqrt{a^2+b^2}}\left(\frac{a}{b^8}-\frac{b}{a^8}\right)$

(C) $\pm\frac{(a^2-b^2)^4}{\sqrt{a^2+b^2}}\left(\frac{a}{b^8}+\frac{b}{a^8}\right)$

(D) $\pm\frac{(a^2-b^2)^4}{\sqrt{a^2+b^2}}\left(\frac{a}{b^8}-\frac{b}{a^8}\right)$.

35. The general value of q which satisfies the equations $\sin\theta = -\frac{1}{2}$ and $\tan\theta = -\frac{1}{\sqrt{3}}$ is

(A) $2n\pi \pm \frac{\pi}{6}$

(B) $\pi + \frac{\pi}{6}$

(C) $n\pi + (-1)^n \frac{\pi}{6}$

(D) $2n\pi + \frac{7\pi}{6}$

36. The volume of real part of $\frac{(1+i)^2}{3-i}$ is

(A) $\frac{1}{5}$

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

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

(D) $-\frac{1}{5}$.

37. $R(z^2) = 1$ is represented by

(A) The parabola $x^2 + y^2 = 1$

(B) The hyperbola $x^2 - y^2 = 1$

(C) Parabola or a circle

(D) All the above

38. If w is an imaginary root of unity, then the value of $\sin\left[(\omega^{10} + \omega^{23})\pi - \frac{\pi}{4}\right]$ is

(A) $-\sqrt{3}/2$

(B) $-1/\sqrt{2}$

(C) $1/\sqrt{2}$

(D) $\sqrt{3}/2$

39. The value of :

$\sqrt{20 + \sqrt{20} + \sqrt{20} + \ldots}$

(A) 5

(B) 4

(C) 3

(D) 2.

40. If one root of the quadratic equation $ax^2 + bx + c = 0$ is equal to the nth power of the other root, then value of $(ac^n)^{\frac{1}{n+1}} + (a^n c)^{\frac{1}{n+1}} =$

(A) b

(B) – b

(C) $b^{\frac{1}{n+1}}$

(D) $-b^{\frac{1}{n+1}}$

41. If x is real and $k = \frac{x^2 - x + 1}{x^2 + x + 1}$, then

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

(B) $k \le 5$

(C) $k \le 0$

(D) None of these

42. If $x^2 - hx - 21 = 0$, $x^2 - 3hx + 35 = 0$ ($h > 0$) have one common root, then the value of h is

(A) 1

(B) 2

(C) 3

(D) 4

43. If the number of terms in the expansion of $(x+2y+3z)^n$ is 45, then n =

(A) 7

(B) 8

(C) 9

(D) 10.

44. If in the expansion of $\left[\sqrt[3]{2}+\frac{1}{\sqrt[3]{3}}\right]^n$ the ratio of 7^{th} term from the beginning and 7^{th} term from the end is $\frac{1}{6}$, then n =

(A) 7

(B) 8

(C) 9

(D) 10

45. In the expansion of $(1-x)^{3/2}$ first four terms are :

(A) $1-\frac{3}{2}x+\frac{3}{8}x^2-\frac{1}{16}x^3$

(B) $1-\frac{3}{2}x-\frac{3}{8}x^2-\frac{1}{16}x^3$

(C) $1-\frac{3}{2}x+\frac{3}{8}x^2+\frac{1}{16}x^3$

(D) $1+\frac{3}{2}x+\frac{3}{8}x^2+\frac{1}{16}x^3$.

46. In how may ways can 5 boys and 5 girls be seated in a circle so that no two boys are together?

(A) $5! \times 5!$

(B) $4! \times 5!$

(C) $\frac{5!5!}{2}$

(D) $\frac{4!\ 5!}{2}$.

47. $\sum_{r=0}^{m} {}^{n+r}C_n$ is equal to

(A) ${}^{n+m+1}C_{n+1}$

(B) ${}^{n+m+2}C_n$

(C) ${}^{n+m+3}C_{n-1}$

(D) None of these

48. The sides AB, BC, CA of a triangle ABC have respectively 3, 4 and 5 points lying on them. The number of triangles that can be constructed using these points as vertices is

(A) 205

(B) 220

(C) 210

(D) None of these

49. If X = { 0, 1, 3, 5 } Y = {1, 2, 4, 7}and Z = {1, 2, 3, 5, 8} then (X $\cap$ Y) $\cup$ Z equal to-

(A) {0, 1, 2, 4, 7, 5, 8}

(B){1, 2, 3, 4, 5, 8}

(C) {1, 2, 3, 5, 8}

(D) {0, 1, 2, 3, 5, 7, 8}

50. $1+\frac{\log_e x}{1!}+\frac{(\log_e x)^2}{2!}+\frac{(\log_e x)^3}{3!}+....\infty =$

(A) $\log_e x$

(B) x

(C) x^{-1}

(D) $-\log_e(1+x)$

REASONING

51. Three friends Rahul, Mukesh and Anil contribute sums of Rs.75000, Rs.150000 and Rs.300000 respectively, towards a venture and agree to share the profits of the venture in such a way that the rate of return which each receives is in proportion to the amount of his contribution. If the profits for a year amount to Rs. 94500, then how much will each receive?

(A) Rs.3500, Rs.19000, Rs.72000

(B) Rs.4000, Rs.18500, Rs. 72000

(C) Rs.4500, Rs.18000, Rs.72000

(D) Rs. 7000, Rs.17500, Rs.70000

52. 4 men earn as much in a day as 7 women and 1 women earns as much as 2 boys. If 6 men, 10 women and 14 boys work together for 8 days to earn Rs. 2200, then what will be the earnings of 8 men and 6 women working together for 10 days ?

(A) Rs. 2520

(B) Rs. 2000

(C) Rs. 2750

(D) Rs. 1600

53. A 10 hectare field is reaped by 2 men, 3 women and 4 boys in 10 days. If a man, a woman and a boy work in the ratio 5 : 4 : 2, then the time that 6 men, 4 women and 7 boys take to reap a 16 hectare field is

(A) 5 days

(B) 6 days

(C) 7 days

(D) 8 days

Directions : For the following question, four options are given. Choose the correct option.

54. What is the weight and the percentage of zinc in the zinc copper alloy, given with 3 kg of pure zinc contains 90 percent of zinc and with 2 kg of another 90% zinc alloy contains 84% of zinc ?

(A) 2.4 kg, 80%

(B) 1.4 kg, 88%

(C) 3.4 kg,90%

(D) 7.4 kg, 18%

55. Two lumps composed of Gold, Silver and Copper together weight 20 kg, one lump contains 75% gold and 31.25 gm per kg of silver. The other contains 85% gold and

30 gm per kg of silver. The total quantity of silver in two lumps is 617.05 gm.If the two lumps are melted and formed into one, then the gold in new lump will be

(A) 50%

(B) 78%

(C) 89%

(D) 67%

Directions - In the series of each question what will replace the question mark?

56. 6, 11, 21, 36, 56 (?)

(A) 51

(B) 42

(C) 81

(D) 91

57. $16^{5} + 2^{15}$ is divisible by

(A) 31

(B) 13

(C) 27

(D) 33

58. Two trains 121 m and 99 m in length respectively are running in opposite directions, one at the rate of 40 kmph and the other at the rate of 32 kmph. In what time will they be completely clear of each other from the moment they meet ?

(A) 110 sec

(B) 99 sec

(C) 88 sec

(D) 11 sec

Directions (59–64) : Study the following information carefully and answer the questions given below.

Seven friends Q, R, S, T, U, V and W work at different places in India i.e. Kolkata, Delhi, Bangalore, Baroda, Chennai, Hyderabad and Mumbai not necessarily in that order. They work for the branches of three organizations i.e. Vision, Skylark and Source one. Not more than three and not less than two of them work in any of the organizations. U works at Baroda. S works at Mumbai and is in the same organization as W only. The one who works at Bangalore does not work with Skylark. R works with Skylark and is placed at Hyderabad. T does not work at Delhi. Q works at Chennai and is in the same organization as only U. Vision is the only organization with a branch at Baroda.

59. Which three friends work in the same organization ?

(A) Q, U, T

(B) V, R, W

(C) V, R, T

(D) W, R T

60. Who works at Delhi ?

(A) W

(B) T

(C) U

(D) None of these

61. Who works at Bangalore ?

(A) V

(B) T

(C) W

(D) Data inadequate

62. Who works at Kolkata ?

(A) R

(B) W

(C) V

(D) T

63. In which organization does R work ?

(A) Skylark

(B) Vision

(C) Sourceone

(D) Either (A) and (B)

64. Who work with the organization Source one ?

(A) Q, U

(B) S, W

(C) S, V

(D) Data inadequate

Directions (65- 70) : Some friends are sitting on a bench, Sunil is sitting next to Sunita and Sanjay is sitting next to Bindu. Bindu is not sitting with Sumit. Sumit on the left end of the bench and Sanjay is on second position from right hand side.Sunil is on the right side of Sunita and to the right side of Sunil. Sunil and Sanjay are sitting together. Based on the above sitting arrangements, answer the following questions.

65. Sunil is sitting between

(A) Sunita and Bindu

(B) Sumit and Bindu

(C) Sunita and Sanjay

(D) None of these

66. Who is sitting in the centre ?

(A) Sumit

(B) Sunil

(C) Bindu

(D) Sanjay

67. Sanjay is sitting between

(A) Bindu and Sunita

(B) Sunil and Sumit

(C) Sunita and Bindu

(D) None of these

68. Sumit is sitting on the

(A) Second place from right

(B) Second place from left

(C) Extreme left

(D) Extreme right

69. Bindu is sitting on the

(A) Extreme left side

(B) Extreme right side

(C) Second from left side

(D) Third from left side

70. Sunita is sitting how many places away from Bindu ?

(A) 1

(B) 2

(C) 4

(D) 5

Questions (71-75): Read the following and answer the questions that follow.

DAV College, Chandigarh is selecting a four - person debate team. There are seven candidates of equal ability X, Y and Z who attended the science block courses and L, M, N and P who attended the commerce block courses. The team must have two members from each block. Also, the members must be able to work well with all the other members must be able to work well with all the other members of the team. Note that debaters Y and L, Z and N, and L and M are incompatible pairs.

71. If debater Y is rejected and M is selected the team will consist of

(A) L, M, X and Z

(B) M, N , X and Z

(C) M, N, P and X

(D) None of these

72. If debater L is on the team, what other debaters must be on the team as well ?

(A) M, X and Z

(B) N, X and Z

(C) P, N and Z

(D) None of these

73. If both Y and Z are selected, which of the other debaters are thereby assured of a place on the team ?

(A) Both L and M

(B) Both M and P

(C) Only N

(D) Both N and P

74. Which of the following must be false ?

(I) Debaters M and Z cannot be selected together.

(II) Debaters N and Y cannot be selected together.

(III) Debaters P and Z cannot be selected together.

(A) I Only

(B) II Only

(C) III Only

(D) None of these

75. Which of the following is true of debator X ?

(I) Debator X must be selected as one of the science block members of the team.

(II) Debator X must be selected if N is selected.

(III) Debator X cannot be selected if both L and N are rejected.

(A) I only

(B) II only

(C) III only

(D) I and III

Directions (76–80) : Five skilled attendants L:, M, N, P and R are to attend the task everyday during the six hours working period.

(1) Each one will attend the work for one hour.

(2) There will be a gap of two hours between the hours being attended by N and P.

(3) R will attend the work immediately before the rest hour (T). The rest hour (T) is not the second or the fourth hour.

(4) L will attend the work before M.

(5) N or P will not be the first to start attending the day's work.

(6) P will attend the work from 4:00 p.m. which is immediately after the rest hour.

76. What are the working hours of 'M' with reference to that of 'L' ?

(A) Immediately before

(B) Immediately after

(C) Two hours after

(D) Cannot be determined

77. How many hour's gap will be there between the working hours of M and N ?

(A) Cannot be determined

(B) Two

(C) Three

(D) None of these

78. Which of the following is the correct statement?

(A) 'L' works the end–hour

(B) 'M' precedes 'P' as far as working hours are concerned

(C) 'N' precedes 'L' as far as working hours are concerned

(D) Rest hour begins at 3:00 p.m.

79. What is the starting time of R's working hour ?

(A) 1:00 p.m.

(B) 2:00 p.m.

(C) 3:00 p.m.

(D) None of these

80. what will replace the question mark?

2, 15, 41, 80, (?)

(A) 111

(B) 120

(C) 121

(D) 132

Directions (81–85) : Study the following information carefully and answer the questions given below :

P, Q, R, S, T, W and Z are seven students studying in three different institutes —A, B and C. There are three girls among them studying one each of these institutes. Two of them study mechanical engineering, two study medicine and one each study biotechnology, pharmacy and electrical engineering. R studies with only her best friend P who studies pharmacy in college B. No girl studies either biotechnology or electrical engineering. T studies mechanical engineering in college A and his brother W studies electrical engineering in college C. None of the two studying medicine studies in college B. S studies biotechnology along with T and Z.

81. Which of the following pairs of students study medicine ?

(A) SZ

(B) ZW

(C) ZQ

(D) TQ

82. Which of the following three represents the three girls ?

(A) SZQ

(B) ZRQ

(C) SRQ

(D) Data inadequate

83. In which college does Q study ?

(A) C

(B) B

(C) A or B

(D) Data inadequate

84. In which colleges do three of them study ?

(A) C

(B) B

(C) A or C

(D) None of these

85. Which of the following is the field of study of Z ?

(A) Medicine

(B) Mechanical

(C) Electrical

(D) Data inadequate

Directions (86–90) :– Study the following information carefully and answer the questions given below :

P, Q, R, S, T, V, Q and Z are three different vehicles. There are atleast two passengers in each vehicle–I, II and III and one of them is a lady. There are two engineers, two doctors and three teachers among them. R is lady doctor and she does not travel with the pair of sisters P and V. Q a male engineer travels with only W, a teacher in vehicle I. S is a male doctor. Two persons belonging to same profession do not travel in the same vehicle. P is not an engineer and travels in vehicle II.

86. How many lady members are there among them ?

(A) Three

(B) Four or Five

(C) Three or Four

(D) Data inadequate

87. Which of the following is not correct ?

(A) T–Male–Teacher

(B) Q–Male–Engineer

(C) P–Female–Teacher

(D) V–Female–Teacher

88. What is V's profession ?

(A) Engineer

(B) Teacher

(C) Doctor

(D) Data inadequate

89. In which vehicle does R travel ?

(A) I

(B) II

(C) III

(D) II or III

90. Which of the following represents the three teachers ?

(A) WTV

(B) WTP

(C) WTV or WTP

(D) None of these

ENGLISH

91. ARID : MOISTURE ::

(A) deserted : dune

(B) sandy : water

(C) verdant : sunshine

(D) silent : sound

92. HUNGER : SATIATED ::

(A) fatigue : rested

(B) pain : hospitalized

(C) fatigue : sleeping

(D) activity : dormant

93. I did not find a single mouse ..... .

(A) alive

(B) single

(C) all

(D) whole

94. Antonym of ABSTAIN

(A) Adore

(B) Pardon

(C) Blame

(D) Consume

95. Antonym of PALATABLE

(A) lovable

(B) tasty

(C) rascal

(D) detesting

96. Antonym of VERNACULAR

(A) native

(B) incorrigible

(C) perfect

(D) Different

97. Antonym of PASTIME

(A) employment

(B) amusement

(C) hobby

(D) enjoy

98. Antonymof NEBULOUS

(A) Certain

(B) Vague

(C) Insignificant

(D) Inadequate

99. Antonym of FORBID

(A) Darken

(B) Abolish

(C) Permit

(D) Confuse

100. Antonym of PROGNOSIS

(A) Identification

(B) Preface

(C) diagnosis

(D) Scheme

PASSAGE

"Let us laugh," says, W. Mathews, "it is the cheapest luxury man enjoys. It stirs up the blood, expands the chest, clears away the cobwebs from the brain and gives the whole system a healthy treatment." So is it not nice to laugh a lot? It is said, "Laughter is the best medicine." For those who dislike medicine, sweet or bitter, a good joke that provokes laughter is prescribed. It is nice to have a good laugh but a "guffaw" may sometime lock one's jaws and so it is suggested that those who enjoy a loud guffaw go slow and subside into a gurgle but the best thing is, as done in Honorable courts before Hon'ble Judges, just titter. And finally, If fee that I should smile, laugh heartily (without the predicament of lockjaw) and be able to enjoy all jokes including ones directed at myself. But never making a laughing stock of myself in the process. Let us remember the wise saying, "He is not laughed at that laughs at himself."

101. It is said that laughter is the best medicine because

(A) it is the cheapest luxury man enjoys

(B) it is available free of cost

(C) it is cheaper whereas medicines in the shops are costly

(D) it provides better treatment than costly medicines

102. The writer says he would never make a stock of himself. It means he should not

(A) let others ridicule him

(B) show disrespect to Judges

(C) laugh, but simple smile at others

(D) let others laugh

103. The writer feels laughter is to be prescribed to those who

(A) are seriously ill

(B) dislike medicines

(C) cannot buy medicines

(D) do not need medicines

Directions: Look at the italic part of each sentence. Below each sentence are given three possible substitutions of the italic part. If one of them (a), (b) or (c) is better than the (a), (b) or (c). If none of the substitutions improve the sentence, indicate (d) as your response on the Answer Sheet. Thus a 'No improvement' response will be signified by the letter (d).

104. *Belonged to* this cadre, you are eligible for facilities such as free air travel and accommodation.

(A) Since you belong to

(B) Whoever belong

(C) For belonging to

(D) No improvement

105. The bank has hired a consultant who will look into any issues which arise during the merger.

(A) is looking over

(B) will be looked after

(C) will look out

(D) No improvement

Directions: In the following items some parts of the sentence have been jumbled up. You are required to rearrange these parts which are labelled as P, Q R and S to produce the correct sentence, Choose the proper sequence and mark in you Answer Sheet accordingly:

106. The secretary announced that

to find answer to these questions (P) in an attempt (Q)

a natioal workshop on technical training has been organized (R)

by the Confederation of Engineering Indusry (S)

The proper sequence should be:

(A) Q P S R

(B) P Q R S

(C) Q P R S

(D) P Q S R

107. You have been writing to me often about

getting a first prize in sports etc. (P) by my daughter (Q)

distinguishing in a fancy dress show, or (R)

such achievement make me apprehensive of your educational progress (S)

The proper sequence should be:

(A) Q P R S

(B) R S Q P

(C) Q S R P

(D) R P Q S

Direction: Fill in the numbered blanks with the most suitable word from the given choices provided under the passage.

The committee's ___108___ to the government to set up a model National Stock Exchange (NSE) has ___109___ controversial. The recommendations are ___110___ on the perception that the country doesn' t really want to set up too many stock exchanges.

108. (A) feature

(B) view

(C) suggestion

(D) idea

109. (A) changed

(B) become

(C) evolved

(D) done

110. (A) viewed

(B) prepared

(C) based

(D) argued

COMPUTER APPLICATION

111. Consider the function

find (int x, int y)

return ((x < y >) ? 0 : (x - y)) ;)

Let a, b be two non-negative integers. The call find (a, find (a, b)) can be used to find the

(A) maximum of a, b

(B) positive difference of a, b

(C) sum of a, b

(D) minimum of a, b

112. Which binary addition is incorrect ?

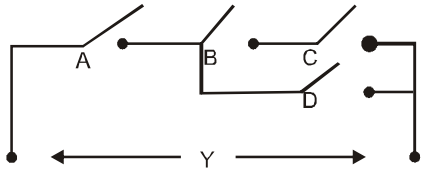
(A) 100101 - 100011=000000

(B) 10000000 - 01000000 = 1000000

(C) 1011110.1 - 101011.11 = 110010.11

(D) 11111111 - 1111111 = 10000000

113. For the switching circuit, taking open as 0 and closed as 1, the expression for the circuit is Y.



Y is given by

(A) A + (B + C) D

(B) A + BC + D

(C) A (BC + D)

(D) None of these

114. If **abc** is the input, then the following program fragment

char x, y, z ;

printf ("%d", scanf ("%c %c %c" , &x, &y, &z)) ; results in

(A) A syntax error

(B) A fatal error

(C) Segmentation violation

(D) Printing of 3

115. 11001, 1001 and 111001 correspond to the 2's complement representation of the following set of numbers

(A) 25, 9 and 57 respectively

(B) –6, –6 and –6 respectively

(C) 7, 7 and 7 respectively

(D) –25, –9 and –57 respectively

116. Pick the correct statements .

The logic of Pumping lemma is a good example of

(A) The Pigeon - hole principle

(B) The divide and computer technique

(C) Recursion

(D) Iteration

117. The number of cross point needed for 10 lines in a cross point switch which is full duplex in nature and there are no self connection is

(A) 100

(B) 45

(C) 50

(D) 90

118. A hash table with 10 buckets with one slot per bucket is depicted in Fig. The symbols, S1 to S7 are initially entered using a hashing function with linear probing. The maximum number of comparisons needed in searching an item that is not present is

(A) 4

(B) 5

(C) 6

(D) 3

119. Memory protection is of no use in a

(A) Single user system

(B) Non - multiprogramming system

(C) Non - multitasking system

(D) None of the above

120. A program P calls two subprograms P1 and P2. P1 can fail 50% times and P2 can fail 40% times. The program P can fail

(A) 50%

(B) 60%

(C) 10%

(D) 70%

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	A	B	B	A	C	C	D	B	D	B	C	D	A	A	B	A	C	D
Question	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Answer	D	D	C	C	D	A	A	B	B	C	B	C	B	A	B	D	B	C	A	B
Question	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	A	D	B	C	C	B	A	A	C	B	C	B	D	A	B	C	D	D	C	D
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Answer	C	D	A	B	C	B	D	C	B	B	D	D	B	D	B	C	D	B	D	D
Question	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Answer	C	B	A	D	A	B	D	A	C	B	D	A	A	D	D	D	A	A	C	C
Question	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Answer	A	A	B	A	D	C	D	C	B	C	D	A	C	D	C	A	B	B	D	D

HINTS AND SOLUTIONS

MATHEMATICS

1.(B) $f(x) = \begin{cases} x^3 - 1, 1 < x < \infty \\ x - 1, -\infty < x \le 1 \end{cases}$

$\therefore$ $f(1) = 1 - 1 = 0$

$Rf'(1) = \lim\limits_{x \to 0} \dfrac{f(1+h) - f(1)}{h} = \lim\limits_{h \to 0} \dfrac{\left[(1+h)^3 - 1\right] - 0}{h} - 3$

$Lf'(1) = \lim\limits_{h \to 0} \dfrac{f(1-h) - f(1)}{-h} = \lim\limits_{h \to 0} \dfrac{(1-h) - 1 - 0}{-h} = 1$

$\therefore$ $Rf'(1) \neq Lf'(1)$

$\therefore$ f(x) is not differentiable at x = 1

Again $f(1 + 0) = \lim\limits_{h \to 0} f(1+h) = \lim\limits_{h \to 0} (1+h) - 1 = 0$

$$f(1-0) = \lim_{h\to 0} f(1-h) \quad = \lim_{h\to 0} (1-h) - 1 = 0$$

Hence f(x) at x = 1 is continuous but not differentiable.

2.(A) $I = \int e^x \sec^2(e^x)\,dx$

Put $e^x = t \Rightarrow e^x\,dx = dt$

$\therefore I = \int \sec^2 t\,dt = \tan t + k = \tan(e^x) + k$

3.(A) $\int x(2x+3)^{1/2}\,dx \qquad = x\dfrac{(2x+3)^{3/2}}{3/2}\dfrac{1}{2} - \int \dfrac{(2x+3)^{3/2}}{3/2}\dfrac{1}{2}dx + c$

$= \dfrac{1}{3}x(2x+3)^{3/2} - \dfrac{1}{3}\int (2x+3)^{3/2}dx + c \qquad = \dfrac{1}{3}x(2x+3)^{3/2} - \dfrac{1}{15}(2x+3)^{5/2} + c.$

4.(B) Let $y = \dfrac{1-x+x^2}{1+x+x^2}$, then $y + yx + yx^2 = 1 - x + x^2 \Rightarrow x^2(y-1) + x(y+1) + y - 1 = 0$

For real value of x, $b^2 - 4ac \geq 0$

i.e. $(y+1)^2 - 4(y-1)^2 \geq 0 \qquad \Rightarrow [y + 1 - 2(y-1)][y + 1 + 2(y+1)] \geq 0$

$\Rightarrow \qquad (3 - y)(3y - 1) \qquad \Rightarrow (y - 3)(y - 1/3) \geq 0 \qquad \Rightarrow$

$\dfrac{1}{3} \leq y \leq 3$

Hence min value of $y = \dfrac{1}{3}$.

5.(B) $f(x) = \sin x + \dfrac{2\sin x\cos x}{2} = \sin x + \dfrac{\sin 2x}{2}$

f '(x) = cos x + cos2 x

For max. and min cos x = cos2 x = 0 $\Rightarrow$ cos 2x = – cos x = cos (π – x)

$\Rightarrow 2x = \pi - x \Rightarrow x = \frac{\pi}{3}$

$f''(x) = -\sin x - 2\sin 2x \Rightarrow \quad f''(x)_{x=\pi/3} = -\sin\frac{\pi}{3} - 2\sin 2.\frac{\pi}{3} < 0$

Hence f(x) has max. at $x = \pi/3$ and max value

$= \sin\frac{\pi}{3}\left(1+\cos\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}\left(1+\frac{1}{2}\right) = \frac{3\sqrt{3}}{4}.$

6.(A) $x^2\frac{dy}{dx} = x^2 + xy + y^2 \qquad \frac{dy}{dx} = \frac{x^2+xy+y^2}{x^2}$ Let $y = vx$

$v + x\frac{dv}{dx} = 1 + v + v^2 \qquad \Rightarrow \int\frac{dv}{1+v^2} = \int\frac{dx}{x} \qquad \Rightarrow \tan^{-1}v = \log x + c$

$\Rightarrow \tan^{-1}\frac{y}{x} = \log x + c$

7.(C) $\frac{dy}{dx} - \frac{2}{x}y = x + \frac{1}{x}\sin\frac{1}{x^2}$

$I.F. = e^{-2\int\frac{1}{x}dx} = \frac{1}{x^2}.$

Sol. is

$\frac{y}{x^2} = \int\left(x + \frac{1}{x}\sin\frac{1}{x^2}\right).\frac{1}{x^2}dx + C = \int\frac{1}{x}dx + \int\frac{1}{x^3}\sin\frac{1}{x^2}dx + C$

$= \log x - \frac{1}{2}\int \sin t\ dt + C$

put $\frac{1}{x^2} = t \Rightarrow -\frac{2}{x^3}dx = dt$

$$\frac{y}{x^2} = \log x + \frac{1}{2}\cos t + C = \log x + \frac{1}{2}\cos\frac{1}{x^2} + C.$$

8.(C) $\text{Siny}\frac{dy}{dx} = \cos y - x\cos^2 y.$

Divide by $\cos^2 y$

$$\tan y \sec y \frac{dy}{dx} - \sec y = -x$$

put sec y = tsec y tan y $\frac{dy}{dx} = \frac{dt}{dx}$

$$\frac{dt}{dx} - t = -x$$

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

9.(D) Formula for (n + 1)the approximated value of x by False position method is

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

For end approximation put n = 1

$$x_2 = x_0 - \frac{(x_1 - x_0)f(x_0)}{f(x_1)f(x_0)}$$

$$x_2 = \frac{x_0 f(x_1) - x_1 f(x_0)}{f(x_1) - f(x_0)}$$

Hence (B) is correct answer.

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

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

By Simpson's Rule

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

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

Comparing with given question

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

Hence (B) is correct answer.

11.(D) $A^2 = I$

$\Rightarrow \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} x^2+1 & x \\ x & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $x^2 + 1 = 1$ and $x = 0$ $x = 0$.

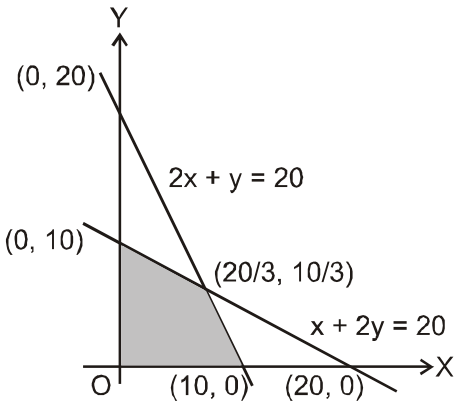
12.(B) Given $4A^3 + 2A^2 + 7A + I = O$

Pre-multiply with A^{-1} $\Rightarrow$ $A^{-1}[4A^3 + 2A^2 + 7A + I] = O \Rightarrow 4IA^2 + 2IA + 7I + A^{-1}I = O.A^{-1}$

$\Rightarrow$ $I(4A^2 + 2A + 7) + A^{-1}I = O$ $\Rightarrow$ $A^{-1} = -(4A^2 + 2A + 7I)$.

13.(C) The points in the feasible region are

(0, 0), (0, 10), $\left(\frac{20}{3},\frac{10}{3}\right)$,(10,0).



Objective function P = x + 3y

$P_{(10,0)} = 10, P_{(0,10)} = 30, P_{\left(\frac{20}{3},\frac{10}{30}\right)} = \frac{50}{3}$

$\therefore$ Maximum value of P = 30 at (0, 10)

Hence (C) is the correct answer.

14.(D) Let the vector be x **i** + y **j**

$\therefore \cos 45° = \frac{x+y}{\sqrt{2}\sqrt{x^2+y^2}} = 1 = \frac{x+y}{\sqrt{x^2+y^2}}$

$\Rightarrow x+y = \sqrt{x^2+y^2}$ also $\sqrt{x^2+y^2} = 1 \Rightarrow x+y = 1$

Again $\cos 60° = \frac{3x+4y}{5} \Rightarrow \frac{5}{2} = 3x-4y$

$5 = 6x - 8y$ .....(i)

$1 = x + y$ .....(ii)

$\Rightarrow$ No value in the given options set satisfies the above relations. Thus (d) is correct.

15.(A) **[a × b b × c c × a] = (a × b). [(b × c) × (c × a)]**

= (**a** × **b**).([**b c a**] **c** – [**b c c**]**a**) = (**a** × **b**). ([**b c a**]**c** – 0)

= [**b c a**] [**a b c**] = [**a b c**] [**a b c**] = 4.4 = 16.

16.(A) Given $\sum_{j=1}^{n} x_{ij} \le a_i, i = 1,2,3....m$ ... (1)

$$\sum_{j=1}^{n} x_{ij} \le b_j, j = 1,2,.....,n \quad \text{... (2)}$$

From condition (1), we have

$x_{11} + x_{12} + x_{13} ..... + x_{1n} \le a_1$; i = 1

$x_{21} + x_{22} + x_{23} ..... + x_{2n} \le a_2$; i = 2

. . . . .

. .

Total constraints for condition (1) = m.

From condition (2)

$x_{11} + x_{21} .... + x_{m1} = b_1$; j = 1

$x_{12} + x_{22} ... + x_{m2} = b_2$; j = 2

. . .

. . .

$x_{1n} + x_{2n} ..... x_{mn} = b_n$; j

Total constraints for condition (2) = n.

$\therefore$ To minimise z, total number of constraints = m + n

Hence (A) is the correct answer.

17.(B) $2\mathbf{a} - 3\mathbf{b} - 4\mathbf{c} = 4i + 16\mathbf{j} + 6\mathbf{k}$

$$| 2\mathbf{a} - 3\mathbf{b} - 3\mathbf{c} | = \sqrt{16 + 256 + 36} = \sqrt{308}.$$

18.(A) Equation of line perpendicular to line $3x + 4y + 5 = 0$ is $4x - 3y = \lambda$

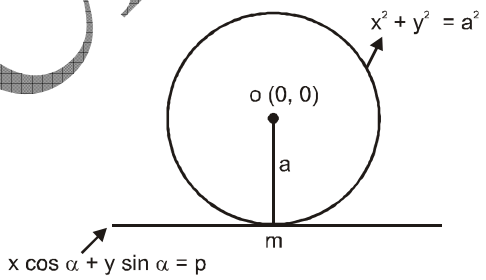
which passes through (1, 2)

$$4 - 6 = \lambda \qquad \Rightarrow \lambda = -2$$

Equation of desired line is $4x - 3y + 2 = 0$.

19.(C) According to question length of perpendicular on the line from the centre of circle is equal to the radius of the circle.

OM = radius of circle



$$\frac{-p}{\sqrt{\cos^2\alpha + \sin^2\alpha}} = a \Rightarrow -p = a \Rightarrow p^2 = a^2$$

20.(D) In circle, $x^2 + y^2 + 14x + 6y + 2 = 0$

$g = 7, f = 3, c = 2$

centre of circle $(-g, -f) = (0, 2)$ (given)

For orthogonally inter section,

$2gg' + 2ff' = c + c'$

$0 - 12 = 2 + c' \Rightarrow c' = -14$

Put the values, in equation

$x^2 + y^2 + 2g'x + 2f'y + c' = 0 \qquad \Rightarrow x^2 + y^2 + 0 - 4y - 14 = 0 \Rightarrow x^2 + y^2 - 4y - 14 = 0$

21.(D) Given P (a sec θ, b tan θ) and Q(a sec ϕ, b tan ϕ)

The equation of tangent at point P is

$$\frac{x\sec\theta}{a} - \frac{y\tan\theta}{b} = 1$$

m of tangent = $\frac{b}{\tan\theta} \times \frac{\sec\theta}{a} = \frac{b}{a}.\frac{1}{\sin\theta}$

Hence the equation of perpendicular at P is

$y - b\tan\theta = \frac{-a\sin\theta}{b}(x - a\sec\theta)$ or by $- b^2\tan\theta = -a\sin\theta\, x + a^2\tan\theta$

or $a\sin\theta x + by = (a^2 + b^2)\tan\theta$ ...(i)

Similarly the equation of perpendicular at Q is

$a\sin\phi\, x + by = (a^2 + b^2)\tan\phi$ ...(ii)

On multiplying (i) by sin ϕ and (ii) and by sin θ

$a\sin\theta\sin\phi\, x + b\sin\phi\, y = (a^2 + b^2)\tan\theta\sin\phi$

$a\sin\theta\sin\phi\, x + b\sin\theta\, y = (a^2 + b^2)\tan\phi\sin\theta$

On subtraction

by $(\sin\phi - \sin\theta) = (a^2 + b^2)(\tan\theta \sin\phi - \tan\phi \sin\theta)$

$\therefore \quad y = k = \frac{a^2+b^2}{b}\frac{\tan\theta\sin\phi - \tan\phi\sin\theta}{\sin\phi - \sin\theta}$

$\because \quad \theta + \phi = \frac{\pi}{2} \Rightarrow \phi = \frac{\pi}{2} - \theta$

$\Rightarrow \sin\phi = \cos\theta$ and $\tan\phi = \cot\theta$

$\therefore \quad y = k = \frac{a^2+b^2}{b}\frac{\tan\theta\cos\theta - \cot\theta\sin\theta}{\cos\theta - \sin\theta}$

$= \frac{a^2+b^2}{b}\left(\frac{\sin\theta - \cos\theta}{\cos\theta - \sin\theta}\right) = \frac{-(a^2+b^2)}{b}$

22.(D) $S = \frac{n}{2}[2a + (n-1)d] \Rightarrow 406 = \frac{n}{2}[6 + (n-1)4] \Rightarrow 812 = n[6 + 4n - 4]$

$\Rightarrow 812 = 2n + 4n^2 \Rightarrow 406 = 2n^2 + n \Rightarrow 2n^2 + n - 406 = 0$

$\Rightarrow \quad n = \frac{-1 \pm \sqrt{1 + 4.2.406}}{2.2} = \frac{-1 \pm \sqrt{3249}}{4} = \frac{-1 \pm 57}{4}$

Taking (+) sign, $n = \frac{-1+57}{4} = 14.$

23.(C) $S_n = 1(1!) + 2(2!) + 3(3!) + ... + n(n!)$

$= (2 - 1)(1!) + (3 - 1)(2!) + (4 - 1)(3!) + ...+[(n + 1) - 1](n!)$

$= (2.1! - 1!) + (3.2! - 2!) + (4.3! - 3!) + ...+[(n + 1)(n!) - (n!)]$

$= (2! - 1!) + (3! - 2!) + (4! - 3!) + ...+[(n + 1)! - (n)!]$

$= (n + 1)! - 1!.$

24.(C) As p, q, r are in G.P. $\therefore q^2 = pr$ ...(i)

and a, b, c are also in G.P. $\therefore$ $b^2 = ac$ ...(ii)

From (i) and (ii)

$q^2 b^2 = (pr)(ac) \Rightarrow (bq)^2 = (cp) \cdot (ar)$

Hence cp, bq, ar are in G. P.

25.(D) $S = 1 + \frac{3}{2!} + \frac{6}{3!} + \frac{10}{4!} + ...$

$$= 1 + \frac{1+2}{2!} + \frac{1+2+3}{3!} + \frac{1+2+3+4}{4!} + ... + \frac{1+2+.....+n}{n!} + ...$$

Here

$$T_n = \frac{\frac{n}{2}(n+1)}{n!} = \frac{1}{2}.\frac{(n-1)+2}{(n-1)!} = \frac{1}{2}\left\{\frac{1}{(n-2)!} + \frac{2}{(n-1)!}\right\} \Rightarrow S = \sum T_n = \frac{1}{2}\left(\sum \frac{1}{(n-2)!} + \sum \frac{2}{(n-1)!}\right)$$

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

26.(A) $P'(x) = 5x^4 + 20x^3 - 80x - 80$, so $P'(-2) = 80 - 160 + 160 - 80 = 0$.

Thus, the zero at p = –2 has multiplicity $m \geq 2$, which implies that Newton's method has linear convergence (that is, the order of convergence is 1).

27.(A) Let $f(x) = x^3 - 3x + k$. Then $f'(x) = 3x^2 - 3$ and so $f'(x) = 0 \Rightarrow x = \pm 1$. The values of f(x) at

$x = -\infty, -1, 1$ and ∞ are :

x	$-\infty$	–1	1	∞
f(x)	$-\infty$	k + 2	k – 2	∞

If all roots of the given equation are real, then

$k + 2 > 0$ and $k - 2 < 0$. $\Rightarrow -2 < k < 2$.

Hence the range of k is (–2, 2).

Hence (A) is the correct answer.

28.(B) Here, it is given that $f : G \to H$ is group homomorphism from a group G into H with kernel K.

$\therefore$ By given condition that O(G)=75 O(H)=45, O(K)=15

$\therefore$ By first fundamental theorem We have $f(G) \cong \frac{G}{K}$

$$\Rightarrow \quad O\{f(G)\} = O\left(\frac{G}{K}\right)$$

$$\Rightarrow \quad O\{f(G)\} = \frac{O(G)}{O(K)} = \frac{75}{15} = 5$$

29.(B) $P(A) = 0.86, P(B) = 0.35, P(A \cap B) = 0.29$

$\therefore$ $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.92$

30.(C) $A \cup A' = S$

$$P(S) = P(A \cup A') = P(A) + P(A') = 1$$

31.(B) Total ways = ${}^{2n}C_{2r}$

out of n pairs 2r pairs can be selected in ${}^{n}C_{2r}$

way and from each of the selected 2r pairs

one shoe can be selected in 2^{2r} ways.

favourable case = ${}^{n}C_{2r} \times 2^{2r}$

Required probability = $\frac{{}^{n}C_{2r} \times 2^{2r}}{{}^{2n}C_{2r}}$

32.(C) $x \sin\theta = y \sin\left(\theta + \frac{2\pi}{3}\right) = z \sin\left(\theta + \frac{4\pi}{3}\right) = \frac{1}{k}(\text{say}) \therefore \frac{1}{x} + \frac{1}{y} + \frac{1}{z}$

$= K\left[\sin\theta + \sin\left(\theta + \frac{2\pi}{3}\right)\sin\left(\theta + \frac{4\pi}{3}\right)\right] = K(0)$

$\left[\therefore \sin x + \sin\left(\theta + \frac{2\pi}{3}\right) + \sin\left(\theta + \frac{4\pi}{3}\right) = 0\right] \therefore xy + yz + zx = 0$

$\therefore$ (c) is the correct answer.

33.(B) since $\tan\alpha = p \therefore \sqrt{1+\tan^2\alpha} = \sqrt{1+p^2} \Rightarrow \sec\alpha = \sqrt{1+p^2} \Rightarrow \cos\alpha = \frac{1}{\sqrt{1+p^2}}$

since $\tan\beta = q \therefore \cos\beta = \frac{1}{\sqrt{1+q^2}}$

$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

$= \frac{1}{\sqrt{1+p^2}\sqrt{1+q^2}} - \sqrt{1-\frac{1}{1+p^2}}\sqrt{1-\frac{1}{1+q^2}}$

$= \frac{1}{\sqrt{1+p^2}\sqrt{1+q^2}} - \frac{p}{\sqrt{1+p^2}} \cdot \frac{q}{\sqrt{1+q^2}}$

$= \frac{1-pq}{\sqrt{1+p^2}\sqrt{1+q^2}}$

34.(A) $\tan\theta = \frac{a}{b} \Rightarrow \sin\theta = \frac{a}{\sqrt{a^2+b^2}}$

$$\cos\theta = \pm\frac{b}{\sqrt{a^2+b^2}}$$

and $$\cos 2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta} = \frac{b^2-a^2}{b^2+a^2}$$

Now, $\frac{\sin\theta}{\cos^8\theta} + \frac{\cos\theta}{\sin^8\theta}$

$$= \frac{\left(\frac{a}{\sqrt{a^2+b^2}}\right)}{\left(\frac{a}{\sqrt{a^2+b^2}}\right)^8} + \frac{\left(\frac{b}{\sqrt{a^2+b^2}}\right)}{\left(\frac{a}{\sqrt{a^2+b^2}}\right)^8}$$

$$= \frac{a}{b^8}\frac{(a^2+b^2)^4}{\sqrt{(a^2+b^2)}} + \frac{b}{a^8}\frac{(a^2+b^2)^4}{\sqrt{a^2+b^2}}$$

$$= \pm\frac{(a^2+b^2)^4}{\sqrt{a^2+b^2}}\left(\frac{a}{b^8}+\frac{b}{a^8}\right).$$

35.(B) $\sin\theta = -\frac{1}{2}, \tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \sin\theta = \sin\left(\pi+\frac{\pi}{6}\right), \tan\theta = \tan\left(\pi+\frac{\pi}{6}\right) \Rightarrow \theta = \pi+\frac{\pi}{6}$

36.(D) $\frac{(1+i)^2}{3-i} = \frac{2i(3+i)}{9+1} \qquad \therefore R\frac{(1+i)^2}{(3-i)} = -\frac{1}{5}.$

37.(B) $z = (x + iy) \Rightarrow z^2 = x^2 - y^2 + 2i\,xy$

$\Rightarrow$ Re $(z^2) = 1 \Rightarrow x^2 - y^2 = 1$

which is a hyperbola.

38.(C) Given : $\sin\left[(\omega^{10}+\omega^{23})\pi-\frac{\pi}{4}\right]=\sin\left[(\omega+\omega^2)\pi-\frac{\pi}{4}\right]$

$=\sin\left(-\pi-\frac{\pi}{4}\right)=-\sin(\pi+\pi/4)=\sin\pi/4=\frac{1}{\sqrt{2}}$

39.(A) Let $x=\sqrt{20+\sqrt{20}+\sqrt{20}+\ldots}$

Since the expression is continued indefinitely, the given quantity does not change even if we leave 20 within the first radical. Therefore $x=\sqrt{20+x}$

squaring, we have $x^2=20+x$ or $x^2-x-20=0$ or $x^2-5x+4x-20=0$

or $x(x-5)+4(x-5)=0$ or $(x-5)(x+4)=0$

or x - 5 = 0 or x + 4 = 0

x = 5 and x = –4

But as the given expression is a positive quantity, the only admissible value is 5.

40.(B) Let α, an be the two roots, Then

$\alpha+\alpha^n=-b/a$, $\alpha.\alpha n=c/a$

Eliminating α, we get $\left(\frac{c}{a}\right)^{\frac{1}{n+1}}+\left(\frac{c}{a}\right)^{\frac{n}{n+1}}=-\frac{b}{a}$

$\Rightarrow$ $a.a^{-\frac{1}{n+1}}.c^{\frac{1}{n+1}}+a.a^{-\frac{n}{n+1}}.c^{\frac{n}{n+1}}=-b$ or $(a^n a)^{\frac{1}{n+1}}+(ac^n)^{\frac{1}{n+1}}=-b.$

41.(A) From $k=\frac{x^2-x+1}{x^2+x+1}$

We have $x^2(k-1)+x(k+1)+k-1=0$

As given, x is real $\Rightarrow$ $(k+1)^2 - 4(k-1)^2 \geq 0$

$\Rightarrow 3k^2 - 10k + 3 \geq 0$

Which is possible only when the value of k lies between the roots of the equation $3k^2 - 10k + 3 = 0$ That is, when $\frac{1}{3} \leq k \leq 3$. {Since roots are $\frac{1}{3}$ and 3}.

42.(D) $\frac{x^2}{-35h-63h} = \frac{x}{-21-35} = \frac{1}{-3h+h} \Rightarrow x^2 = 49, x = \frac{28}{h}$

$\therefore \left(\frac{28}{h}\right)^2 = 49 \Rightarrow h^2 = \frac{28\times 28}{49} = 16$

$\Rightarrow$ h = 4.

43.(B) $\frac{(n+1)(n+2)}{2} = 45 \; (n+1)(n+2) = 9.10 \Rightarrow n+1 = 9 \Rightarrow n = 8.$

44.(C) $\frac{1}{6} = \frac{{}^nC_6 \left(2^{1/3}\right)^{n-6} \left(3^{-1/3}\right)^6}{{}^nC_{n-6} \left(2^{1/3}\right)^6 \left(3^{-1/3}\right)^{n-6}} \Rightarrow 6^{-1} = 6^{-4} \cdot 6^{\frac{n}{3}} = 6^{\frac{n}{3}-4} \Rightarrow -1 = \frac{n}{3} - 4 \Rightarrow n = 9.$

45. (C) $(1-x)^{3/2} = 1 - \frac{3}{2}x + \frac{\left(\frac{3}{2}\right)\left(\frac{3}{2}-1\right)}{2!}(-x)^2 + \frac{\frac{3}{2}\left(\frac{3}{2}-1\right)\left(\frac{3}{2}-2\right)}{3!}(-x)^3$

$= 1 - \frac{3}{2}x + \frac{3}{8}x^2 + \frac{1}{16}x^3.$

46.(B) By fixing a boy, boys can be seated in 4 ! ways. Between boys, girls can be seated in 5 ! ways. so Total no. of required ways = 4! × 5!.

47.(A) Since ${}^nC_r = {}^nC_{n-r}$

and ${}^nC_{r-1} + {}^nC_r = {}^{n+1}C_r$, we have

$$\sum_{r=0}^{m} {}^{n+r}C_n = \sum_{r=0}^{m} {}^{n+r}C_r = {}^{n}C_0 + {}^{n+1}C_1 + {}^{n+2}C_2 + \ldots\ldots + {}^{n+m}C_m$$

$$= [1+(n+1)] + {}^{n+2}C_2 + {}^{n+3}C_3 + \ldots\ldots + {}^{n+m}C_m$$

$$= ({}^{n+2}C_1 + {}^{n+2}C_2) + {}^{n+3}C_3 + \ldots\ldots + {}^{n+m}C_m$$

$\because \quad n+2 = {}^{n+2}C_1$ or ${}^{n}C_1 = n$

$$= ({}^{n+3}C_2 + {}^{n+3}C_3) + \ldots\ldots + {}^{n+m}C_m$$

$$= ({}^{n+4}C_3 + {}^{n+4}C_4) + \ldots\ldots + {}^{n+m}C_m$$

.....

.....

$$= {}^{n+m}C_{m-1} + {}^{n+m}C_m$$

$$= {}^{n+m+1}C_m = {}^{n+m+1}C_{n+1} \qquad [\because {}^{n}C_r = {}^{n}C_{n-r}]$$

48.(A) In all there are 3 + 4 + 5 = 12 points in a plane.

The number of required triangles = (The number of triangles formed by these 12 points) - (The number of triangles formed by the collinear points)

$$= {}^{12}C_3 - ({}^{3}C_3 + {}^{4}C_3 + {}^{5}C_3) = 220 - (1+4+10) = 205.$$

49.(C) Given that X = {0, 1, 3, 5}, Y = {1, 2, 4, 7} and Z = {1, 2, 3, 4, 8}

$\therefore (X \cap Y) \cup Z$

$$= \left[\{0,1,3,5\} \cap \{1,2,4,7\}\right] \cup \{1,2,3,5,8\}$$

$$= \{1\} \cup \{1,2,3,5,8,\}$$

$$= \{1,2,3,5,8,\}$$

50.(B) $1+\frac{\log_e x}{1!}+\frac{(\log_e x)^2}{2!}+\frac{(\log_e x)^3}{3!}+....+\frac{(\log_e x)^n}{n!}+....$

$= e^{(\log_e x)} = x.$

REASONING

51.(C) Since the rate of return i.e. rate of interest each receives in the proportion to the amount of his contribution.

$\therefore$ Rates of interest are 75000 : 150000 : 300000 = 1 : 2 : 4.

$\therefore$ Rahul's share of profits = Rs. $\left(\frac{r}{100}\times 75000\right) = 750r$

Mukesh's share of profits = Rs. $\left(\frac{2r}{100}\times 150,000\right) = 3000r$

Anil's share of profits = Rs. $\left(\frac{4r}{100}\times 300,000\right) = 120000r$

Since the total profit of a year amounts to Rs. 94500, we have

$750r + 3000r + 12000r = 94500 \Rightarrow 15750r = 94500 \Rightarrow r = \frac{94500}{15750} = 6$

$\therefore$ The profits are Rs. 4500, Rs. 18000 and Rs. 72000.

52.(B) Given earnings of 4 man per day = earnings of 7 women per day $\Rightarrow$ 4 M = 7 W .....(i)

Again earnings of 1 women per day = earnings of 2 boys per day $\Rightarrow$ 1 W = 2 B .....(ii)

From (i) and (ii) ratio of earnings of M.W.B = 7: 4 : 2 .

Now (6 M + 10 W + 14B) × B = 2200

$\Rightarrow (6\times 7x + 10\times 4x + 14\times 2x) = 275 \Rightarrow 110x = 275 \Rightarrow x = 2.5$

Earnings of 8M + 6W per day = 8 × 7x + 6 × 4x = 56x + 24x = 80 x = 200 .

$\therefore$ Earnings of 8 men and 6 women in 10 days = 200 × 10 = Rs. 2000.

53.(D) We have 4 men $\equiv$ 5 women; 1 man $\equiv$ 5/4 women; 2 women $\equiv$ 4 boys; 1 women $\equiv$ 2 boys; 5/4 women $\equiv$ 2 × (5/4) boys = 5/2 boys or 1 man $\equiv$ 5/4 women $\equiv$ 5/2 boys.

Now 2M + 2W + 4B = 2 × 5/2 B + 3 × 2B + 4B = 15 B .

or 15 boys do the work in 10 days (10 hectares).

6M + 4W + 7B = (6 × 5/2 + 4 × 2 + 7) B = 30 boys. 30 boys will do 16 hectares of work in 10 × (15/30) × (16/10) = 8 days.

54.(A) Let w kg of alloy contains z% of zinc in it.

Now when 3kg of pure zinc is added to alloy we get $\left(\frac{z}{100}\times w\right)+3=\frac{90}{100}(w+3)$

(Given the resulting alloy contains 90% zinc)

$zw + 300 = 90w + 270 \Rightarrow 90w - zw = 30$ .....(i)

When 2 kg of 90% zinc alloy is mixed, we get 84% zinc

$\Rightarrow\left(\frac{z}{100}\times w\right)+\frac{90}{100}\times 2=\frac{84}{100}(w+2)\Rightarrow zw+180=84w+168\Rightarrow 84w-zw=12$ .....(ii)

Solving (i) and (ii) we get w = 3 kg, z = 80%.

$\therefore$ The amount of zinc in the alloy = $3\times\frac{80}{100}$ = 2.4 k.g.

55.(B) 1st lump weights X kg, 2nd lump weights (20 – x) kg.

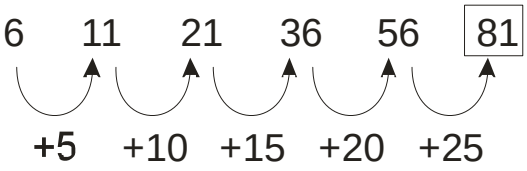
31.25 X + 30(20 + X) = 617.5; X = 14 kg. (Quantity of silver)

$\therefore$ Weight of second lump = 6 kg

$\Rightarrow$ 75% of 14 kg + 85% of 6 kg = 10.5 + 5.1 = 15.6 kg (Quantity of gold)

The required percentage of gold in new lump = (15.6/20) × 100 = 78%.

56.(C)



57.(D) $16^5 + 2^{15} = 2^{20} + 2^{15} = 2^{15}\left(2^5 + 1\right) \rightarrow$ Hence, is divisible by 33.

58.(D) Time taken to cover = (121 + 99) = 220 m

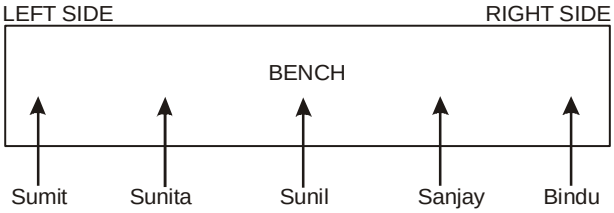
at the rate of (32 + 40), i.e., 72 kmph = $\frac{220}{\left(72 \times \frac{5}{18}\right)}$ sec $= 11$ sec.

59–64

Chennai	←	Q	→	Vision
Hyderabad	←	R	→	Skylark
Mumbai	←	S	→	Sourceone
Kolkata	←	T	→	Skylark
Baroda	←	U	→	Vision
Delhi	←	V	→	Skylark
Bangalore	←	W	→	Sourceone

59. (C) 60. (D) 61. (C) 62. (D) 63. (A) 64. (B)

65-70 : make a sketch of sitting positions based on the description given :



65.(C), 66.(B), 67.(D), 68.(C), 69.(B), 70.(B)

71–75.The diagram will be:

Science Block Commerce Block

(Two from each block)

X P

Y ← Not with → L ← Not with → M

Y ← Not with —→ N

This diagram helps to decide who can and can't be on the team with a particular other candidate.

• L's inclusion base Y and M, Y's omission requires the inclusion of X and Z to have two Science block candidates.

• Selection of Y and Z excludes L and N respectively, thus assuring the selection of P and M, therefore choice (b).

•The answer gives an example of M, P and Z being in the same team, thus falsifying statement (I) and (III). N, P, Y and X is a possible team which shows the error of II.

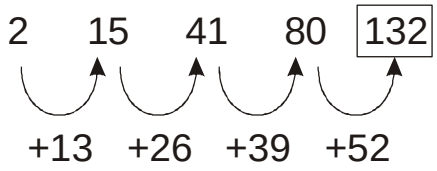
71.(D), 72.(D), 73.(B), 74.(D), 75.(B)

76–78.

R → T (1 hr) → L (1 hr) → N (1 hr) → M (1 hr) → P (1 hr)

76. (C) 77. (D) 78. (B) 79.(D)

80.(D)



81–85.

Students	Institution	Subject							
	A	B	C	Mech Eng.	Medi	Biotech	Pharm	Ele. Eng.	Sex
P	×	✓	×	×	×	×	✓	×	Boy
Q	×	×	✓	×	✓	×	×	×	Girl
R	×	✓	×	✓	×	×	×	×	Girl
S	✓	×	×	×	×	✓	×	×	Boy
T	✓	×	×	✓	×	×	×	×	Boy
W	×	×	✓	×	×	×	×	✓	Boy
Z	✓	×	×	×	✓	×	×	×	Girl

81.(C) 82. (B) 83. (A) 84. (D) 85. (A)

86–90.

Vehicle			Passengers	Occupation			Gender
I	II	III		En.	Dr.	T.	
×	✓	×	P	×	×	✓	Female
✓	×	×	Q	✓	×	×	Female
×	×	✓	R	×	✓	×	Female
×	✓		S	×	✓	×	Male
×	×	✓	T	×	×	✓	Male
×	✓	×	V	✓	×	×	Female
✓	×	×	W	×	×	✓	Female

En. —— Engineer

Dr. —— Doctor

T. —— Teacher

86. (B) 87. (D) 88. (A) 89. (C) 90. (B)

ENGLISH

91.(D) Arid :- Lacking sufficient water or rainfall.

Moisture :- Wetness caused by water.

Thus arid is an antonym of moisture. In the same manner silent : sound are opposite to each other. Thus option (D) will be accurate.

92.(A) According to hunger : satiated the correct option is (B). When hunger is satisfied it is called satiated, in the same way when pain is healed, it is called hospitalized.

93.(A) Alive is the relevant word for the sentence.

94.(D) Abstain :- Refrain from voting or Choose not to consume. Thus consume is the antonym of abstain.

95.(D) Palatable means :- Acceptable to the taste or mind.

Detesting means :- Dislike intensely; feel antipathy or aversion towards.

Thus Detesting is the antonym of palatable.

96.(D) Vernacular :- common or ordinary, thus Different is the antonym of Vernacular.

97.(A) Pastime :- Leisure time or a diversion that occupies one's time and thoughts (usually pleasantly).

Employment :- The state of being employed or having a job or being busy.

Thus employment is the antonym of pastime.

98.(A) Nebulous :- Lacking definite form or limits.

Definite :- Definite but not specified or identified.

Thus Definite is the antonym of nebulous.

99.(C) Forbid :- Command against. Thus its antonym is permit.

100.(C) Prognosis :- A prediction about how something (as the weather) will develop.

Diagnosis :- the identification of the nature and cause of an illness, e.g. by studying the symptoms.

Thus the antonym of Prognosis is diagnosis.

101.(A) Laughter does not demand money, it is free of cost and good for health too which keeps a person healthy. It is said that laughter is the best medicine because it is the cheapest luxury man enjoys.

102.(A) It means he should not let others ridicule him.

103.(B) The writer feels laughter is to be prescribed to those who dislike medicines because laughter is the best medicine to cure all diseases.

104.(A) Since you belong to this cadre, you are eligible for facilities such as free air travel and accommodation.

105.(D) The given sentence is correct.

106.(C) The proper sequence is given below:-

The secretary announced that in an attempt to find answer to these questions a national workshop on technical training has been organized by the Confederation of Engineering Industry.

107.(D) You have been writing to me often about distinguishing in a fancy dress show, or getting a first prize in sports etc by my daughter. Such achievement make me apprehensive of your educational progress.

108.(C) Suggestion is the most suitable word here.

109.(B) Become is the accurate word for the given sentence.

110.(C) Based is the most appropriate word here.

COMPUTER APPLICATION

111.(D) The call find (a, find (a, b)) can be used to find the minimum of a, b.

112.(A) 2's complement of 100011

Adding with

011101
100101
1000010 ≠ 000000
↓
Discard

113.(C) y = A * (BC + D)

= A (BC + D)

114.(D) The scan function returns the number of successful matches. i. e., 3 in this case.

115.(C) All are 2's complement of 7

$$11001 \Rightarrow 00110 + 1 = 00111 = 7_{10}$$

$$1001 \Rightarrow 0110 + 1 = 0111 = 7_{10}$$

$$111001 \Rightarrow 000110 + 1 = 000111 = 7_{10}$$

116.(A) Pigeon - hole principle is that if 'n' balls are to be put in 'm' boxes, then at least one box will have more than one ball if n > m. Though this is obvious, still powerful.

117.(B) As all lines are full - duplex and there are no self connections, only the cross points above the diagonal are needed. Hence formula for the number of cross points needed is n (n – 1)/2 .

118.(B) It will be one more than the size of the biggest cluster (which is 4) in this case. This is because, assume a search key hashing onto bin 8. By linear probing the next location for searching is bin 9. Then 0, then 1. If all these resulted in a miss, we try at bin 2 and stop as it is vacant. This logic may not work if deletion operation is done before the search .

119.(D) Even in a non - multiprogramming system, memory protection may be used, when, for example, spooling is being used.

120.(D) 1 – (1 – 0.5) (1 – 0.4) = 0.7.