Question Papers

ExamCode: RA_MATH_162015

1. **Let G be any group and g a fixed element of G. The mapping $\varphi:G\rightarrow G$ defined by $\varphi(x) = g\, x\, g^{-1}$ is:**

   1) Not an onto function
   2) Not a homomorphism
   3) An isomorphism of G onto G
   4) Not an isomorphism

2. **If a + bi is not a unit of J[i] then-**

   1) $a^2 + b^2 = 1$
   2) $a^2 + b^2 \neq 1$
   3) $a^2 + b^2 > 1$
   4) $a^2 + b^2 < 1$

3. **Which of the following is not an integral domain?**

   1) J_{17}, the ring of integers mod17
   2) The set of all integers
   3) Any field
   4) $(z_6, +_6, \cdot_6)$

4. **Let K be the field of complex numbers and F be the field of real numbers. Then which of the following statement is correct?**

   1) G(K, F) is a group of order 4
   2) G(K, F) is a group of order 3
   3) The fixed field of G(K, F) is K
   4) The fixed field of G(K, F) is F

5.

The splitting field of $x^2 + 3x + 4$ over the field F_0 of rational numbers is:	
A.	$F_0(\sqrt{7})$
B.	$F_0(-\sqrt{7})$
C.	$F_0(\sqrt{7}i)$
D.	$F_0(7)$

6. **In J_7, the field of integer mod 7 find the values of a and b in J_7 so that $1 + \alpha a^2 + \beta b^2 = 0$ where $\alpha=1$, $\beta=2$**

   1) a = 3 , b = 4
   2) a = 4 , b = 3
   3) a = 4 , b = 5
   4) a = 5 , b = 3

7. **The group G is abelian iff for any two elements a and b in G $(ab)^2 =$**

   1) a^2b^2
   2) ab
   3) b^2a^2
   4) ba

8. **Every abelian group G is a module over-**

   1) The ring of integers
   2) The ring of rationals
   3) The ring of complex numbers
   4) The ring of reals

9. **Any finite abelian group is:**

   1) The direct product of cyclic groups
   2) The direct product of non-cyclic groups
   3) The direct sum of non cyclic groups
   4) The direct sum of abelian groups

10. **If L is a finite extension of F and K is a subfield of L which contains F, then-**

1) [K : F] x [L : F]
2) [K : F] / [L : F]
3) [K : F] = [L : F], always
4) [L : F] / [K : F]

11. **The number of p-sylow subgroups in G for a given prime p is of the form-**

1) kp, where k is an integer
2) 1 - kp, where k is a real number
3) 1 + kp, where k is a non-negative integer
4) k+p, where k is an integer

12. **Let f : G →G' be an Isomorphism. If G is cyclic then G' is:**

1) Abelian
2) Non abelian
3) Cyclic
4) Non cyclic

13. **Let f : G →G' be an Isomorphism. If G is abelian, then G' is:**

1) Non abelian
2) Abelian
3) Cyclic
4) Normal

14. **Find the generators of the cyclic group G={1, -1, i, -i}**

1) 1, -1
2) -1, i
3) i, 1
4) -i, i

15. **Let G be a group of even order and e be its identity. Then there exists an element a≠e in G, such that a^2 =**

1) a
2) -a
3) 2a
4) e

16. **If the finite field F has p^n elements, then F is the splitting field of the polynomial-**

1) $x^{p^n} - x$
2) $x^{np} - x$
3) $x^{n/p} - x$
4) $x^{p/n} - x$

17. **Suppose f'(x) exists for x > 0 and f is continuous for x ≥ 0 with f(0) = 0. Further if f' is an increasing function then g(x) = f(x)/x, x > 0 is:**

1) Monotonically increasing
2) Decreasing
3) Neither increasing nor decreasing
4) Strictly increasing

18. **A piecewise continuous function on a finite interval has-**

1) A countable number of discontinuities
2) Infinite number of discontinuities
3) No discontinuities at all
4) A finite number of discontinuities

19.

If $f(x) = \begin{cases} 1, x \text{ is rational} \\ 0, x \text{ is irrational} \end{cases}$ then which of the following is a valid statement?

A.	f is Riemann integrable on [0, 1]
B.	f is not Lebesgue integrable on [0, 1]
C.	f =1 a.e on [0,1]
D.	f =0 a.e on [0,1]

20. **Consider the following two statements. I. A monotonic function on [a, b] is of bounded variation on [a, b] II. A continuous function on [a, b] is of bounded variation if f'(x) does not exist on [a, b]. Then,**

1) Both I and II are true
2) I is false and II is true
3) I is true and II is false
4) Both are false

21.

If E is a bounded set of real numbers not containing the point x_0 then $f(x) = \frac{1}{x - x_0}, x \in E$ is:	
A.	Is not continuous on E
B.	Continuous on E
C.	Uniformly continuous on E
D.	Continuous but not uniformly continuous on E

22. **Consider the two statements given below I. A closed subset of a compact is compact II. A compact set is bounded. Then,**

1) Only I is true
2) Only II is true
3) Both I and II are false
4) Both I and II are true

23.

The function $f(x) = \begin{cases} \frac{x}{\lvert x \rvert}, & x \neq 0 \\ A, & x = 0 \end{cases}$	
A.	Has a jump discontinuity at x=0 if A=0
B.	Has a jump discontinuity at x=0 if A=1
C.	Has a jump discontinuity at x=0 for all values of A
D.	Is continuous at x=0

24. **Let X= [0, 2π] and Y ={(x, y)/$x^2+y^2=1$}. Then f : X → Y defined by f(t) = (cos t, sin t)**

1) Is continuous on [0, 2π] but not onto
2) Is one to one but not continuous
3) Is onto but not one to one
4) Is continuous one to one and onto

25.

If [x] denotes the greatest integer that does not exceed x and n is a positive integer then $\lim_{x \to n^+} [x]$ is equal to-	
A.	$n - 1$
B.	n
C.	$n + 1$
D.	0

26. **If $|x - 2| < 1$ then $|x^2-4|$ is (x is a real number)-**

1) Also less than 1 always
2) Less than 5
3) Equal to 2
4) Is equal to 4

27.

If $\varphi_n(x) = \frac{e^{inx}}{\sqrt{2\pi}}$, for n = 0, 1, 2,...., where $x \in [0, 2\pi]$, then norm of φ_{100} is :	
A.	100
B.	1
C.	0
D.	$\frac{1}{\sqrt{2\pi}}$

28.

Which of the following is correct?	
A	Both $\prod_{n=1}^{\infty}\left(1+\frac{1}{n}\right)$ and $\prod_{n=1}^{\infty}\left(1-\frac{1}{n}\right)$ are convergent
B	Both $\prod_{n=1}^{\infty}\left(1+\frac{1}{n}\right)$ and $\prod_{n=1}^{\infty}\left(1-\frac{1}{n}\right)$ are divergent
C	$\prod_{n=1}^{\infty}\left(1+\frac{1}{n}\right)$ is convergent and $\prod_{n=1}^{\infty}\left(1-\frac{1}{n}\right)$ is divergent
D	$\prod_{n=1}^{\infty}\left(1+\frac{1}{n}\right)$ is divergent and $\prod_{n=1}^{\infty}\left(1-\frac{1}{n}\right)$ is convergent

29.

If m is an integer and if $x \neq 2m\pi$ is real then-	
A.	$\left|\sum_{k=1}^{n} e^{ikx}\right| \le \frac{1}{2}$
B.	$\left|\sum_{k=1}^{n} e^{ikx}\right| \le \frac{1}{\left|\sin\frac{x}{2}\right|}$
C.	$\left|\sum_{k=1}^{n} e^{ikx}\right| \le \left|\sin\frac{nx}{2}\right|$
D.	$\left|\sum_{k=1}^{n} e^{ikx}\right| \ge \frac{1}{\left|\sin\frac{x}{2}\right|}$

30. **Which of the following statement is not correct?**

1) Every singleton set has measure zero
2) Every countable set has measure zero
3) The set of rationals has measure zero
4) There are only a finite number of sets having measure zero

31.

If $f_n(x) = \frac{nx}{1+n^2x^2}$, then the value of $\lim \int_0^1 f_n(x)dx$ is equal to-	
A.	0
B.	1
C.	2
D.	∞

32. **Find out the correct statement.**

1) Constant functions are measurable
2) Characteristic function of a set is measurable
3) Continuous functions are measurable
4) If f is measurable then its positive part f^+ is measurable

33. **If f and g are measurable functions defined on a measurable set E anf if c is any real number then which of the following statement is not correct?**

1) f + g is measurable on E
2) f - g is measurable on E
3) cf is measurable on E
4) f^2 is not measurable on E

34. **The collection of open rays in an ordered set A is a sub basis for the _____ topology on A.**

1) Order
2) Product
3) Standard
4) Lower limit

35. **The sequence {pn} is said to be bounded-**

1) If its range is unbounded
2) If its range is bounded
3) If its domain is bounded
4) If its domain is unbounded

36.

If f is defined on [a, b] and if P is a partition of [a, b], then upper Riemann integral is given by-	
A.	$\overline{\int_a^b} f(x)dx = \inf U(P,f)$
B.	$\underline{\int_a^b} f(x)dx = \inf U(P,f)$
C.	$\int_a^b f(x)dx = \sup U(P,f)$
D.	$\underline{\int_a^b} f(x)dx = \sup U(P,f)$

37.

The Laurent expansion for $f(Z) = \dfrac{1}{1-Z^2}$ around z = 1 exists in the region.	
A.	$\lvert z-1 \rvert < 2$
B.	$0 < \lvert z-1 \rvert < 2$
C.	$\lvert z-1 \rvert > 2$
D.	$1 < \lvert z-1 \rvert < 2$

38. **If f(Z) is defined and continuous on a closed bounded set E and analytic on the interior of E. Then the maximum of |f(Z)| on E is assumed-**

1) Inside the boundary of E
2) Outside the boundary of E
3) Only on the boundary of E
4) Never on the boundary of E

39. **A finite product of countable sets is:**

1) Finite
2) Inifinite
3) Countable
4) Uncountable

40. **The gamma function is:**

1) An entire function
2) A meromorphic function
3) A harmonic function
4) Constant function

41. **On a closed and bounded set E, the absolute value |f(z)| of a non-constant harmonic function f has-**

1) A maximum on E and minimum inside E
2) Both maximum and minimum inside E
3) Both maximum and minimum on boundary of E
4) No minimum but a maximum on boundary of E

42. **What type of singularity does the function sin h πz have in the extended complex plane?**

1) No singularity in the extended plane
2) Essential singualrity at $z = \infty$
3) Pole at $z = \infty$
4) Removable singularity at z= 0

43. **The genus h of sin πz is equal to-**

1) 0
2) 2
3) 1
4) 3

44.

The Legendre's duplication formula is:	
A.	$\sqrt{\pi}\sqrt{(2z)} = 2^{2z-1}.\sqrt{z}.\sqrt{(z-1/2)}$
B.	$\sqrt{\pi}\sqrt{(2z)} = 2^{2z-1}.\sqrt{z}.\sqrt{(z+1/2)}$
C.	$\sqrt{\pi}\sqrt{(2z)} = 2^{z-1}.\sqrt{z}.\sqrt{(z+1/2)}$
D.	$\sqrt{\pi}\sqrt{(2z)} = 2^{2z-1}.\sqrt{z}.\sqrt{(z+1)}$

45. **If f(z) is analytic at Z_0 with $f'(z_0) \neq 0$, it maps on neighborhood of Z_0 conformally and topologically-**

1) Into a region
2) Into a sub region
3) One to one and onto a region
4) Onto a region

46.

The Laurent's expansion of $\frac{1}{(e^z-1)}$, valid in $0<\|z\|<2\pi$ is :	
A.	$\frac{1}{z}-\frac{1}{2}-\frac{1}{12}z-\frac{1}{720}z^3+.....$
B.	$\frac{1}{z}-\frac{1}{2}-\frac{1}{12}z+\frac{1}{720}z^3+.....$
C.	$\frac{1}{z}-\frac{1}{12}z-\frac{1}{720}z^3+.....$
D.	$\frac{1}{z}+\frac{1}{2}-\frac{1}{12}z-\frac{1}{720}z^3+.....$

47.

The value of $\lim_{m\to\infty}\sum_{-\infty}^{\infty}(-1)^n\frac{1}{z-n}$ is :	
A.	$\frac{\pi}{\sin \pi z}$
B.	$\pi \cot \pi z$
C.	$\frac{\pi^2}{\sin^2 \pi z}$
D.	$\frac{\pi}{2}.\cot\frac{\pi z}{2}$

48. **The coefficient Z^5 in Taylor's development of tan Z is:**

1) 1
2) 1/3
3) 1/15
4) 2/15

49.

A power series expansion of the form $\sum_{n=-\infty}^{\infty} A_n(z-a)^n$ is possible if f(z) is analytic in-	
A.	$\lvert z-a \rvert < R$
B.	$\lvert z-a \rvert > R$
C.	$\lvert z \rvert < R$
D.	$R_1 < \lvert z-a \rvert < R_2$

50. **If f(z) is analytic and non constant in a region Ω, then its absolute value |f(z)| has-**

1) Maximum in Ω
2) Minimum in Ω
3) Not maximum in Ω
4) Not minimum in Ω

51.

The relation between the genus h and the order λ of an entire function is:	
A.	$h \le \lambda \le h+1$
B.	$\lambda \le h \le \lambda+1$
C.	$h \le 2\lambda \le \lambda+1$
D.	$\lambda = \sqrt{h(h+1)}$

52. **For $f(z) = e^{1/z}$, the point z = 0 is:**

1) An isolated zero
2) Removable singular point
3) Pole
4) Isolated essential singularity

53. **A subspace of a topological space is itself a -**

1) Topological space
2) Sphere
3) Metric space
4) Open base

54.

Poisson formula is:	
A.	$u(a) = \frac{1}{2\pi} \int_{\lvert z \rvert = R} \frac{R - \lvert a \rvert}{\lvert z-a \rvert^2} u(z) dv$
B.	$u(a) = \frac{1}{2\pi} \int_{\lvert z \rvert = R} \frac{R^2 - \lvert a \rvert^2}{\lvert z-a \rvert^2} u(z) dv$
C.	$u(a) = \frac{1}{2\pi} \int_{\lvert z \rvert = R} \frac{R^2 - \lvert a \rvert^2}{\lvert z-a \rvert} u(z) dv$
D.	$u(a) = \frac{1}{2\pi} \int_{\lvert z \rvert = R} \frac{R^2 + \lvert a \rvert^2}{\lvert z+a \rvert^2} u(z) dv$

55. **If the second fundamental co-efficients vanish everywhere on a surface then the surface is a part of a-**

1) Circle
2) Sphere
3) Plane
4) Cylinder

56.

$\left[\vec{r}' \ \vec{r}'' \ \vec{r}'''\right]$ is equal to –	
A.	K
B.	τ
C.	$k\tau^2$
D.	$k^2\tau$

57.

The equations $H^2N_1 = (FM - GL)\vec{r_1} + (FL - FM)\vec{r_2}$ $H^2N_2 = (FN - GM)\vec{r_1} + (FM - EN)\vec{r_2}$ are known as-	
A.	Weingarten equations
B.	Gauss equations
C.	Codazzi equations
D.	Quadratic equations

58.

If $T = \frac{1}{2}\left[E\dot{u}^2 + 2F\dot{u}\dot{v} + G\dot{v}^2\right]$, $U = \frac{d}{dt}\left(\frac{\partial T}{\partial \dot{u}}\right) - \frac{\partial T}{\partial u}$ and $V = \frac{d}{dt}\left(\frac{\partial T}{\partial \dot{v}}\right) - \frac{\partial T}{\partial v}$, then $\dot{u}u + \dot{v}v$ is equal to –	
A.	0
B.	1
C.	$\frac{dT}{dt}$
D.	$\frac{dT}{ds}$

59. **The area of the anchor ring x = (b + a cosu) cosv, y = (b + a cosu) sinv, z = a sinu where $0 \le u, v \le 2\pi$ is:**

1) πab
2) $\pi^2 ab$
3) $4\pi^2 ab$
4) $4\pi ab$

60. The arc length of one complete turn of the circular helix $\bar{r} = (a\cos u, a\sin u, bu), -\infty < u < \infty, a > 0$

A.	$2\pi\sqrt{a^2 + b^2}$
B.	$\sqrt{a^2 + b^2}$
C.	$2\pi + \sqrt{a^2 + b^2}$
D.	$\frac{2\pi}{\sqrt{a^2 + b^2}}$

61. If w is the angle between the parametric curves, then sin w is:

A.	$\sqrt{EG}$
B.	F
C.	$\frac{H}{F}$
D.	$\frac{H}{\sqrt{EG}}$

62. The equation of normal to the surface xyz = 4 at the point (1, 2, 2)

A.	$\frac{x+1}{2} = \frac{y+2}{1} = \frac{z+2}{1}$
B.	$\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-2}{1}$
C.	$\frac{x-1}{1} = \frac{y-2}{1} = \frac{z-2}{2}$
D.	$\frac{x-1}{1} = \frac{y-2}{2} = \frac{z+2}{-1}$

63. If the tangent and binormal at a point of a space curve makes angles θ and φ, respectively, with a fixed direction, then $\frac{\sin\theta}{\sin\varphi}\frac{d\theta}{d\varphi}$ is equal to –

A.	$\frac{\tau}{k}$
B.	τk
C.	$-\frac{k}{\tau}$
D.	$\frac{k}{\tau}$

64.

The unit tangent vector to the circular helix $\vec{r} = (a\cos t, a\sin t, bt)$ $-\infty < t < \infty$, is :	
A.	$\frac{1}{\sqrt{a^2+b^2}}(-a\sin t, 0, bt)$
B.	$\frac{1}{\sqrt{a^2+b^2}}(-a\sin t, a\cos t, b)$
C.	$(a\cos t, b\sin t, t)$
D.	$(-a\sin t, a\cos t, b)$

65.

For the curve $x = 3t$, $y = 3t^2$, $z = 2t^3$ the equation of oscillating plane at $t = t_1$ is:	
A.	$2t_1^2x + 2t_1y + z = 2t_1^3$
B.	$2t_1^2x + 2t_1y - z = 2t_1^3$
C.	$2t_1^2x - 2t_1y + z = 2t_1^3$
D.	$x + y + zt = 0$

66. A necessary and sufficient condition that a given curve is a plane curve is:

1) $k = 0$
2) $\tau = 0$
3) $k \neq 0$
4) $\tau \neq 0$

67. The nature of singularity at the vertex of the cone is:

1) Removable
2) Isolated
3) Essential
4) Artificial

68. E, F, G and L, M, N are first and second fundamental magnitudes then condition for a surface to be minimal at every point of the surface-

1) EM + LN + 2GF = 0
2) EN + 2 FG - ML = 0
3) EN + FM - GL = 0
4) EN + GL - 2FM = 0

69.

Torsion of any curve $\vec{r} = \vec{r}(u)$ is given by -	
A.	$\vec{r}\times\vec{r}\mid$
B.	$\mid\vec{r}\times\vec{r}\mid^2$
C.	$\frac{[\vec{r},\vec{r},\vec{r}]}{\mid\vec{r}\times\vec{r}\mid}$
D.	$\frac{[\vec{r},\vec{r},\vec{r}]}{\mid\vec{r}\times\vec{r}\mid^2}$

70. **The reciprocal of the curvature is called-**

1) Screw-curvature
2) Geodesic curvature
3) Radius of curvature
4) Radius of torsion

71. **A linear programming problem can be solved by graphical method if it contains only _______ variable.**

1) 2
2) 3
3) 4
4) 1

72. The canonical form of the linear programming problem is

A	Maximize $z = \sum_{j=1}^{n} c_j x_j$, Subject to $\sum_{j=1}^{n} a_{ij} x_j \le b_i$, $i = 1, 2, \dots m$; $x_j \ge 0$, $j = 1, 2, \dots n$
B	Minimize $z = \sum_{j=1}^{n} c_j x_j$, Subject to $\sum_{j=1}^{n} a_{ij} x_j = b_i$, $i = 1, 2, \dots m$
C	Minimize $z = \sum_{j=1}^{n} c_j x_j$, Subject to $\sum_{j=1}^{n} a_{ij} x_j \ge b_i$, $i = 1, 2, \dots m$
D	Maximize $z = \sum_{j=1}^{n} x_j c_j$, Subject to $\sum_{j=1}^{n} a_{ij} x_j \ge b_i$, $i = 1, 2, \dots m$

73. **In a linear programming problem, the basic solution that also optimizes the objective function is called _____.**

1) Basic feasible solution
2) Unbounded solution
3) Optimal basic feasible solution
4) Degenerate solution

74. **If a constraint has a sign €, then in order to make it an equality we have to add ______ to the left hand side.**

1) Surplus variable
2) Slack variables
3) Artificial variable
4) Surplus & Artificial variable

75. **A transportation problem with m-rows and n-columns if number of basic feasible solution is less than m + n - 1 is called _____.**

1) Non-degenerate basic feasible solution
2) Degenerate basic-feasible solution
3) Optimum solution
4) Unbounded solution

76. **The objective of a Transportation problem is to-**

1) Minimize the total transportation cost
2) Maximize the total transportation cost
3) Minimize the profit
4) To increase a customer

77. **Sequencing problem may be classified into ___ groups.**

1) 4
2) 3
3) 2
4) 1

78. **The travelling salesman problem is to ____.**

1) Find the best route without trying each one
2) Find the best route with trying each one
3) Find the worst route without trying each one
4) Find the worst route with trying each one

79. Sequencing problem involving 6 jobs and 3 machines requires evaluation of-

1) 6! + 6! + 6! Sequences
2) $(6!)^3$ sequences
3) (6x6x6) sequences
4) (6+6+6) sequences

80. OR is directly applicable to _____ and ______.

1) Salesman and Customer
2) Vendors and Public
3) Business and Society
4) Industry and Society

81. To increase the impact of Operation Research, the Operations Research Society of America (ORSA) was formed in the year-

1) 1950
2) 1951
3) 1952
4) 1953

82. The general form of OR model is:

1) $E = f(x_i - y_i)$
2) $E = f(x_i, y_i)$
3) $E = f(x_i / y_i)$
4) $E = f(x_i + y_i)$

83. While solving a Linear Programming Problem of n variables with m constraints by simplex method, an initial basic solution is found by assigning zeros to ______ variables.

1) m
2) n
3) n - m
4) None of these

84. In a transportation problem of m rows and n columns, dummy source (or destination) is introduced when-

1) m = n
2) $m \neq n$
3) Total demand = Total availability
4) Total demand ≠ Total availability

85. Let A and B be two separated subsets of a topological space (x, y) and if A U B is closed then-

1) Both A and B are open sets
2) A is open, B is closed
3) Both A and B are closed sets
4) A is closed, B is open

86. The property/properties satisfied by the operation * of composition on paths defined by [f] * [g] = [f * g] is/are-

1) Associativity only
2) Right and left identities only
3) Inverse only
4) Associativity, Right and left identities and inverse

87. Which of the following statement is true? I: Any continuous image of a connected space is connected. II: The product of any non-empty class of connected space is connected. III: The spaces R^n and C^n are connected

1) I only
2) II only
3) III only
4) I, II, III

88. Let x is a compact metric space. If a closed subspace of C(X, R) is compact then-

1) It is bounded
2) It is equicontinuous
3) It is bounded and equicontinuous
4) It is not bounded

89.

Let X be a topological space and A is a subset of X. Then A is closed if and only if-	
A.	$A \leq D(A)$
B.	$A \neq D(A)$
C.	$D(A) \leq A$
D.	$\overline{A} \leq D(A)$

90.

A subset A of a topological space is called a perfect set if:	
A.	$A = D(A)$
B.	$\overline{A} = D(A)$
C.	$A = D(\overline{A})$
D.	$A' = D(A)$

91.

Let f be a one-to-one mapping of one topological space onto another, then f is a homeomorphism if and only if-	
A.	Both f and $\overset{-1}{f}$ are continuous
B.	f is continuous
C.	$\overset{-1}{f}$ is continuous
D.	f and $\overset{-1}{f}$ are not continuous

92.

If A is a subset of a topological space x, then the interior of A denoted by A^0 satisfies-	
A.	$x-(x-A)^0 = \overline{A}$
B.	$(x-A)^0 = \overline{A}$
C.	$(\overline{x-A}) = \overline{A}$
D.	$x-(x-\overline{A}) = A^0$

93. Let (x, J_1) and (y, J_2) be two topological spaces, then the mapping f : x → y is open mapping if f(G) is J_2 open whenever G is ____.

1) J_2 - open
2) J_1 - closed
3) J_1 - open
4) J_2 - closed

94. The derived set of A is the set of all-

1) Interior points of A
2) Exterior points of A
3) Isolated points of A
4) Limit points of A

95.

If $A \subset X$, then the boundary of A is given by-	
A.	$A \cap (x - A)$
B.	$\overline{A} \cap (x - A)$
C.	$A \cap (\overline{x - A})$
D.	$\overline{A} \cap (\overline{x - A})$

96. A topological space (X, J) is Lindelof if every open cover of X has a-

1) Finite subcover
2) Countable subcover
3) Uncountable subcover
4) Open covers

97.

Let X and Y be topological spaces. The function $f : X \to Y$ is continuous if :	
A.	For every subset A of X, one has $\overline{f(A)} \subset f(\overline{A})$
B.	For every closed set B in Y, the set $f^{-1}(B)$ is closed in X
C.	For every subset A and B of X, $f(A \cap B) = f(A) \cap f(B)$
D.	For every open set B in Y, the set $f^{-1}(B)$ is need not open in X

98. Let X = {a, b, c, d, e} and let J = {φ, {b}, {c, d}, {b, c, d}, {a, c, d}, {a, b, c, d}, x}, then the interior and exterior of the subset of X A = {c} is:

1) φ and {b}
2) {b} and φ
3) φ only
4) {a} and {a, b}

99. Let X be a nonempty compact Hausdorff space. If every point of X is a limit point of X, then X is:

1) Countable
2) Uncountable
3) Totally disconnected
4) Sequentially compact

100. If X = {a, b, c} and J = {X, φ, {a}, {a, b}}, Then X is:

1) A compact Hausdorff space
2) Is not Hausdorff
3) A compact Hausdorff space which is not connected
4) A Hausdorff space which is not connected

101. A jet of water issues from a pipe, of cross section of a circle of diameter 6cm, at the rate of 20 m/sec. Given that 1 c.c of water weighs 1 gram the kinetic energy generated per second (in absolute units) is:

1) 3600
2) 36000
3) 3600π
4) 360π

102. An object moving vertically upwards passes a point at a height of 54.5 cm with a velocity of 436 cm/sec. The initial velocity of projection of the object is:

1) 545 cm/sec
2) 545 m/sec
3) 436 cm/sec
4) 43.6 m/sec

103. A man seated in a train whose velocity is 80 km/hr throws a ball at right angles to the train, with a velocity 60 km/hr. Then the resultant velocity of the ball is:

1) 70 km/hr
2) 75 km/hr
3) 100 km/hr
4) 64 km/hr

104. A point P describes an equiangular spiral $r = a e^{\theta \cot \alpha}$ with a constant angular velocity about the pole 0. Then its acceleration varies as the-

1) Square of the distance
2) Distance
3) Inverse of the distance
4) Cube of the distance

105. A smooth sphere of mass m collides obliquely with a fixed smooth plane with a velocity u inclined to the normal to the plane at an angle α, then the loss in its kinetic energy is:

A.	$\frac{1}{2}mu^2(1-e^2)\cos^2\alpha$
B.	$\frac{1}{2}mu^2e^2\cos^2\alpha$
C.	$\frac{1}{2}mu^2(1+e^2)\cos^2\alpha$
D.	$\frac{1}{2}mu^2\sin^2\alpha$

106. A ball of mass 2m impinges directly on another ball of mass m which is at rest. If the velocity of the former before impact is equal to the velocity of the latter after impact, then the coefficient of restitution is:

1) 0
2) 1
3) 1/2
4) 1/4

107.

A particle moves with uniform acceleration and v_1, v_2, v_3 are the average velocities in three successive intervals of time t_1, t_2, t_3 then $\frac{v_1 - v_2}{v_2 - v_3}$ is equal to-	
A.	$\frac{t_1 - t_2}{t_2 - t_3}$
B.	$\frac{t_2 - t_3}{t_1 - t_2}$
C.	$\frac{at_1 - t_2}{t_2 - at_3}$
D.	$\frac{t_1 + t_2}{t_2 + t_3}$

108.

A particle of mass m is projected with a velocity u along a direction making an angle α with the horizontal. The range on an inclined plane of inclination β is (with usual notation)	
A.	$\frac{u^2}{g(1+\sin\beta)}$
B.	$\frac{2u^2\sin(\alpha-\beta)\cos\alpha}{g\cos^2\beta}$
C	$\frac{2u\sin(\alpha-\beta)}{g\cos\beta}$
D.	$\frac{2u^2\cos(\alpha-\beta)}{g\sin\alpha}$

109. In the projectile, the maximum horizontal range is:

1) u/g
2) u/2g
3) u^2/g
4) $u^2/2g$

110. Moment of inertia of a elliptic lamina of axes 2a, 2b about the major axis is:

1) $Mb^2/2$
2) Mb^2
3) $Mb^2/4$
4) $Mb^2/3$

111. The period of one revolution with angular speed ω, is:

1) $2\pi\omega$
2) $2\pi/\omega$
3) $\omega/2\pi$
4) $2\pi+\omega$

112. A right circular solid cone of height h rests on a fixed rough sphere of radius a. Then the equilibrium is stable if-

1) $h < 4a$
2) $h > 4a$
3) $h < a$
4) $h > a$

113.

From the equation of the trajectory, the maximum height by the particle is the y coordinate of the vertex is:	
A.	$\frac{u^2}{2g}$
B.	$\frac{u^2 \sin\alpha}{2g}$
C.	$\frac{u^2}{g}$
D.	$\frac{u^2 \sin^2\alpha}{2g}$

114. If the sum of the components of a system of forces along two perpendicular directions are 1,2 and the algebraic sum of the moments about the origin is 6 then the equation of the line of resultant is:

1) $2x - y + 6 = 0$
2) $2x - y = 6$
3) $x + 2y + 6 = 0$
4) $x + 2y = 6$

115. When studying forces on a rigid body, which of the following has no or least relevance?

1) Line of action of the force
2) Magnitude of the force
3) Direction of the force
4) Point of application of the force

116. If a right circular solid cylinder of height h rests on a fixed rough sphere of radius a, then the equilibrium is stable if-

1) $h > 2a$
2) $h < 2a$
3) $h < a$
4) $h > a$

117. For two unlike parallel forces acting at A and B, the resultant acts at a point C dividing AB:

1) Internally in the ratio of the forces
2) Externally in the inverse ratio of the forces
3) Internally in the inverse ratio of the squares of the forces
4) Externally in the ratio of the forces

118. The resultant of two unlike parallel forces is of magnitude and direction given by-

1) Their sum, direction of greater force
2) Their difference, direction of greater force
3) Their sum, direction of smaller force
4) Difference, direction of smaller force

119. If S is the circumcentre of a triangle ABC and if forces of magnitudes P, Q, R acting SA, SB, SC respeetively, are in equilibrium. Then P, Q, R are in the ratio-

1) Sin 3A : Sin 2B : Sin 2C
2) Sin A : Sin 2B : Sin 2C
3) Sin 2A : Sin 2B : Sin 2C
4) Sin A : Sin B : Sin C

120. **If three parallel forces are in equilibrium then-**

1) They are equal in magnitude
2) They are all in the same sense
3) Each is proportional to the square of the distance between the other two
4) The magnitude of each force is proportional to the distance between the other two

121.

If $-1 < x < 1$ and n is any positive integer, then modulus of Legendre polynomial, $\mid P_n(x) \mid$ is less than-	
A.	$\left\{\frac{\pi}{2n(1+x^2)}\right\}^{1/2}$
B.	$\left\{\frac{\pi}{2n(1-x^2)}\right\}^{1/2}$
C.	$\left\{\frac{\pi}{2n(1-x)}\right\}^{1/2}$
D.	$\left\{\frac{\pi}{2n(1+x)}\right\}^{1/2}$

122.

$\frac{d}{dx}[x^n J_n(x)]$ is ________, where $J_n(x)$ is Bessel's function.	
A.	$J_{n-1}(x)$
B.	$J_{n+1}(x)$
C.	$x J_{n-1}(x)$
D.	$x^n J_{n-1}(x)$

123. **The complete integral of the partial Differential Equation (y-x) (qy-px)=(p-q)² is**

1) $z = b^2(x+y)-bxy+c$
2) $z = b^2(x-y)+bxy+c$
3) $z = b^2(x+y)+bxy+c$
4) $z = -b^2(x+y)-bxy+c$

124.

By Charpit's method, the complete integral of partial differential equation $(x^2-y^2)pq-xy(p^2-q^2)-1=0$, is :	
A.	$z=\frac{a}{2}\log(x^2+y^2)-\frac{1}{a}\tan^{-1}\frac{y}{x}+b$
B.	$z=\frac{a}{2}\log(x^2-y^2)+\frac{1}{a}\tan^{-1}\frac{y}{x}+b$
C.	$z=\frac{a}{2}\log(x^2+y^2)+\frac{1}{a}\tan^{-1}\frac{y}{x}+b$
D.	$z=\frac{a}{2}\log(x^2-y^2)-\frac{1}{a}\tan^{-1}\frac{y}{x}+b$

125.

With usual notation $\int_0^1 \frac{uJ_0(xu)}{(1-u^2)^{1/2}} du$ is equal to-	
A.	$\frac{\sin^{-1} x}{x}$
B.	$-\frac{\sin^{-1} x}{x}$
C.	$-\frac{\sin x}{x}$
D.	$\frac{\sin x}{x}$

126.

The Legendre polynomial of degree n is:	
A.	$\sum_{r=0}^{n} (-1)^r \frac{(2n-2r)!}{2^r r!(n-r)!(n-2r)!} x^{n-2r}$
B.	$\sum_{r=0}^{n/2} (-1)^r \frac{(2n-2r)!}{2^r r!(n-r)!(n-2r)!} x^{n-2r}$
C.	$\sum_{r=0}^{n/2} (-1)^r \frac{(2n-2r)!}{2^r r!(n-r)!(n-2r)!} x^{n+2r}$
D.	$\sum_{r=0}^{n} (-1)^r \frac{(2n-2r)!}{2^r r!(n-r)!(n-2r)!} x^{n+2r}$

127. The equation of a surface passing through the two lines z = x = 0, z - 1 = x- y = 0, satisfying r - 4s + 4t = 0 is:

1) z (2x - y) = 3x
2) z (2x + y) = 3x
3) z (2x + y) = -3x
4) z (2x + y) = 3

128.

The General Solution of the partial Differential Equation $(D^2 + 3DD' + 2D'^2)$ z = x+y is	
A.	$z = \phi_1(y-x) + \phi_2(y-2x) - \frac{1}{36}(x+y)^3$
B.	$z = \phi_1(x-y) + \phi_2(2x-y) - \frac{1}{36}(x+y)^3$
C.	$z = \phi_1(y-x) + \phi_2(y-2x) + \frac{1}{36}(x+y)^3$
D.	$z = \phi_1(y-x) + \phi_2(y-2x) + \frac{1}{36}(x-y)^3$

129. If point $x = x_0$ is called an ordinary point of the equation y'' + P(x)y' + Q(x)y=0 if-

1) P(x) is analytic at $x = x_0$ and Q(x) is not analytic at $x = x_0$
2) P(x) is not analytic at $x = x_0$ and Q(x) is analytic at $x = x_0$
3) Both P(x) and Q(x) are analytic at $x = x_0$
4) Both P(x) and Q(x) are not analytic at $x = x_0$

130. In the Bessel's function, if n is a +ve integer then $J_{-n}(x)$ is:

1) $J_n(x)$
2) $-J_n(x)$
3) $(-1)^n J_n(x)$
4) $J_{n+1}(x)$

131. The power series solution of y'=2xy is:

1) $y=a_0 e^{x}$, a_0 being an arbitrary constant
2) $y=a_0 e^{x2}$, a_0 being an arbitrary constant
3) $y=a_0 e^{2x}$, a_0 being an arbitrary constant
4) $y=a_0 e^{-x2}$, a_0 being an arbitrary constant

132. Solution of a(p+q) = z is:

1) $\phi(x+y, y+az)=0$, ϕ being an arbitrary function
2) $\phi(x-y, y+az)=0$, ϕ being an arbitrary function
3) $\phi(x+y, y-az)=0$, ϕ being an arbitrary function
4) $\phi(x-y, y-az)=0$, ϕ being an arbitrary function

133.

If y_1 is a non-zero solution of $y''+P(x)y'+Q(x)y=0$ then $y_2 = ?$	
A.	vy_1 where $v=\int \frac{1}{y_1^2} e^{-\int P dx} dx$
B.	vy_1 where $v=\int P dx\, dx$
C.	$v+y_1$ where $v=\int \frac{1}{y_1^2} e^{-\int P dx} dx$
D.	$v-y_1$ where $v=\int \frac{1}{y_1^2} e^{-\int P dx} dx$

134. The system of two partial differential equations are not compatible then these equations posses-

1) Common solution
2) No common solution
3) No solution
4) Unbounded solution

135. If $y_1 = e^{2x}$ and $y_2 = e^{x}$ then $w(y_1, y_2)$ is given by-

1) e^{-3x}
2) e^{3x}
3) $-e^{3x}$
4) $-e^{-3x}$

136.

If $P_n(x)$ is a Legendre's polynomial of degree n and $\int_{-1}^{1} P_n(x)dx = 2$ if n is:	
A.	1
B.	0
C.	– 1
D.	≥ 1

137.

For repeated ranks, which of the following factor is added to $\sum d^2$ in calculating rank correlation coefficient for each repetition of rank m times.	
A.	$\frac{m^2(m^2-1)}{12}$
B.	$\frac{m(m^2-1)}{12}$
C.	$\frac{m(m+1)}{12}$
D.	$\frac{m^2(m+1)}{12}$

138.

Find the regression coefficient b_{xy} of X on Y if $r = \frac{1}{6}, b_{yx} = \frac{-1}{9}$:	
A.	$\frac{-1}{4}$
B.	$\frac{1}{4}$
C.	$\frac{1}{9}$
D.	1

139. **Find the mode of the Ψ^2 distribution with 10 degrees of freedom:**

1) 10
2) 8
3) 9
4) 11

140. **A coin is tossed until a head appears. Find the expectated number of tosses to get first head:**

1) 5
2) 6
3) 7
4) 8

141. **If X and Y are two independent random variables, and Z = aX+bY, where a and b are constants, then var(Z) = _____.**

1) a var(X) + b var(Y)
2) a^2 var(X) + b^2 var(Y)
3) var(X) + var(Y)
4) a^2 var(X) - b^2 var(Y)

142. **If Y = aX, a is a constant and the characteristic function of a random variable X is φ(t), then the characteristic function of Y is ____.**

1) a φ(t)
2) φ(t)
3) φ(-t)
4) φ(at)

143. **Number of equations needed for n events A_1, A_2,....,A_x to be independent is _____.**

1) 2^n
2) 2^n+1
3) 2^n-1
4) $2^n-(n+1)$

144.

If X is a random variable such that p(X=0) =p(X=2)=p and p(X=1)=1 – 2p. for $0 \le p \le \frac{1}{2}$: Find the value of p for which var(X) is maximum.	
A.	0
B.	$< \frac{1}{2}$
C.	$> \frac{1}{2}$
D.	$\frac{1}{2}$

145.

Which of the following density functions cannot serve as the probability distribution?	
A.	$f(x) = \frac{1}{6}$, for x = 1, 2, 3, 4, 5, 6
B.	$f(x) = \frac{1}{2}$, for x = 1, 2
C.	$f(x) = \frac{1}{3}$, for x = 1, 2, 3
D.	$f(x) = \frac{1}{4}$, for x = 1, 2

146. In a binomial distribution the mean μ and variance σ^2 are related by-

A.	$\sigma^2 = \frac{\mu}{q}$
B.	$\sigma^2 = \mu q$
C.	$q^2\sigma^2 = p$
D.	$p^2\sigma^2 = q$

147. Which function defines a probability space on the sample space s = {e_1, e_2, e_3}?

A.	$p(e_1) = \frac{1}{4}, p(e_2) = \frac{1}{3}, p(e_3) = \frac{1}{2}$
B.	$p(e_1) = \frac{2}{3}, p(e_2) = +\frac{1}{3}, p(e_3) = \frac{2}{3}$
C.	$p(e_1) = \frac{1}{4}, p(e_2) = \frac{1}{3}, p(e_3) = \frac{2}{3}$
D.	$p(e_1) = 0, p(e_2) = \frac{1}{3}, p(e_3) = \frac{2}{3}$

148. Moment generating function of a normal distribution is:

A.	$e^{\mu t - \frac{\sigma^2 t^2}{2}}$
B.	$e^{\mu t + \frac{\sigma^2 t^2}{2}}$
C.	$e^{\mu t}$
D.	$e^{\frac{\sigma^2 t^2}{2}}$

149. The correlation is said to be perfect positive if the coefficient of correlation is:

1) -1
2) >0
3) <0
4) +1

150. If the probability density function of a normal distribution is $c.e^{-\frac{1}{2}\frac{(x-100)^2}{25}}$, then the value of c is equal to-

A.	$\frac{1}{25\sqrt{2\pi}}$
B.	$\frac{1}{50\sqrt{2\pi}}$
C.	$\frac{1}{10\pi}$
D.	$\frac{1}{5\sqrt{2\pi}}$

151. **Probability of rejecting a lot when it is good is called-**

1) Type II error
2) Type I error
3) Sample test
4) Level of significance

152. **Moment generating function of chi-square distribution with n degrees of freedom is:**

1) $(1-2t)^{-1}$
2) $(1-2t)^{n/2}$
3) $(1-2t)^{-n/2}$
4) $(1+2t)^{-n/2}$

153. **In the case of inviscid fluids, there is no tangential or ____.**

1) Independent forces
2) Dynamic forces
3) Inviscid forces
4) Shearing forces

154. **Which of the following is correct? (i) The Mach number M = 1, then the flow is sonic (ii) The Mach number M > 1, then the flow is supersonic (iii) The Mach number M < 1, then the flow is subsonic.Comment the above statement:**

1) (i) & (ii) are true
2) (ii) & (iii) are true
3) (i) & (iii) are true
4) (i),(ii) & (iii) all are true

155. If $\frac{\partial^2 w}{\partial x^2}+\frac{\partial^2 w}{\partial y^2}=f(x,y)$ at all points of a region S in the plane OX, OY bounded by a closed curve C and if. f is prescribed at each point(x, y) of S and W at each point of C, then the number of solutions satisfying these conditions is:

A.	Infinite
B.	Zero
C.	Unique
D.	Two

156.

	Which of the following statement is correct?
A.	For slow motion the vorticity is given by $\zeta = \frac{k}{8\pi\gamma t}\exp\left(\frac{-R^2}{4\gamma}\right)$
B.	For slow motion $\zeta = \frac{k}{8\pi\gamma}\exp\left(\frac{-R^2}{4\gamma t}\right)$
C.	For slow motion ζ decays rapidly with time
D.	For slow motion ζ decays slowly with time

157.

	With usual notation the displacement thickness δ^* is equal to-
A.	$1.728\sqrt{\frac{\gamma x}{U_\infty}}$
B.	$5.64\sqrt{\frac{\gamma x}{U_\infty}}$
C.	$0.664\sqrt{\frac{\gamma x}{U_\infty}}$
D.	$0.728\sqrt{\frac{\gamma x}{U_\infty}}$

158.

	The energy equation for a non-viscous fluid is given by-
A.	$\Sigma\frac{\partial}{\partial x}\left(k\frac{\partial \bar{T}}{\partial x}\right) = \frac{-Dp}{Dt}$
B.	$\frac{\partial}{\partial x}\left(k\frac{\partial \bar{T}}{\partial x}\right)+\frac{\partial}{\partial y}\left(k\frac{\partial \bar{T}}{\partial y}\right)+\frac{\partial}{\partial z}\left(k\frac{\partial \bar{T}}{\partial z}\right) = \rho\frac{D}{Dt}(C_p\bar{T}) - \frac{Dp}{Dt}$
C.	$\Sigma\frac{\partial}{\partial x}\left(k\frac{\partial \bar{T}}{\partial x}\right) = \rho\frac{D}{Dt}(C_p\bar{T})$
D.	$\Sigma\frac{\partial}{\partial x}\left(k\frac{\partial \bar{T}}{\partial x}\right) = \rho\frac{D}{Dt}(\bar{T}) + \frac{Dp}{Dt}$

159. If a particle of viscous fluid of fixed mass $\rho\delta v$ and moving at any time t with velocity q then its kinetic energy is:

1) $(\rho\delta v)q^2$
2) $1/2(\rho\delta v)q^2$
3) $1/2(\rho\delta v)q$
4) $1/2(\rho\delta v)q^3$

160. The boundary layer equation can be regarded as a process of a symptotic integration of the Navier-stokes equations at very-

1) Large Reynolds number
2) Large Navier number
3) Large Stoke number
4) Large Green number

161. **The concept of the boundary layer which was introduced by-**

1) Green
2) L.prandtl
3) Navier
4) Stoke

162.

The Reynolds number $R = \frac{VL}{\nu}$ ensures,	
A.	How to scale the body forces
B.	Dynamical similarity in the two flows at points where viscosity is unimportant
C.	Dynamical similarity at corresponding points near the boundaries where viscous effects supervene
D.	To measure the fluid velocity

163. **Which of the following is correct? (i) The large value of Reynold's number indicates that the fluid is lightly viscous (ii) The small value of Reynold's number indicates that the fluid is highly viscous. Comment the above statement.**

1) (i) is true, (ii) is false
2) (i) is false, (ii) is true
3) Both (i) & (ii) are true
4) Both (i) & (ii) are false

164.

The pressure ratio $\frac{p_2}{p_1}$ in terms of the Mach number M_1 of the incident stream is _____.	
A.	$\frac{2\gamma M_1^2}{\gamma-1} - \frac{\gamma+1}{\gamma-1}$
B.	$\frac{2\gamma M_1^2}{\gamma+1} - \frac{\gamma-1}{\gamma+1}$
C.	$\frac{2\gamma M_1^2}{\gamma-1} - \frac{\gamma-1}{\gamma+1}$
D.	$\frac{2\gamma M_1}{\gamma+1} - \frac{\gamma-1}{\gamma+1}$

165. **In Descartes folium, there is a circle which divides the plane into two regions. (i)Outside the circle the flow is everywhere supersonic (ii)Within the circle the flow is subsonic, and (iii)On the circle the flow is sonic**

1) (i) is true only
2) (ii) is true only
3) (iii) is true only
4) All the three (i), (ii), (iii) are true

166.

	The one-dimensional wave equation is ____.
A.	$\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} = \frac{1}{c^2}\frac{\partial^2 \phi}{\partial t^2}$
B.	$\frac{\partial^2 \phi}{\partial t^2} = c^2 \frac{\partial^2 \phi}{\partial x^2}$
C.	$\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} + \frac{\partial^2 \phi}{\partial z^2} = \frac{1}{c^2}\frac{\partial^2 \phi}{\partial t^2}$
D.	$\frac{\partial \phi}{\partial t} = c^2 \frac{\partial^2 \phi}{\partial x^2}$

167. **The local Mach number M is the dimensionless parameter defined by the relation M=q/a, when q=a, M=1 and the flow is said to be ____.**

1) Sonic
2) Supersonic
3) Subsonic
4) Sink sonic

168.

	Prandtl's relation $u_1 u_2 = a_*^2$ (where a_* is the critical speed) implies that-
A.	If $u_1 > a_*$, then $u_2 < a_*$
B.	If $u_1 < a_*$, then $u_2 > a_*$
C.	If $u_1 > a_*$, then $u_2 < a_*$ and if $u_1 < a_*$ then $u_2 > a_*$
D.	If $u_1 > a_*$, then $u_2 > a_*$

169. **Let G be a (p, q) graph. If G is connected and p = q+1 then G is a-**

1) Tree
2) Cycle
3) Complete graph
4) Block

170. **Every two points of graph G are joined by a unique path then G is a _____.**

1) Cycle
2) Hamiltonian graph
3) Complete graph
4) Tree

171. **The connectivity and line connectivity of a disconnected graph is:**

1) 1
2) 0
3) 2
4) 3

172. **Any set M of independent lines of a graph G is called _____ of G.**

1) Covering
2) Matching
3) Colouring
4) Cycles

173. **Every uniquely n-colourable graph is _____ connected.**

1) n
2) n - 1
3) n + 1
4) ∞

174. **Let v be a point of a connected graph G. There exists two points u and w distinct from v such that v is on every u - w path then v is a _____ point of G.**

1) Maximal
2) Minimal
3) Cut
4) Connected

175. **For any graph G, the edge chromatic number is either _____. [∞ and δ are maximum and minimum degree of G]**

1) ∞ or $\infty + 1$
2) δ or $\delta + 1$
3) 0 or ∞
4) -1 or +1

176. **An eulerian tour is a tour which-**

1) Passes through all the edges any number of times
2) Passes through all the edges exactly once
3) Not passing through all the edges
4) Passes through all the edges exactly two times

177. **The order of incidence matrix of a graph is:**

1) p x p
2) p x q
3) q x p
4) q x q

178. **If a k-regular bipartite graph with $k > 0$ has bipartition (X,Y), then-**

1) $|X| < |Y|$
2) $|X| > |Y|$
3) $|X| = |Y|$
4) $|X| + |Y| = k$

179. **If G is a tree with 10 vertices then the number of edges in G is equal to-**

1) 10
2) 11
3) 9
4) 5

180. **The minimum number of edges in a connected graph with n vertices is:**

1) n
2) n +1
3) n - 1
4) 2n

181. **If G is Hamiltonian then, for every non empty proper subset S of V,**

1) $W(G - S) \geq |S|$
2) $W(G - S) \leq |S|$
3) $W(G - S) \leq |S| + 1$
4) $W(G) \leq |G - S|$

182. **A matching M of a graph G contains no M augmenting path, then it is:**

1) A perfect matching
2) A minimum matching
3) A maximum matching
4) Neither a maximum matching nor a minimum matching

183. **For any two integers $k \geq 2$ and $l \geq 2$ the Ramsey number r(k, l) is less or equal to-**

1) $r(k,l-1) + r(k+1,l)$
2) $r(k,l+1) + r(k-1,l)$
3) $r(k,l-1) + r(k-1,l)$
4) $r(k,l) + r(k-1,l-1)$

184. **Let Q be a (p, q) graph all of whose points have degree k or k + 1. If G has $t > 0$ points of degree k, then t = _____.**

1) $p(k+1)-2q$
2) $p-2q$
3) $pk-q$
4) $2p-kq$

185. **The complete graph k_p is regular graph of degree _____.**

1) $p + 1$
2) p
3) $p - 1$
4) $p + 2$

186. **Let N be normal linear space and let $x, y \in N$. Then $|\,||x|| - ||y||\,|$ _____ $||x - y||$**

1) <
2) =
3) >
4) ≤

187. **$||x + y||_p \leq ||x||_p + ||y||_p$ (Minkowski's inequality), for-**

1) $1 \leq p$
2) $p \leq \infty$
3) $p < 1$
4) $1 \leq p < \infty$

188. **If T is a bounded linear operator such that its inverse T^{-1} exists then T^{-1} is _____.**

1) Continuous
2) Discontinuous
3) Conjugate space
4) Closed and bounded

189. **$x = 0$ is ______ point of the differential equation $2x^2y'' + 7x(x + 1)y' - 3y = 0$.**

1) Ordinary point
2) Singular point
3) Regular singular point
4) Irregular singular point

190. **If x and y are any vectors in a Hilbert space, then- $||x+y||^2 - ||x-y||^2 + i\,||x+iy||^2 - i||x-iy||^2 =$ ____.**

1) 3(x, y)
2) 4(x, y)
3) 2(x, y)
4) (x, y)

191.

If M is a ______ of a Hilbert space H, then $H = M \oplus M^{-}$	
A.	Linear subspace
B.	Closed
C.	Closed linear subspace
D.	Normal linear space

192. **Let T be an operator on a Hilbert space H and T* be an adjoint of the operator T. Then $||T^* T|| =$ ______.**

1) $||T^*||^2$
2) $||T||^2$
3) $||T + T^*||$
4) $(\alpha T)^*$

193. **If T is a _____ operator on a Hilbert space H, then the eigen spaces of T are pairwise orthogonal.**

1) Unitary
2) Adjoint
3) Self adjoint
4) Normal

194. **In the normal linear space N, for $x, y \in N$, _______ $\leq ||x - y||$.**

1) $||x|| + ||y||$
2) $|\,||x|| - ||y||\,|$
3) $||x - y|| + ||y||$
4) $||x - y|| + ||x||$

195.

The probability of having a knave and queen when two cards are drawn from a pack of 52 cards is:	
A.	$\frac{52}{663}$
B.	$\frac{8}{663}$
C.	$\frac{2}{663}$
D.	$\frac{4}{663}$

196. Let X and Y be two normal linear spaces over the same scalar field and let T be a linear transformation of X onto Y. Except one all other falling statements are equivalent. Identify the odd statement.

1) T is continuous at a point of X
2) T is continuous at every point of X
3) T is bounded
4) T need not maps bounded sets in X into bounded sets of Y

197. If x and y any two vectors in a Hilbert space then $|(x,y)| \leq$ _____.

1) $||x||\ ||y||$
2) $||x^2y||$
3) $|x\ y|$
4) $||x + y||$

198. If x and y any two vectors which are orthogonal, in a Hilbert space, then $||x + y||^2 =$ _____.

1) $||x||^2+||y||^2$
2) $||x||^2-||y||^2$
3) $2||x||+2||y||$
4) $2(||x||^2+||y||^2)$

199. E a projection on a Banach space B, then identify the statement which is not true.

1) $E^2=E$
2) E is continuous
3) Linear transformation
4) The range and null spaces of E are not closed

200.

The space L_2 associated with a measure space X with measure m, the inner product (f, g) of two function f and g is defined by-	
A.	$\int f(x)g(x)dm(x)$
B.	$\int \overline{f(x)}\, m(x)d\,g(x)$
C.	$\int f(x)\overline{g(x)}\,d\,m(x)$
D.	$\int \overline{g(x)}\, m(x)df(x)$