JNU-2017 SET-A

1. Find the median of the given in the table:

Income	1000	1100	1200	1300	1400	1500
No. of Person	14	26	21	18	28	15

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(a) 1300 (b) 1250 (c) 1200 (d) N.O.T

2. Determine the set $B = \left\{ x \in R : \frac{2x+1}{x+2} < 1 \right\}$

Where, R is the set of real numbers **JNU-2017**

(a) B = (-2, 1) (b)B = (1, 2)

(c) $B = (-\infty, -1) \cup \left(\frac{1}{2}, \infty\right)$ (d) N.O.T

3. The odds against A solving the problem is 4 is to 3 and the odds in favour of B solving the problem is 7 is to 5. What is the probability that the problem will not be solved? **JNU-2017**

(a) 4/21 (b) 16/21 (c) 63/84 (d) 69/84

4. Let $\{f_n\}$ be the Fibonacci sequence of number defined by $f_1 = 1$, $f_2 = 1$ and $f_n = f_{n-1} + f_{n-2}$ for n > 2

It is defined that $x_n = \frac{f_n}{f_{n+1}}$ for n ≥ 1. Then, the sequence is$\{x_n\}$ **JNU-2017**

(a) diverges

(b) converges to $\frac{1}{2}\left(-1+\sqrt{5}\right)$

(c) converges to $\frac{1}{2}\left(1+\sqrt{5}\right)$

(d) None of these

5. Let a, b be integers. A necessary and sufficient condition for $(a^2 - b^2)$ to be an odd number is **JNU-2017**

(a) Both a, b are even

(b) Both a, b are odd

(c) a even and b odd or a odd and b even

(d) None of these

6. Find following system of linear equations

2x + 3y – z = 5

x – 2y + 3z = 7

x + 5y – 4z = 0 **JNU-2017**

(a) a unique solution

(b) no solution

(c) infinitely many solution

(d) N.O.T

7. The variance of the first n natural numbers is **JNU-2017**

(a) $n^2/4$ (b) $(n^2 + 1)/8$

(c) $(n^2 – 1)/12$ (d) N.O.T

8. The number of 2 × 2 matrices whose entries are either 1's and – 1's will be equal to **JNU-2017**

(a) 8 (b) 16 (c) 32 (d) None of these

9. In a certain language, MACHINE is coded as LBBIHOD. Which one of the following words will be coded as SLTMFNB? **JNU-2017**

(a) RKLEMA (b) TKULGMC

(c) RMSNEOA (d) TMUNGMC

10. Find the rank of the matrix $\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 6 \end{bmatrix}$ **JNU-2017**

(a) 1 (b) 2 (c) 3 (d) N.O.T

11. When Gauri was born, her mother was 25 years older than her sister and her father was 32 years older than her brother. If Gauri's brother is 6 years older than her mother is 3 years younger than her father, how old was Gauri's sister when Gauri was born? **JNU-2017**

(a) 10 yrs (b) 8 yrs (c) 7 yrs (d) 5 yrs

12. The first four moments of a distribution about the value 4 of the variable are -1.5, 17, - 30 and 108. The variance is **JNU-2017**

(a) 21.0 (b) 19.5 (c) 14.75 (d) N.O.T

13. If $6\cos 2\theta + 2\cos^2(\theta/2) + 2\sin^2\theta = 0$, $0 < \theta < \pi/2$ then the value of θ is equal to **JNU-2017**

(a) π/3 (b) π/4 (c) π/6 (d) N.O.T

14. The three words, Historian : Scholar : Researcher are related in some way. Which one of the following options exhibit the same relationship **JNU-2017**

(a) Professor : Lecturer : Teacher

(b) Story : History : Book

(c) Morning : Day : Night

(d) Novel : Book : Epic

15. The vectors 2i + j – 2k, i + j + 3k and xi + j are coplanar. Then x is **JNU-2017**

(a) 5/8 (b) 3/4 (c) 8/5 (d) 4/3

16. Find the determinant of the skew-symmetric matrix A defined by

$$A = \begin{pmatrix} \sin x & -\sin(x-\pi/4) & \tan(x-\pi/4) \\ \sin(x-\pi/4) & 0 & \log(x/y) \\ -\tan(x-\pi/4) & \log(y/x) & \tan x \end{pmatrix}$$

JNU-2017

(a) sin x + tan x (b) 1

(c) 0 (d) N.O.T

17. If an anticraft gun hit the target in 3-shot. The probability of hitting target in 1st, 2nd and 3rd target is 0.3, 0.2 & 0.1. Then the probability that the target is hit **JNU-2017**

(a) 0.419 (b) 0.456 (c) 0.496 (d) None of these

18. Let X be a random variable such that E{|X|} < ∞. Then E {|X - C|} is minimized if we choose c is equal to **JNU-2017**

(a) the variance of X (b) E[X]

(c) the median of X (d) N.O.T

19. Priya walked 10 meters in front and 10 meters to her right. Then every time turning to her left, she walked 5, 15 and 15 meters respectively. How far is she from her starting point **JNU-2017**

(a) 55 meters (b) 35 meters

(c) 25 meters (d) 5 meters

20. If x is real, then the maximum value of

$\frac{3x^2+9x+17}{3x^2+9x+7}$ is **JNU-2017**

(a) 40 (b) 48 (c) 51 (d) N.O.T

21. The number of equivalence relations on the set S = {a, b, c} is **JNU-2017**

(a) 6 (b) 8 (c) 9 (d) None of these

22. Complete the series

2, 5, 9, 19, 37, ? **JNU-2017**

(a) 76 (b) 75 (c) 74 (d) 72

23. Let a, b, c be real numbers. Consider the following equalities:

(i) max $\{a,b\} = \frac{1}{2}\left(a+b+|a-b|\right)$

(ii) min $\{a,b\} = \frac{1}{2}\left(a+b-|a-b|\right)$

(iii) min {a, b, c} = min {min {a, b}, c}

Among these, identify the number of correct statements **JNU-2017**

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

24. Statements :

I: All trolleys are pulleys

II : Some pulleys are chains

III : All chain are bells.

Conclusion **JNU-2017**

(a) some bells are trolleys (b) no bell is trolley

(c) some pulleys are bells (d) all chain are pulleys

From the statements given above which of the conclusions logically follow?

(a) either I or II

(b) Only III and IV

(c) either I and III, or II and IV

(d) either I or II and III

25. Among the following serried defined as

(i) $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ (ii) $\sum_{n=1}^{\infty} \frac{1}{n!n^n}$

(iii) $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$

Identify the converging series **JNU-2017**

(a) Only I and II (b) Only I and III

(c) Only II and III (d) N.O.T

26. Given that $(4373)^2 + 1 = 2(9561, 565)$. Write the number (9561, 565) as the sum of two squares **JNU-2017**

(a) $(2185)^2 + (2184)^2$ (b) $(2180)^2 + (2183)^2$

(c) $(2188)^2 + (2189)^2$ (d) $(2185)^2 + (2187)^2$

27. Let $A = \frac{1}{2}\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$

and C = AB be 2 × 2 matrices. Then C^k will be equal to **JNU-2017**

(a) $\begin{bmatrix} 1 & 0 \\ 0 & (-1)^k \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} (-1)^k & 0 \\ 0 & 0 \end{bmatrix}$ (d) N.O.T

28. Let $\vec{a}, \vec{b}, \vec{c}$ be vectors such that $\vec{a}+\vec{b}+\vec{c}=0$ and $|\vec{a}| = 3$, $|\vec{b}| = 5$, $|\vec{c}| = 7$, Then the angle between a and b is **JNU-2017**

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{2\pi}{3}$ (d) $\frac{5\pi}{3}$

29. An particle is moving in the clockwise direction around the unit circle $x^2 + y^2 = 1$. As it passes through the point $\left(1/2, \sqrt{3/2}\right)$ its y-coordinate is decreasing at the rate of 3 units per second. The rate at which the x-coordinate changes at this point is **JNU-2017**

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

30. Let R = {(1, 1), (2, 2), (3, 3), (2, 1), (1, 2), (2, 3), (3, 1)} be a binary relation on the set S = {1, 2, 3}. Then the relation R is **JNU-2017**

(a) reflexive (b) symmetric

(c) transitive (d) equivalence

31. Find all the eigenvalues of the matrix $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ **JNU-2017**

(a) 1, - 1 (b) 0, - 1 (c) 1, 0 (d) 0, 0

32. Find the greatest common divisor of 1800 and 756. **JNU-2017**

(a) 36 (b) 32 (c) 24 (d) None of these

33. Consider the Fibonacci function F : N → N, where N is the set of natural numbers defined by

$1 \to F(1) = F_1 = 1$

$2 \to F(2) = F_2 = 1$

and

$n \to F(n) = F_n = F_{n-1} + F_{n-2}$ for $n > 2$

Then the Fibonacci function is **JNU-2017**

(a) one-to-one

(b) onto

(c) both one-one-one and onto

(d) None of these

34. The stripes measuring 1 ml in a 1 litre cylindrical kitchen measuring jug is 1 mm wide, if the radius is with an error of no more than 1%. What is the radius of the cylinder? **JNU-2017**

(a) 50 mm (b) 60 mm

(c) 75 mm (d) 100 mm

35. In a cricket match, 5 batsman A, B, C, D and E scored an average of 36 runs. D scored 5 more than E, E scored 8 fewer than A, B scored as much as the combined score of D and E and B and C together scored 107. How many runs did E score? **JNU-2017**

(a) 62 (b) 45 (c) 28 (d) 20

36. How many numbers in the range 1000 - 9999 do not have any repeated digits? **JNU-2017**

(a) 4635 (b) 4435 (c) 4365 (d) 4536

37. A student must answer exactly eight question out of ten on a final examination. In how many ways can she choose the questions to answer if she must answer at least three of the last five questions and at most four of the first five? **JNU-2017**

(a) 30 (b) 32 (c) 35 (d) 38

38. Among the following statements, identify the true statement(s) :

(i) Any subgroup of a cyclic group is cyclic

(ii) Let (H, *) be a subgroup of a group (G, *). Let N = $\{x \mid x \in G, xHx^1 = H\}$, where x^1 is the inverse of the element x. Then (N,*) is a subgroup of (G, *).

(iii) Let (G,*) be a group. Let H = {x ∈ G| x * y = y * x for all y ∈ G}. Then (H, *} is a subgroup of {G, *} **JNU-2017**

(a) only 1 & 2 are true (b) only 1 & 3 are true

(c) only 2 and 3 are true (d) all of these are true

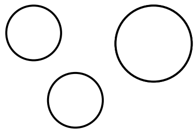
39. Find the following sum : $\sum_{x=0}^{n} \binom{M}{x}\binom{N-M}{n-x}$ **JNU-2017**

(a) $\binom{M}{N}$ (b) $\binom{N}{M}$ (c) $\binom{N}{n}$ (d) None of these

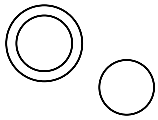
40. Find Venn diagrams best illustrate the relationship among the given two sets of items?

Statement 1: yak, zebra, bear
Statement 2: sun, moon, star

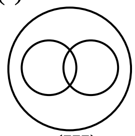
JNU-2017



(I)



(II)



(III)

(a) only I and III (b) Only II and III
(c) Only I and II (d) Only I

41. Let the equation of two circles be given as
$x^2+y^2+2g_1x+2f_1y=0$ and
$x^2+y^2+2g_2x+2f_2y=0$
If they touch each other, then **JNU-2017**
(a) $f_1^2+g_1^2=f_2^2+g_2^2$ (b) $f_2g_1=f_1g_2$
(c) $f_1f_2=g_1g_2$ (d) $f_1^2+g_2^2=f_2^2+g_1^2$

42. Among the five groups of letters given below, two are different from the remaining three groups of letters:
(i) LEVEL (ii) FRETFUL
(iii) DRUID iv) UELOPE
(v) CALORIC
Which one of the given is true? **JNU-2017**
(a) only i and ii (b) only ii and iii
(c) only ii and iv (d) only iv and v

43. If ca ≡ cb (mod n) and gcd (c, n) = d, then **JNU-2017**
(a) a ≡ b (mod n/d) (b) a ≡ b (mod n)
(c) a ≡ b (mod d/n) (d) a ≡ b (mod (nd))

44. The total work done in moving a particle in a force field given by F = 3xyi – 5zj + 10xk
Along the curve $x=t^2+1$, $y=2t^2$, $z=t^3$ from t=1 & t=2 is **JNU-2017**
(a) 101 (b) 202 (c) 303 (d) 330

45. Find the root of equation $\frac{1}{x+1}+\frac{1}{x+5}=\frac{1}{x+2}+\frac{1}{x+4}$
JNU-2017
(a) -2 (b) -1/2 (c) 1/3 (d) -3

46. For any positive integer n > 1, the canonical form for the number n is **JNU-2017**
(a) $n=p_1^{k_1}p_2^{k_2}.....p_r^{k_r}$, where p_i's are primes and k_i's are positive integers
(b) $n = p_1p_2 \dots p_r$ where p_i's are primes
(c) n = 2p + 1, where p is prime
(d) None of these

47. In a certain code, 15789 is written as EGKPT and 2346 is written as ALUR. How is 23549 written in that code? **JNU-2017**
(a) ALGUT (b) ALEUT
(c) ALGTU (d) ALGRT

48. The vectors **X, Y, Z** issue from a common point and have their heads in a plane. The vector perpendicular to this plane is **JNU-2017**
(a) (**X** × **Y** × Z)
(b) (**X** × Y) + (**Z** × X)
(c) (X × Y) × (Y × Z) × (Z × X)
(d) (**X** × Y) + (**Y** × Z) + (**Z** × X)

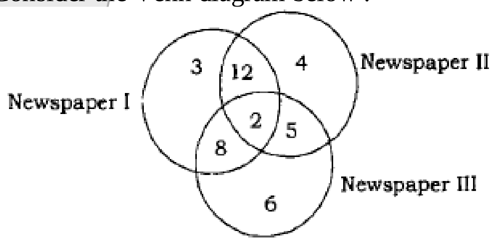
49. Let z be a complex number such that $|z| = 1$ and $z \neq \pm 1$. Then all the values of $\frac{z}{1-z^2}$ are **JNU-2017**
(a) on the X-axis
(b) on the Y-axis
(c) not on the X-axis but on a line parallel to the X-axis
(d) None of the above

50. Six fruits-an apple, an orange, a guava, a banana, a papaya and a kiwi are placed in two rows, three fruits in each of the rows. Consider the following information :
(i) Papaya is not at the end of any row.
(ii) Banana is second to the left of kiwi.
(iii) Guava, placed next to papaya is diagonally opposite to banana.
(iv) Orange is beside kiwi.
Which one of the following statements is true regarding the fruit arrangement? **JNU-2017**
(a) Apple and orange are placed diagonally opposite to each other.
(b) Apple, guava and papaya are placed in the same row.
(c) Banana is placed opposite to guava.
(d) None of the above is true.

51. Evaluate $\left[e^{\lambda}\sum_{i=0}^{\infty} i\frac{\lambda^i}{i}\right]$ **JNU-2017**
(a) e^{λ} (b) λ (c) λe^{λ} (d) None of these

52. Suppose a is a rational number and b is an irrational number. Then $a+b$ will become **JNU-2017**
(a) integer (b) rational
(c) irrational (d) complex

53. Consider the Venn diagram below :



The number in the Venn diagram indicates the number of persons reading the newspapers. The diagram is drawn after surveying 50 persons. In a population of 10000, how many can be expected to read at least two newspapers? **JNU-2017**
(a) 5000 (b) 5400 (c) 4400 (d) 4000

54. Let X = {a, b, c} and Y = {1, 2, 3, 4} be sets. How many one-to-one functions are there from X to Y?
JNU-2017
(a) 14 (b) 17 (c) 20 (d) None of these

55. Among the following sequences
(i) $\lim_{n\to\infty}\left(\frac{2^n}{n!}\right)$ (ii) $\lim_{n\to\infty}\left(\frac{\sin x}{n}\right)$
(iii) $\lim_{n\to\infty}\left((-1)^n n^2\right)$
find the converging sequences **JNU-2017**
(a) Only (i) and (ii) (b) Only (i) and (iii)
(c) Only (ii) and (iii) (d) All converge

56. In the series
6 4 1 2 2 8 7 4 2 1 5 3 8 6 2 1 7 1 4 1 3 2 8 6
How many pairs of alternate numbers have a difference of 2? **JNU-2017**

(a) Five (b) Four (c) Three (d) Two

57. Let A, B, C be square matrices. Assume that
$AB= I$ and $BC= I$
where, I is the identity matrix. Then, the matrix A should be equal to **JNU-2017**
(a) B (b) C
(c) the zero matrix (d) the identity matrix

58. The points (a, b +c), (b, c+a) and (c, a+b) **JNU-2017**
(a) are vertices of an equilateral triangle
(b) are vertices of a right angled triangle
(c) lie on a circle
(d) None of the above

59. If a line OP through the origin O makes angles a, 45° and 60° with X-, Y- and Z-axis respectively, then the value of $\cos a$ is **JNU-2017**
(a) 1/2 (b) $\sqrt{3}/2$ (c) $1/\sqrt{2}$ (d) 1

60. Find the value of the trigonometric sum
tan203° + tan22° + tan203°tan22° **JNU-2017**
(a) -1 (b) 0 (c) 1 (d) None of these

61. How many elements are in the power set of the power set of the empty set? **JNU-2017**
(a) 0 (b) 1 (c) 2 (d) None of these

62. Consider the following limits :
(i) $\lim_{x\to 0} f(x)$, where
$$f(x)=\begin{cases} x & \text{when x is rational} \\ 0 & \text{when x is irrational}\end{cases}$$
(ii) $\lim_{x\to 0} x\sin(1/x)$
(iii) $\lim_{x\to 0}\left(x+\frac{x}{|x|}\right)$
Then **JNU-2017**
(a) all of them do not exist
(b) exactly two of them do not exist
(c) exactly one of them does not exist
(d) all of them exist

63. If – means ÷, + means ×, ÷ means -, and × means+, then which one of the following equations is incorrect? **JNU-2017**
(a) 52 ÷ 4 + 5 × 8 - 2 = 36
(b) 36 × 4 – 12 + 5 ÷ 3 = 2
(c) 45 × 5 ÷ 15 + 8 - 4 = 19
(d) 36 - 3 × 12 + 4 ÷ 6 = 54

64. The value of 573_8 is equal to **JNU-2017**
(a) 319_{10} (b) 359_{10} (c) 389_{10} (d) 379_{10}

65. Let T: $R^3 \to R^3$ be a transformation defined by for (v_1, v_2, v_3) in R^3
$T(v_1, v_2, v_3) = (v_2, v_3, v_1)$
Then $T^{100}(v_1, v_2, v_3)$ is equal to **JNU-2017**
(a) (v_1, v_2, v_3) (b) (v_2, v_3, v_1)
(c) (v_3, v_1, v_2) (d) None of the above

66. Let a_1, a_2, ... be the sequence of numbers defined by
$a_1 = 1$, $a_2 = 0$
and
$a_n = 4a_{n-1} – 4a_{n-2}$ for n > 2
Then a_{10} will become **JNU-2017**
(a) -4096 (b) -4224 (c) 4672 (d) 4360

67. A man, a woman, a boy, a girl, a dog and a cat are walking down a long road one after the other. In how many ways can this happen if only the dog is between the man and the boy? **JNU-2017**
(a) 40 (b) 42 (c) 46 (d) None of these

68. In a row of boys, Aryan is eighth from the tight and Nilesh is twelfth from the left. When Aryan and Nilesh interchange positions, Nilesh becomes twenty-first from the left. Which will be Aryan's position from the tight? **JNU-2017**
(a) Seventeenth (b) Nineteenth
(c) Twenty-first (d) Thirtieth

69. Let $A=\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$
where ω(≠ I) is a cubic root of unity. Then, the matrix A^2 will become **JNU-2017**
(a) zero matrix (b) identity matrix
(c) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ (d) None of the above

70. What is the probability of picking either a spade or a queen from a well-shuffled pack of playing cards? **JNU-2017**
(a) 4/13 (b) 11/52 (c) 7/26 (d) 22/52

71. The value of the integral
$\int_{-\infty}^{\infty}\exp\left[-(x-7)^2-32\right]dx$ is equal to **JNU-2017**
(a) $2\sqrt{\pi}$ (b) $4\sqrt{2\pi}$ (c) $7\sqrt{2}$ (d) None of these

72. How many natural numbers are lying between 20000 and 60000, the sum of the digits being even? **JNU-2017**
(a) 19998 (b) 19999 (c) 39998 (d) 39999

73. The probability density function (pdf) of a continuous random variable X is
$$f(x)=\begin{cases} |x|, & |x|\le 1 \\ 0, & otherwise\end{cases}$$
The variance of X is **JNU-2017**
(a) 1/2 (b) 1 (c) 2 (d) 0

74. Which one of the following numeral groups is odd one out? **JNU-2017**
(a) 12-144 (b) 15--180
(c) 18—198 (d) 21-252

75. Let u and v be differentiable functions of the variables x, y and z. Show that a necessary and sufficient condition that u and v are functionally related by the equation $F(u, v) = 0$ is **JNU-2017**
(a) $\nabla u \times \nabla v = 0$
(b) $\nabla u\cdot\nabla v = 0$
(c) Both (a) and (b) should be satisfied
(d) None of the above

76. If *every* alternate letter starting from B of the given alphabet is written in small letters, and rest all in capital letters, how will the month of September be written? **JNU-2017**
(a) SepteMbeR (b) SEptEMbEr
(c) SEptembER (d) sePTeMbeR

77. A fair coin is flipped until head appears for the first time. If this occurs on the kth trial, the player gets 2^k amount. The expected gain from this game is **JNU-2017**
(a) 0 (b) 2 (c) ∞ (d) None of these

78. Find the number of solutions to the equation
$x_1 + x_2 + x_3 + x_4 = 13$
so that x_1, x_2, x_3, x_4 are non-negative integers **JNU-2017**

(a) 560 (b) 520 (c) 490 (d) 356

79. For any two integers *a*, *b*, when *a* divides *b* we denote it by a | *b*. For integers *a*, *b*, c and *d* consider the following statements :
(i) If *a*|*b* and c | *b*, then $a \times$ c | *b*
(ii) If *a* | *b* and c | d, then $a \times c \mid b \times d$
(iii) If *a* | *b* and c| (b/a), then c | b and a| (b/c)
Among them, identify the true statements. **JNU-2017**
(a) Only (i) and (ii) (b) Only (i) and (iii)
(c) Only (ii) and (iii) (d) (i), (ii) and (iii)

80. Suppose $f: A \to B$ and $g: B \to C$ are functions where *A*, *B*, Care non-empty sets. Let *g o f* denote the composite function such that (g o *f*) *(x)* = *g* (f (x)). If *g o f* is one-to-one and *f* is onto, then **JNU-2017**
(a) *g* is one-to-one
(b) *g* is onto
(c) *g* is both one-to-one and onto
(d) None of the above

81. Consider the four matrices given below :
$$\begin{bmatrix}1&1&3\\0&4&6\\1&5&9\end{bmatrix}, \begin{bmatrix}2&0&-3\\3&1&2\\-4&0&6\end{bmatrix}, \begin{bmatrix}0&1&1\\1&0&1\\1&1&0\end{bmatrix}, \begin{bmatrix}0&0&1\\0&0&2\\1&3&2\end{bmatrix}$$
Find the number of matrices whose determinant is zero. **JNU-2017**
(a) 1 (b) 2 (c) 3 (d) 4

82. The result of adding the binary numbers 11011 and 10011
will be **JNU-2017**
(a) 110010 (b) 101100
(c) 101010 (d) 101110

83. Let *A*, *B*, *C* be sets. Identity the number of true statements from below :
(i) $A \cup B = A \cup C \Rightarrow B = C$
(ii) $A \cup B \subseteq A \cap B \Rightarrow A = B$
(iii) $A \cap B = A \cap C \Rightarrow B = C$ **JNU-2017**
(a) 0 (b) 1 (c) 2 (d) 3

84. Let $\{x_n\}$ be the sequence, defined by
$x_1 = 1$, $x_2 = 2$ and $x_n = \frac{1}{2}(x_{n-2} + x_{n-1})$ x > 2
It is given that $\lim_{n\to\infty} x_n = x$.
Then **JNU-2017**
(a) $1 < X < 2$ (b) $x > 2$
(c) **x = ∞** (d) $x < O$

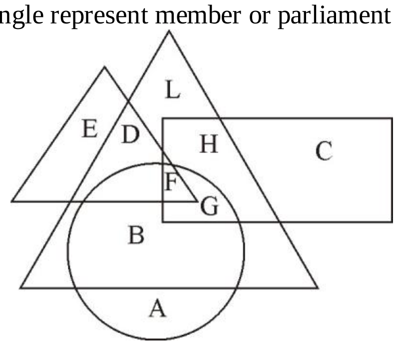
85. Define the function $f: Z \to Z$ by
F(x) = $3x^3 - x$
where *Z* denotes the set of integers. Then *f* is **JNU-2017**
(a) injective (b) surjective
(c) bijective (d) None of the above

86. Let '~' be an equivalence relation on the Euclidian plane R^2 defined by for (x_1, y_1), (x_2, y_2) in R^2
$(x_1, y_1) \sim (x_2, y_2)$ if and only if $x_1^2 - y_1^2 = x_2^2 - y_2^2$
Then the equivalence class of the point (0, 0) will be **JNU-2017**
(a) a pair of straight lines
(b) a parabola
(c) an ellipse
(d) a hyperbola

87. Among the following statements, identify the number of the true statements :
(i) If all diagonal entries of a square matrix *A* are zero, then *A* is singular.
(ii) If *U* is an invertible upper triangular matrix, then $(U^{-1})^T$ is a lower triangular matrix.
(iii) If *A*, *B* are invertible matrices, then (A+ B) is always invertible. **JNU-2017**
(a) 0 (b) 1 (c) 2 (d) 3

88. Let *f: R* →-4 (1, ∞) be the function defined by f(x) 3 *L*< • 1. where R is the set of real numbers. Then, the function g: (1, ∞) → R numbers. Then, the function *g:* (1, ∞) → *R* be the *inverse of f when*
JNU-2017
(a) $g(x) = \log_3(x - 1)$ (b) $g(x) = 2\log_3(x - 1)$
(c) $g(x) = 31og_2(x - I)$ (d) None of the above

89. Smaller triangle represent teacher, bigger triangle represent politicians, circle represent graduates and rectangle represent member or parliament



Then find who is teacher or graduates but not politicians. **JNU-2017**
(a) B, D (b) A, C (c) A, E (d) L, E

90. How many integers between 1 and 300 (inclusive) are divisible by 3 and by 5 but not by 7? **JNU-2017**
(a) 16 (b) 20 (c) 22 (d) 18

91. In a group of 100 people, several will have their birthdays in the same month. At least how many must have their birthdays in the same month? **JNU-2017**
(a) 7 (b) 9 (c) 11 (d) None of these

92. Let z and *w* be two non-zero complex numbers such that |z| = |w| and arg (z) + arg (w) = π
If $\overline{w}$ is the complex conjugate of *w*, then z will be equal to **JNU-2017**
(a) *w* (b) $\overline{w}$ (c) -*w* (d) $-\overline{w}$

93. A coin is tossed four times. How many times would you expect it falls heads? **JNU-2017**
(a) 4 (b) 3 (c) ∞ (d) 1

94. Let z be a complex number such that |z| = 1. Let
$w = \frac{z-1}{z+1}$ (where $z \neq -1$)
Then the real part of the complex number *w* is equal to **JNU-2017**
(a) 0 (b) 1 (c) $\sqrt{2}$ (d) None of these

95. Consider the following limits :
(i) $\lim_{x\to 0}\frac{1}{x}$ =h (ii) $\lim_{x\to 0}\sin(1/x)$
(iii) $\lim_{x\to 0}\frac{x}{|x|}$
Then, the limits of **JNU-2017**
(a) all of them do not exist
(b) exactly two of them do not exist
(c) exactly one of them does not exist
(d) all of them exist

96. Let *a*, *b* be real numbers. Consider the inequalities :

(i) $\left(\frac{1}{2}(a+b)\right)^2 \le \frac{1}{2}\left(a^2+b^2\right)$

(ii) $a<b \Leftrightarrow a<\sqrt{ab}<b$

(iii) $ab>0 \Leftrightarrow |a+b|=|a|+|b|$

Among them, the correct statements are **JNU-2017**

(a) only (i) and (ii) (b) only (i) and (iii)
(c) only (ii) and (iii) (d) None of the above

97. For k = 1, 2, 3, 4, let

$$z_k=\cos\left(\frac{k\pi}{10}\right)+i\sin\left(\frac{k\pi}{10}\right)$$

be complex numbers. Then the product $z_1z_2z_3z_4$ will be **JNU-2017**

(a) 1 (b) -1 (c) 0 (d) None of these

98. Let the complex numbers z_1, z_2 and z_3 be vertices of a parallelogram *ABCD*. Then, its fourth vertex is **JNU-2017**

(a) $z_1+z_2+z_3$ (b) $z_1+z_2-z_3$
(c) $z_1-z_2+z_3$ (d) None of the above

99. A bus starts from city *X*. The number of women in the bus is half of the number of men. In city *Y*, as 10 men leave the bus and 5 women enter, the number of men and women in the bus is equal. From city *X*, how many passengers started the journey? **JNU-2017**

(a) 15 (b) 24 (c) 36 (d) 45

100. Let a point undergoes the following three transformations successively :
(i) Reflection about the line $y = x$
(ii) Translation through a distance of 2 units along the positive direction of the x-axis
(iii) Rotation through the angle 90° about the origin in the anticlockwise direction
What is the final position if the given point is (4, 1)? **JNU-2017**

(a) $\left(\frac{1}{\sqrt{2}},\frac{7}{\sqrt{2}}\right)$ (b) $\left(-\frac{1}{\sqrt{2}},\frac{7}{\sqrt{2}}\right)$

(c) $\left(-\sqrt{2},7\sqrt{2}\right)$ (d) $\left(\sqrt{2},7\sqrt{2}\right)$

JNU-2017

Answers

1	2	3	4	5	6	7	8	9	10
C	A	W	B	C	B	C	B	B	A
11	12	13	14	15	16	17	18	19	20
A	C	A	D	C	C	C	C	D	D
21	22	23	24	25	26	27	28	29	30
D		D	D		C	D	B	W	A
31	32	33	34	35	36	37	38	39	40
C	A	D		D	D	C	D	C	C
41	42	43	44	45	46	47	48	49	50
B	W	A	C	D	A	A	D	B	B
51	52	53	54	55	56	57	58	59	60
W	C	B	D	A	D	B	D	A	C
61	62	63	64	65	66	67	68	69	70
C	B	Abd	D	D	A	D	A	A	A
71	72	73	74	75	76	77	78	79	80
W	B	D	C	C	B	B	A	C	C
81	82	83	84	85	86	87	88	89	90
C	D	C	A	D	A	B	W	C	D
91	92	93	94	95	96	97	98	99	100
B	D	C	A	A	C	B	C	D	B

PAPER-2017 JNU
SOLUTIONS OF (MATHS DIFFICULT QUESTIONS)

1. **Ans. (c)**

Income	Frequency	L.R.
1000	14	14
1100	26	40
1200 ←	21 ←	61
1300	18	79
1400	28	107
1500	15	122 = N

Median $\frac{N}{2}=\frac{122}{2}=61$ → So median is 1200

2. **Ans. (a)**

Here $\frac{2x+1}{x+2}<1$

Case I: x + 2 > 0 ⇒ 2x + 1 < x + 2
x > - 2 …(1) x < 1 ……(2)
From, (1), (2) ⇒ 2 < x < 1

Case II: x + 2 < 0 ⇒ 2x + 1 > x + 2
…(1) x > 1 ……(2)
From, (1), (2) ⇒ Not possible
⇒ only – 2 < x < 1 satisfies

3. **Ans. (w)**

P(odds in favour of A) $=\frac{3}{3+4}=\frac{3}{7}$

P(odds in favour of B) $=\frac{7}{5+7}=\frac{7}{12}$

P(Problem not solved)

$=\left(1-\frac{3}{7}\right)\left(1-\frac{7}{12}\right)=\frac{4}{7}.\frac{5}{12}=\frac{20}{84}$

4. **Ans. (b)**

Here $f_1 = 1$, $f_2 = 1 \Rightarrow f_3 = f_1 + f_2 = 1 + 1 = 2$
$\Rightarrow f_4 = f_2 + f_3 = 1 + 2 = 3$
$\Rightarrow f_5 = 2 + 3 = 5$

$$\Rightarrow x_n=\left(\frac{f_n}{f_{n+1}}\right)=\left[1,\frac{1}{2},\frac{2}{3},\frac{3}{5},......\right]\rightarrow\frac{1}{2}\left(-1+\sqrt{5}\right)$$

5. **Ans. (c)**

$a^2 - b^2$ = (a – b) (a + b) is odd iff (a – b) and (a + b) both odd ⇒ one of a, b odd and other is even.

6. **Ans. (b)**

$$D=\begin{vmatrix}2 & 3 & -1\\ 1 & -2 & 3\\ 1 & 5 & -4\end{vmatrix}=0$$

$$D_1=\begin{vmatrix}5 & 3 & -1\\ 7 & -2 & 3\\ 0 & 5 & -4\end{vmatrix}\ne 0\Rightarrow \text{ No solution.}$$

7. **Ans. (c)**

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

Variance

$= \frac{\sum (x_i)^2}{n} - (\bar{x})^2 = \frac{1^2+2^2+.....+n^2}{n} - \frac{(n+2)^2}{4}$

$= \frac{n(n+1)(2n+1)}{6n} - \left(\frac{n+1}{4}\right)^2 = \frac{n^2-1}{12}$

8. **Ans. (b)**
There are four places, each place 2 possibilities
$\Rightarrow$ Total possibilities = $2^4 = 16$

9. **Ans. (b)**

10. **Ans. (a)**
$\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 2 & 0 & 0 & 6 \end{bmatrix} \rightarrow \begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 3 \\ 2 & 0 & 0 & 6 \end{bmatrix} \rightarrow \begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$
$\rightarrow$ by $R_3 \rightarrow R_3 - 2R_2$
By Echelon $\rightarrow$ only one non-zero row $\Rightarrow$ Rank = 1

11. **Ans. (a)**

12. **Ans. (c)**
Variance = 2nd central moment = H2 – (K1)2
Where H2 $\rightarrow$ second moment
H1 $\rightarrow$ first moment
= 17 – (-1.5)2 = 17 – 2.258 = 14.75

13. **Ans. (a)**
If $\theta = \frac{\pi}{3} \Rightarrow 6\cos 2\theta + 2\cos^2\frac{\theta}{2} + 2\sin^2\theta.$

14. **Ans. (d)**

15. **Ans. (c)**
As vertices are coplanar $\Rightarrow$ |dA| = 0
$\Rightarrow \begin{vmatrix} 2 & 1 & -2 \\ 1 & 1 & +3 \\ x & 1 & 0 \end{vmatrix} = 0 \Rightarrow x = \frac{8}{5}$

16. **Ans. (c)**
Here some misprinting
As matrix is skew symmetrical ____ of odd order $\Rightarrow$ |A| = 0

17. **Ans. (c)** Probability of hitting a target
= 1 – P(Always miss a target)
= 1 – (1 - .3) (1 - .2) (1 - .1)
= 1 – (.7) (.8) (.9)
= .496

18. **Ans. (c)**
E|x - c| is minimum about median.

19. **Ans. (d)**

20. **Ans. (d)** Let $y = \frac{3x^2+9x+17}{3x^2+9x+7}$
$(3y - 3)x^2 + (9y - a)x + (7y - 17) = 0$
$x \in R \Rightarrow D \geq 2)\ (ay - 9)^2 - 4(3y - 3)(7y - 17) \geq 0$
$81(y^2 - 2y + 1) - 4(21y^2 - 72y + 51) \geq 0$
$\Rightarrow y^2 - 42y + 41 \leq 0$
$\Rightarrow (y - 1)(y - 41) \leq 0$
$1 \leq y \leq 41 \Rightarrow$ Max – y = 41.

21. **Ans. (d)**
S = {a, b, c}
Equivalence relations on S
R_1 = [(a, a), (b, b), (c, c)]
R_2 = [(a, a), (b, b), (c, c), (a, b), (b, a)]
R_3 = [(a, a), (b, b), (c, c), (a, b), (b, a)]
R_4 = [(a, a), (b, b), (c, c), (b, c) (c, b)]
R_5 = [(a, a), (b, b), (c, c), (a, b), (b, a), (a, c), (c, a), (b, c), (c, b)]
Total relations on

22. **Ans. ()**

23. **Ans. (d)**
All three statements are true.

24. **Ans. (d)**

25. **Ans. ()**
(i) converges
(ii) converges

26. **Ans. (c)**

27. **Ans. (d)**
$AB = \frac{1}{2}\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} = c$

$c = \frac{1}{2}\begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix}$

c^k; k = 1 $\Rightarrow$ No choice satisfies.

28. **Ans. (b)**
$\vec{a} + \vec{b} + \vec{c} = 0$
$\Rightarrow \vec{a} + \vec{b} = -\vec{c}$
$\Rightarrow |\vec{a} + \vec{b}|^2 = |-\vec{c}|^2 = |\vec{c}|^2$
$\Rightarrow |\vec{a}|^2 + |\vec{b}|^2 + 2|\vec{a}||\vec{b}|\cos\theta = |\vec{c}|^2$
$3^2 + 5^2 + 2(3)(5)\cos\theta = 7^2 = 49$
$\cos\theta = \frac{49-34}{30} = \frac{15}{30} = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{3}$

29. **Ans. (w)**

30. **Ans. (a)**
It's very clear S is reflexive

31. **Ans. (c)**
$|A - \lambda I| = \begin{vmatrix} \frac{1}{2} - \lambda & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} - \lambda \end{vmatrix} = 0$

$= \left(\frac{1}{2} - \lambda\right)^2 - \frac{1}{4} = 0$

$$\frac{1}{2}-\lambda=\pm\frac{1}{2}\Rightarrow\frac{1}{2}-\lambda=\frac{+1}{2}\Rightarrow\lambda=0,1$$

32. **Ans. (a)**
F(1) = F_1 = 1
F(2) = F_2 = 1
= F_3 = 2
= F_4 = 3
= F_5 = 5
= F_6 = 8 ⇒ many – one but not onto.

33. **Ans. (d)**

34. **Ans. ()**

35. **Ans. (d)**

36. **Ans. (d)**
1 1 1 1
a × a × 8 × 2 = 4546

37. **Ans. (c)**

38. **Ans. (d)**

39. **Ans. (c)**
$$\sum_{n=0}^{n}\binom{M}{n}\binom{N-M}{n-x}=\binom{N}{n}$$

40. **Ans. (c)**

41. **Ans. (b)**

42. **Ans. (d)**

43. **Ans. (c)**
Results

44. **Ans. (c)**

45. **Ans. (d)**
x = - 3 satisfies

46. **Ans. (a)**
Choice

47. **Ans. (a)**

48. **Ans. (d)**

49. **Ans. (b)**
___ z = 1 ⇒ z = cis θ
$$\Rightarrow\frac{z}{1-z^2}=\frac{cis\theta}{1-cis2\theta}=\frac{cis\theta}{(1-\cos2\theta)-i\sin2\theta}$$
$$=\frac{cis\theta}{2\sin^2\theta-2i\sin\theta\cos\theta}=\frac{cis\theta}{2\sin\theta(\sin\theta-i\cos\theta)}$$
$$=\frac{cis\theta}{-i(2\sin\theta)(cis\theta)}$$
$$=\frac{i}{2\sin\theta}\Rightarrow\left(2,\frac{1}{2\sin\theta}\right)\Rightarrow\text{in y - axis}$$

50. **Ans. (b)** a ∈ θ , b ∈ IRR ⇒ a + b = IRR

51. **Ans. (w)**

52. **Ans. (c)**

53. **Ans. (b)**

54. **Ans. (d)**
x = {a, b, c}
y = {1, 2, 3, 4} ⇒ one-one fns = $^4P_3$

55. **Ans. (a)**
(i), (ii) satisfies.

56. **Ans. (d)**

57. **Ans. (b)**
A – B = I, BC = I
⇒ A = $B^{-1}I = B^{-1}$
Also
C = $IB^{-1} = B^{-1}$
⇒ A = C = B^{-1}
⇒ A = C

58. **Ans. (d)**
$$\text{Area}=\frac{1}{2}\begin{vmatrix}a & b+c & 1\\ b & c+a & 1\\ c & a+b & 1\end{vmatrix}=\frac{1}{2}\begin{vmatrix}a+b+c & b+c & 1\\ a+b+c & c+a & 1\\ a+b+c & a+b & 1\end{vmatrix}=0$$
⇒ pts are collinear.

59. **Ans. (a)**
Directions cosines
l = cos 45°
m = cos60°
n = cos a
⇒ $l^2 + m^2 + n^2 = 1$
$\cos^2 45° + \cos^2 60° + \cos^2 a = 1$
$$\frac{1}{2}+\frac{1}{4}+\cos^2 a=1$$
$$\cos^2 a=1-\left(\frac{1}{2}+\frac{1}{4}\right)$$
$$=1-\left(\frac{3}{4}\right)=\frac{1}{4}$$
$$\Rightarrow\cos a=\frac{1}{2}$$

60. **Ans. (c)**
$$\tan(203+22)=\tan 225$$
$$\tan 225=\frac{\tan 203+\tan 22}{1-\tan 203\tan 20}$$
$$\tan(180+45)=\frac{\tan 203+\tan 22}{1-\tan 203\tan 22}$$
$$\tan 45°=1=\frac{\tan 203+\tan 22}{1-\tan 203\tan 22}$$
$$1-\tan 203\tan 22=\tan 203+\tan 22$$
$$1=\tan 203+\tan 22+\tan 203\tan 22$$

61. **Ans. (c)**

$n\left(P\left(P(\phi)\right)\right)=2$

$n\left(P(\phi)\right)=2^{\circ}=1$

$\Rightarrow n\left(P\left(P\phi\right)\right)=2=2$

62. **Ans. (b)**
(i), (ii) don't exist
as (i) → In any neighbourhood we have rationals and irrationals ⇒ LHL ≠ RHL

(iii) As we know $\lim_{x\to 0}\frac{x}{|x|}=1=RHL=-1=LHL$

$\Rightarrow LHL\neq RHL$
(ii) exists as 0. (bounded fns.) = 0

63. **Ans. (abd)**
(a) 52 ÷ 4 + 5 × 8 - 2 = 13 + 40 – 2 = 51

(b) 36 × 4 – 12 + 5 ÷ 3 = 144 – 13 $+\frac{5}{3}\neq 2$

(c) 45 × 5 ÷ 15 + 8 - 4 $=45\times\frac{5}{15}+4=19$

(d) 36 - 3 × 12 + 4 ÷ 6 =

$36-3\times 12+\frac{4}{6}=36-36+\frac{4}{6}=\frac{4}{6}$

By BODMAS RULE

64. **Ans. (d)**
$a_1 = 1$, $a_2 = 0$
$a_3 = 4(a_2 - a_1) = -4$
$a_4 = 4a_3 - 4a_2 = -16$
$a_5 = 4(a_4 - a_3) = -48$
$a_6 = -128$
$a_7 = -360$
$a_8 = -928$
$a_9 = -2272$
$a_{10} = -5376$

65. **Ans. (d)**

66. **Ans. (a)**

67. **Ans. (d)**

68. **Ans. (a)**

69. **Ans. (a)**

$$A^2=\begin{bmatrix}1 & w & w^2\\ w & w^2 & 1\\ w^2 & 1 & w\end{bmatrix}\begin{bmatrix}1 & w & w^2\\ w & w^2 & 1\\ w^2 & 1 & w\end{bmatrix}=\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$$

70. **Ans. (a)**

$\frac{13}{52}+\frac{4}{52}-\frac{1}{52}=\frac{16}{52}=\frac{4}{13}$

71. **Ans. (w)**
Result (c)

72. **Ans. (b)**

73. **Ans. (d)**

74. **Ans. (c)**

75. **Ans. (c)**

76. **Ans. (b)**

77. **Ans. (b)**

X :	0	1	2	3	…..	k
P :	2^0	2^1	2^2	2^3	.....	2^k

$E(x)=\sum_{r=1}^{\infty}x_i p(x_i)=\sum_{k=1}^{\infty}k2^k$ → AG – series

= 1.2 + 2.2^2 + ….

$s=\frac{ab}{1-r}+\frac{db^r}{(1-r)^2}=\frac{1.2}{1-2}+\frac{1.2.2}{(1-2)^2}=-2+4=2$

78. **Ans. (a)**
${}^{n+r-1}C_{r-1} = {}^{13+4-1}C_{4-1} = {}^{16}C_3 = 560$

79. **Ans. (c)** Results of no. _____ y.

80. **Ans. (c)** Both one-one, onto only than its possible.

81. **Ans. (c)**

$|A|=\begin{vmatrix}1 & 1 & 3\\ 0 & 4 & 6\\ 1 & 5 & 6\end{vmatrix}=0$

$|B|=\begin{vmatrix}2 & 0 & -3\\ 3 & 1 & 2\\ -4 & 0 & 6\end{vmatrix}=0$

$|C|=\begin{vmatrix}0 & 1 & 1\\ 1 & 0 & 1\\ 1 & 1 & 0\end{vmatrix}=2\neq 0$

$|D|=\begin{vmatrix}0 & 0 & 1\\ 0 & 0 & 2\\ 1 & 3 & 2\end{vmatrix}=0$

82. **Ans. (d)**

83. **Ans. (c)**
Only (ii), (iii) true.

84. **Ans. (a)**
$x_1 = 1$
$x_2 = 2$

$x_3=\frac{1}{2}(x_1+x_2)=\frac{3}{2}$

$x_4=\frac{1}{2}(x_2+x_3)=\frac{1}{2}\left(2+\frac{3}{2}\right)=\frac{7}{4}$

$x_5=\frac{13}{6},x_6=\frac{27}{16}\Rightarrow\{x_n\}=\left[1,2,\frac{3}{2},\frac{7}{4},\frac{13}{6},.....\right]$

= × as n → ∞
⇒ 1 < x < 2

85. **Ans. (d)**
$f(x) = 3x(x^2 - 1)$
$= 3x(x - 1)(x + 1)$

$\Rightarrow$ f(0) = f(1) = f(-1) = 0 $\Rightarrow$ many-one.
Also f'(x) = $9x^2 - 1 = (3x - 1)(3x + 1)$

$\Rightarrow$ Decreasing in $\frac{-1}{3} < x < \frac{1}{3}$

Increasing $x < \frac{-1}{3}$ or $x > \frac{1}{3}$ $\Rightarrow$ not onto.

86. **Ans. (a)**
A pair of st. lines.
as (0, 0) (1, 1) (2, 2) (3, 3) ……
(-1, -1), (-2, -2), (-3, -3) …… $\Rightarrow$ x = y

and (1, -1), (2, -2) ……
(-1, 1), (-2, 2), ……. $\Rightarrow$ = - 0
$\Rightarrow$ pair of lines $x^2 - y^2 = 0$

87. **Ans. (b)**
(i) $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & 3 \\ 2 & 3 & 0 \end{bmatrix} = -1.(-6) + 2(3) = 12 \neq 0$

(ii) $U = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix} \Rightarrow U^T = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 3 & 1 \end{bmatrix}$

$\Rightarrow$ Adj U^T = lower triangular

$|U^T| = 1 \Rightarrow (U^T)^{-1} = \frac{AdjU^T}{|U^T|}$ = lower triangular.

88. **Ans. (w)**

89. **Ans. (c)**

90. **Ans. (d)**
No. divisible by 3, 5 $\Rightarrow$ 15, 30, 45, ….., 300 = 20
Divisible by 7 $\Rightarrow$ 7, 14, 21, …..
Divisible by (3, 5, 7) = 105, 210 = 2
So divisible by (3, 5) but not by 7

91. **Ans. (b)**
12 months
100 people
$\Rightarrow \frac{100}{12} = 8$ persons each month and 4 persons left
which again distribute in 4 – months separately $\Rightarrow$
atleast 9 have birthdays.

92. **Ans. (d)**
Result (solved III)

93. **Ans. (c)**

94. **Ans. (a)**
Let z = x + iy

$\Rightarrow w = \frac{(x-1)+iy}{(x+1)+iy} = \frac{(x-1)+iy}{x+1+iy} \times \frac{(x+1)-iy}{(x+1)-iy}$

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

Real part $= \frac{x^2+y^2-1}{(x+1)^2+y^2}$ as |z| = 1 $\Rightarrow$ $x^2 + y^2 = 1$

$\Rightarrow$ Real part = 0

95. **Ans. (a)**
(i) $\lim_{x\to 0} \frac{1}{x} = \infty$

(ii) $\lim_{x\to 0} \sin\frac{1}{x}$ = not defined

(iii) $\lim_{x\to 0} \frac{x}{|x|}$ $\Rightarrow$ LHL $\neq$ RHL

$\Rightarrow$ All of then don't exist.

96. **Ans. (c)**
(i) $\frac{1}{4}(a^2+b^2+2ab) \le \frac{1}{2}(a^2+b^2)$

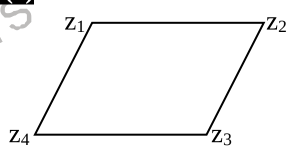
$\frac{ab}{2} \le \frac{1}{4}(a^2+b^2)$
$\Rightarrow 0 \le a^2 + b^2 - 2ab \Rightarrow 0 \le (a-b)^2 \Rightarrow$ True.
(ii) False if a, b < 0 but $\sqrt{ab}$ is always +ve.
$a < \sqrt{ab} < b$ not true.
(iii) ab > 0 $\Rightarrow$ a and b have same sign.
$\Rightarrow$ |a + b| = |a| + |b|

97. **Ans. (b)**
$z_k = cis\frac{k\pi}{10}$

$z_1z_2z_3z_4 = cis\frac{\pi}{10}cis\frac{2\pi}{10}cis\frac{3\pi}{10}cis\frac{4\pi}{10}$

$= cis\left(\frac{\pi}{10}+\frac{2\pi}{10}+\frac{3\pi}{10}+\frac{4\pi}{10}\right)$

98. **Ans. (c)**



$\Rightarrow \frac{z_1+z_3}{2} = \frac{z_2+z_4}{2}$
$\Rightarrow z_1 + z_3 = z_2 + z_4$
$\Rightarrow z_4 = z_1 + z_3 - z_2$

99. **Ans. (d)**

100. **Ans. (b)**
$(4,1) \xrightarrow{y=x} (1,4)$

$\xrightarrow{2units} (3,4)$

$\xrightarrow{rotation 90^\circ}$ (x cosα - y sin α, x sinα+ y cosα)
(3 cos90 – y sin 90, 3sin90 + 4cos 90)
$\Rightarrow$ (-4, 3)