PPSC Paper 2021 (Lecturer in Mathematics)

Available at: http://www.mathcity.org/ppsc

Time Allowed: Two Hours   Maximum Marks: 100

We are very thankful to *Ms. Iqra Liaqat* for providing solution of this paper.

Instructions:

- Read QUESTION PAPER carefully and mark your answers on the ANSWER SHEET.
- Each question has four options. Fill only one box that you think is the correct answer. Each question carries 1 mark. 0.25 mark will be deducted for each incorrect answer.
- Use of calculator is NOT allowed.

1. How many women candidates won National Assembly seats directly in General Election 2018?

   (A) 4   (B) 6   (C) 8   (D) 10

2. Let X and Y be Banach spaces. Then the product space $X \times Y$, with the norm defined by: $\| (x,y) \| = \| x \| + \| y \|, \, \forall \, (x,y) \in X \times Y$

   (A) Banach space   (B) Normed space   (C) Linear space   (D) All of these

3. Let $f(x) = [x]$, greatest integer $\leq x$; be integrable function on $[0,4]$, then $\int_0^4 [x]dx$ is equal to:

   (A) 3   (B) 7   (C) 6   (D) 4

4. Solution of $(\triangle^2 = 2 \triangle + 1)u_x = 3x + 2$ is:

   (A) $u_x = 3x + 4$ (B) $u_x = 4x + 3$ (C) $u_x = 3x - 4$ (D) $u_x = 4x - 3$

5. The sequence $\left\{ \dfrac{2ni}{n+i} - \dfrac{(9-12i)n+2}{3n+1+7i} \right\}$ converges to :

   (A) $3 + 6i$ (B) $-3 - 6i$ (C) $-3 + 6i$ (D) $3 - 6i$

6. Which of those is not an analytical method to solve partial differential equation?

   (A) Change of variable   (B) Superposition principle   (C) Finite element method   (D) Integral transform

7. Order of convergence of Newton's method is :

   (A) Quadratic   (B) Cubic   (C) 4th (D) Undefined

8. After discretizing the partial differential equations take which if these forms?

   (A) Exponential equations   (B) Trigonometric equations   (C) Logarithmic equations   (D) Algebraic equations

9. For a function f, if $f_{xx} = f_{xy} = f_{yy} = 0$, the point (x,y) will be multiple point of order:

   (A) Lower than two   (B) Two   (C) Higher   (D) Higher than the two

10. Suppose that X and Y are closed subspaces of a Hilbert space H such that $X \perp Y$, then $X + Y$ is :

    (A) A closed subspace   (B) $X^\perp + Y^\perp$ (C) $X^\perp + Y$ (D) Normed subspace

11. The function $f(x) = x^{(-1)}$ is not:

    (A) Uniform continuous on $(0, 1)$ (B) Continuous on $(0, 1)$ (C) Differentiable on $[0, 1)$

    (D) Both A and B

12. Lnz is discontinuous on axis:

    (A) Positive real   (B) Nonpositive real   (C) Negative   (D) Nonnegative

13. Normal component of an acceleration is :

    (A) v/p (B) v^2/p (C) p^2/v (D) p/v

14. Every metric space is a :

    (A) Hausdroff space   (B) T_2 space   (C) Both A and B (D) T_3

15. $\mathbb{N}'$, derived set of $\mathbb{N}$, is:

    (A) ϕ (B) $\mathbb{R}$ (C) $\mathbb{Q}$ (D) Not exist

16. Given $(a_n)_{n \in \mathbb{N}}$, where $a_n > 0 \,\forall\, n$. If $\lim\limits_{n \to \infty} a_n = l > 0$, then $\lim\limits_{n \to \infty} (a_n \ldots a_1)^{\frac{1}{n}}$ is

    (A) l^n (B) $1/l$ (C) l (D) $1/l^n$

17. If $\vec{F}$ is a continuously differentiable vector point function and V is the volume bounded by a closed surface S, then $\iint_c \vec{F} \times \vec{n}\,dS = \iiint_c \operatorname{div}\vec{F}\,dV$ is called

    (A) Gauss' divergence theorem   (B) Surface integral   (C) Volume integral   (D) None of these

18. $c_{ijk}c_{ijk}$ is equal :

    (A) 4   (B) 3   (C) 6   (D) 2

19. $\sum\limits_{d|n} 1/d = \sigma(n)/n$ for each integer:

    (A) $n \geq 1$ (B) $n \geq 3$ (C) $n \geq 7$ (D) None of these

20. Let A and B be two non-square matrices such that $AB = A$ and $BA = B$, then A and B are matrices:

    (A) Idempotent   (B) Involuntary   (C) Nilpotent   (D) No conclusion

21. The Cauchy-Riemann equations can be satisfied at a point z, but the function $f(z) = u(x, y) + iv(x, y)$ can be at z:

    (A) Differentiable   (B) Non-differentiable   (C) Continuous   (D) None of these

22. Let G and G' be two groups. Then a homomorphism $f : G \to G'$ is one-one iff:

    (A) Ker $f = \{e\}$ (B) Im $f = \{e\}$ (C) Ker $f \neq \{e\}$ (D) Im $f = \{e\}$

23. The sequence $(1/n^2)_{n \in \mathbb{N}}$ is:

    (A) convergent   (B) Cauchy   (C) Bounded   (D) Both A & B

24. Kronecker delta is a tensor of rank :

    (A) 3   (B) 2   (C) 1   (D) any

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25. Let G be a group and $a \in G$ is of finite order n such that $a^m = 0$, then
    (A) $m|n$ (B) $n|m$ (C) $(m, n) = 1$ (D) n

26. $4\times$ volume of a tetrahedron is equal to the volume of:
    (A) Parallelepiped   (B) Cube   (C) Cuboid   (D) None

27. Let A be the real matrix with the rows from an orthonormal set, then A is :
    (A) Normal   (B) Orthogonal   (C) Column of A from an orthonormal set   (D) Both A and C

28. The solution $\sin 2x$ and $\cos 2x$ of the differential equation $y'' + 4y = 0$ are
    (A) Independent   (B) Dependent   (C) Wronskian of both is zero   (D) Both A and C

29. Let V be an inner product space and $u, v \in V$, Then $|<u, v>| = ||u|| \, ||v||$ iff:
    (A) u nd v are linearly independent   (B) u and v are linearly dependent   (C) u and v are scalar multiple of each other   (D) Both B and C

30. Let U & V be two vectors spaces such that $T : V \to U$, a linear transformation. Then :
    (A) $\dfrac{V}{\text{Ker}T} \cong U$ (B) $\dfrac{V}{\text{Ker}T} \cong V$ (C) $\dfrac{U}{\text{Ker}T} \cong V$ (D) $\dfrac{V}{\text{Ker}T} \cong T(V)$

31. Let $x, p \in \mathbb{R}, x + 1 > 0, p \neq 0, 1$ be such that $(1 + x)^p < 1 + px$, then:
    (A) $0 \leq p \leq 1$ (B) $0 \leq p < 1$ (C) $0 < p \leq 1$ (D) $0 < p < 1$

32. The Diophantine equation $15x + 51y = 14$ has solution:
    (A) Unique   (B) More than one   (C) No   (D) Arbitrary

33. Kepler stated the first law of planetary motion in:
    (A) 1709   (B) 1609   (C) 1507   (D) 1607

34. Rings of integers has characteristic:
    (A) 1   (B) 0   (C) ∞ (D) -1

35. Every invertible diagonal matrix is a matrix:
    (A) Scalar   (B) Lower triangular   (C) Upper triangular   (D) Both B & C

36. $\tanh^{-1} z$ is not defined for z equal to:
    (A) 1   (B) -1 (C) ± 1 (D) Complex plane

37. Every homogenous system of linear equations has solution:
    (A) Trivial   (B) Non-trivial   (C) Parametric   (D) None of these

38. Let H be a subgroup of a group G such that $Ha \neq Hb$, then:
    (A) $aH = bH$ (B) $aH \subseteq bH$ (C) $bH \subseteq aH$ (D) $aH \neq bH$

39. If S_1, S_2 are subsets of $V(F)$ and $L(S_1)$ is the linear space of S_1, then:
    (A) $L(L(S_1)) = L(S_1)$ (B) $L(S_1 \cup S_2) = L(S_1) + L(S_2)$ (C) Both A and B (D) $L(S_1) \subseteq L(S_2)$

40. The summation index is also called:
    (A) Dummy index   (B) Free index   (C) Convention   (D) Both A and B

41. Reduced echelon form of a matrix is:

    (A) Unique   (B) Not unique   (C) Pivot element are 1   (D) Both A and C

42. The number of asymptotes of an algebraic curve of the nth degree:

    (A) Exceed n (B) Cannot exceed n (C) Exactly n (D) Both A and C

43. Let H, K be subgroups of a group G, Then HK is a subgroup of G iff:

    (A) $HK = KH$ (B) $HK \neq KH$ (C) $H^{-1} = K^{-1}$ (D) $(HK)^{-1} = K^{-1}H^{-1}$

44. If A and B are two ideals of a ring R, Then $A + B$ is an ideal of R containing:

    (A) A (B) B (C) Both A & C (D) None of these

45. A normed space X is finite dimension iff X is:

    (A) Compact   (B) Connected   (C) Locally compact   (D) Homeomorphic

46. The symbol A_{ijk}, $\{i, j, k = 1, 2, 3\}$ denotes numbers:

    (A) 27   (B) 9   (C) 8   (D) 4

47. The function $f(z)$ is analytical in a domain D and $f(z) = c + iv(x, y)$, where c is a real constant. Then f in D is a:

    (A) Constant   (B) Nonconstant   (C) Continuous   (D) None of these

48. The centre of curvature at any point P of a curve is the point which on the positive direction of the normal at P and is at a distance

    (A) $x\,(keps)$ (B) $\ell(rho)$ (C) $\dfrac{1}{x}$ (D) $\dfrac{1}{\ell}$

49. Time of flight of the projectile is:

    (A) $\dfrac{2v_0 \sin \alpha}{-g}$ (B) $\dfrac{2v_0 \cos \alpha}{g}$ (C) $\dfrac{v_0 \sin 2\alpha \sec \alpha}{g}$ (D) $\dfrac{v_0 \sin 2\alpha}{-g \cos \alpha}$

50. For a function $f(x, y)$ in a region D in xy plane, the condition $|f(x, y_2) - f(x, y_1)| \leq K|y_2 - y_1|$ is called Lipschitz, provided that:

    (A) $K = 0$ (B) $K > 0$ (C) $K < 0$ (D) $K \in \mathbb{R}$

51. If k integers $a_1, a_2, ..., a_k$ form a complete residue system modulo m, then:

    (A) $m < k$ (B) $m \geq k$ (C) $m \leq k$ (D) Both B & C

52. the function $f(x) = x|x|$ at the origin is only

    (A) Differentiable   (B) Continuous   (C) Both A and B   (D) None of these

53. Every subgroup of an abelian group is :

    (A) Normal   (B) Cyclic   (C) Abelian   (D) None of these

54. A point where a curve cross on a tangent is known as:

    (A) Maximum point   (B) Minimum point   (C) Point of inflection   (D) None of these

55. A vector space $V(F)$, if possible, have:

    (A) A unique basis   (B) Two bases   (C) At least one basis   (D) None of these

56. Method of factorization is also called :

    (A) Method of factorization   (B) Method of triangularization   (C) Indirect method   (D) Both A and B

57. Every infinite dimensional normed space has a subspace which is:

    (A) Closed   (B) Not closed   (C) Connected   (D) Both B and C

58. For any real matrix A such that $AA^t = A^t A$, we have A:

    (A) Orthogonal   (B) Normal   (C) Both A and B   (D) None of these

59. The locus of the centres of curvature of a curve is called its evolute and a curve is said to be an:

    (A) Evolute of its involute   (B) Involute of its evolute   (C) Both A and B   (D) None of these

60. Suppose that u_1, u_2 are non-zero orthogonal vectors in $\mathbb{R}^n$, then for $v \in \mathbb{R}^n$ we have:

    (A) $v = \dfrac{v \cdot u_1}{u_1 \cdot u_1} u_1 + \dfrac{v \cdot u_2}{u_2 \cdot u_2} u_2$ (B) $v = \dfrac{v \cdot u_1}{u_1 \cdot u_1} u_2 + \dfrac{v \cdot u_2}{u_2 \cdot u_2} u_1$ (C) $v = \dfrac{v \cdot u_1}{u_1 \cdot u_2} u_1 - \dfrac{v \cdot u_2}{u_2 \cdot u_2} u_2$

    (D) None of these

61. The zeros of the function $f(z) = \sin \dfrac{\pi(1-z)}{z}$ are:

    (A) 1 (B) -1 (C) π (D) $-\pi$

62. The interval $[3, 5)$ with respect to usual topology is:

    (A) Open   (B) Closed   (C) Semi open   (D) None of these

63. Which one is more reliable, Simpson's rule or Trapezoidal rule?

    (A) Trapezoidal rule   (B) Simpson's rule   (C) Both A and B   (D) None of these

64. Let X be a normed space such that norm obeys the parallelogram law, X can be made:

    (A) Inner product   (B) Hilbert space   (C) A linear space   (D) No conclusion

65. The greatest and the least values of a function f in an interval $[a, b]$ are $f(a)$ or $f(b)$ or are given by the values of x for which?

    (A) $f'(x) > 0$ (B) $f'(x) < 0$ (C) Both A and B   (D) $f'(x = 0)$

66. The mapping $w = z^2 + 1$ is conformable at:

    (A) $z = -1$ (B) $z = 1$ (C) $z = \pm 1$ (D) None of these

67. The order of the continuity equation of steady two-dimensional flow is:

    (A) 1 (B) 0 (C) 2 (D) 3

68. Let a and $m > 0$ be integers with $a^{\phi(m)} \equiv 1 \pmod{m}$ provided that:

    (A) $a > m$ (B) $m < a$ (C) $(a, m) = 1$ (D) $(a,m) \neq 1$

69. Let $\vec{F}(\vec{r})$ be a continuous vector point function defined on smooth curve C given by $\vec{r} = \vec{f}(t)$, then $\displaystyle\int_C \vec{F} \times d\vec{r}$ is called

    (A) Line integral   (B) Surface integral   (C) Volume integral   (D) None of these

70. The frequency of a simple harmonic motion is:

(A) $\dfrac{\sqrt{\lambda}}{2pi}$ (B) $\dfrac{\lambda}{\pi}$ (C) $\dfrac{\lambda}{\sqrt{2\pi}}$ (D) $\sqrt{\dfrac{\lambda}{2\pi}}$

71. Let $u_1, u_2, ..., u_n$ be a linear dependent set of functions on $x \in [a, b]$ and let each function be $(n-1)$ times differentiable in (a, b). Then the Wronskian of the set of the functions is:

(A) Zero   (B) Positive   (C) Negative   (D) An integer

72. $\dfrac{\tan x}{x} > \dfrac{x}{\sin x}$ is true for:

(A) $0 \le x \le \dfrac{\pi}{2}$ (B) $0 < x < \dfrac{\pi}{2}$ (C) $0 \le x < \dfrac{\pi}{2}$ (D) $0 < x \le \dfrac{\pi}{2}$

73. While solving a partial differential equation using a variable separable method, we equate the ratio to a constant?

(A) Can be positive or negative integer or zero   (B) Can be positive or negative number or zero

(C) Must be a positive integer   (D) Must be negative integer

74. A particle of mass m moves in a circle of radius r with constant speed v and F an acting force, then:

(A) $F \propto \frac{mv^2}{r}$ (B) $F \propto \frac{mv}{r}$ (C) $F \propto \frac{(mv^2)}{\sqrt{r}}$ (D) None of these

75. Let $W(F)$ be a subspace of a finite dimensional vector space $V(F)$, then $\dim(V/W)$ is :

(A) $\dim V - \dim W$ (B) $\dim V + \dim W$ (C) $\dim V + \dim W - \dim(V \cap W)$ (D) $\dim V - \dim W + \dim(V \cap W)$

76. If L,M and N are three subspaces of a vector space V such that $M \subseteq L$, then:

(A) $L \cap (M+N) = (L \cap M) + (L \cap N)$ (B) $L \cap (M+N) = M + (L \cap N)$ (C) $L \cup (M+N) = (L \cup M) + (L \cup N)$ (D) Both A and B

77. Changes in sign but not in magnitude when the cyclic order is changed is possible in:

(A) Vector triple product   (B) Scalar triple product   (C) Mixed product   (D) Both B and C

78. Let A be a subspace of a topological space X; let $\bar{A}$ be its closure, then $\bar{A}$ is equal: (provided that A°, $b(A)$ and A' are respectively interior, boundary and set of accumulation points of A respectively)

(A) $A^\circ \cup b(A)$ (B) $A \cup A'$ (C) Both A and B   (D) $A \cap A'$

79. Let $\vec{f}(x, y, z)$ be continuously differentiable vector point function then $\text{Curl Curl}\vec{f} + \nabla^2 f$ is:

(A) $\text{grad div}\vec{f}$ (B) $\text{div grad}\vec{f}$ (C) $\text{div Curl}\vec{f}$ (D) $\text{Curl div}\vec{f}$

80. A square unitary matrix with real entries is:

(A) Orthogonal   (B) Normal   (C) None   (D) Leslie

81. Every triangular matrix is:

(A) Diagonal   (B) Lower triangular   (C) Invertible diagonal   (D) Both A and B

82. Printing press was invented by

(A) Mary Anderson   (B) Johannes Gutenbery   (C) George Antheil   (D) Victor Adler

83. Which of the following is used for the purification of water?

(A) Oxygen   (B) Ammonia   (C) Chlorine   (D) Carbon Dioxide

84. Faiz Ahmed Faiz was imprisoned for his alleged involvement in ———— conspiracy.

    (A) Agartala   (B) Lahore   (C) Attock   (D) Rawalpindi

85. Turkey connects which two continents?

    (A) Asia and Europe   (B) Asia and Africa   (C) South America and North America   (D) Asia and Australia

86. Aljazeera TV channel belong to:

    (A) Qatar   (B) Kuwait   (C) Egypt   (D) Bahrain

87. In the period of which pious caliph Quranic verses were collected in one place?

    (A) Hazrat Umar (RA)   (B) Hazrat Abu Bakar (RA)   (C) Hazrat Ali (RA)   (D) Hazrat Usman (RA)

88. Given the name of the Sahabi who was given the title of Ateeq

    (A) Hazrat Abu Bakar (RA)   (B) Hazrat Umar (RA)   (C) Hazrat Ali (RA)   (D) Hazrat Zaid Bin Sabit (RA)

89. Choose the correct pronoun;- Can you please return the calculator —— you borrow yesterday?

    (A) Who   (B) Whom   (C) That   (D) Whose

90. Fill in the suitable preposition;- "The shop is open from 7am —— 5pm.

    (A) At   (B) Until   (C) Above   (D) On

91. In computing, WAN stands for:

    (A) World Area Network   (B) Wide Area Network   (C) World Access Network   (D) Wireless Access Network

92. What is the shortcut key to hide entire column in MS Excel sheet?

    (A) CTRL+O   (B) CTRL+A   (C) CTRL+H   (D) CTRL+I

93. Which one is the capital city of Oman?

    (A) Adam   (B) Muscat   (C) As Sib   (D) Bahia

94. Tarbela is ———— dam.

    (A) Rock fill   (B) Earth fill   (C) Concrete   (D) None of these

95. The famous pre-historic monument Stonehenge is found in ——

    (A) Greece   (B) China   (C) England   (D) None of these

96. When India stopped supply of water to Pakistan from every canal flowing from India to Pakistan for first time after creation

    (A) April 1st, 1947   (B) April 1st, 1948   (C) April 1st, 1949   (D) April 26, 1948

97. The Pakistan International Airlines came into being in the year

    (A) 1952   (B) 1953   (C) 1954   (D) 1955

98. Sepoys in the British army raised in revolt from the city of ——
    (A) Meerut   (B) Delhi   (C) Lucknow   (D) Calcutta

99. "By Leaps and Bounds" کے درست مطلب کا انتخاب کریں
    (A) کتے کی طرح لپکنا   (B) جنگجو ہونا   (C) رفتہ رفتہ آگے بڑھنا   (D) تیزی سے ترقی کرنا

100. اردو میں منقوط حروف کی تعداد ہے
    (A) پندرہ   (B) سترہ   (C) انیس   (D) اکیس

ANSWERS

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