APPOLO STUDY CENTRE
TRB P.G. 2015 – MATHS

1. The characteristic of the ring of integers is,
   a. ∞ b. 0   c. -1   d. 2

2. If M is the ring of 2x2 matrices over the integers then
   K=$\left\{\begin{pmatrix} a & b \\ 0 & 0 \end{pmatrix} / a, b \in Z\right\}$ is,
   a. a sub ring   b. an ideal
   c. a right ideal   d. a left ideal

3. In $z\left(\sqrt{-5}\right)=\left\{a+b\sqrt{-5} / a, b \in Z\right\}$, which of the following is true?
   a. 1 is the only unit.
   b. 9 and -3+3$\sqrt{-5}$ have a greatest common factor.
   c. 3 is reducible
   d. $\sqrt{-5}$ is a prime element.

4. If x and y are orthogonal vectors in a Euclidean space then
   a. $\|x+y\|^2=\|x\|^2+\|y\|^2$ b. $\|x+y\| = \|x\| + \|y\|$
   c. $\|x-y\| = \|x\| - \|y\|$ d. $\|x-y\|^2=\|x\|^2-\|y\|^2$

5. Which of the following sets is linearly independent over the field of real numbers?
   a. $\{(0,-3,2),(3,3,4)(-6,-18,0)\}$ b. $\{(1,1,0),(3,1,3)(5,3,3)\}$
   c. $\{(1,2,3),(2,-1,5)(5,0,13)\}$ d. $\{(5,0,0),(0,-3,0)(0,0,2)\}$

6. Which of the following groups is not cyclic?

a. goup of order 35
b. group of 'n' roots of unity under usual multiplication
c. group of integers under usual addition
d. $\{1,3,5,7\}$ under multiplication mod 8.

7. If G′ is the commutator subgroup of a goup G, then which of the following is true?
   a. G′ is not normal in G
   b. G/G' is non-abelian
   c. G/G' is abelian
   d. If N is normal in G such that G/N is abelian then $N \subset G'$

8. The least order of a non-abelian group is
   a. 5 b. 6 c. 7 d. ∞

9. Which of the following is true?
   a. A_4 has a subgroup of order 6
   b. S_4 has a subgroup of order 12
   c. S_3 is abelian
   d. S_5 is solvable.

10. Which of the following is an integral domain?
   a. Ring of integers
   b. $(Z_{6'} +_{6'} \times_6)$
   c. Ring of real quaternions
   d. None of the above.

11. Let $E = \left\{1, \frac{1}{2}, \frac{1}{3} \ldots\ldots\right\}$. Then E
   a. is bounded
   b. is unbounded
   c. has l.u.b only
   c. has g.l.b only

12. The set Q of all rational number is
   a. countable
   b. uncountable
   c. finite
   d. connected set

13. $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converse if

a. p=1 b. p<1 c. p>1 d. $p \neq 1$

14. If is continuous on [a,b] and differentiable in (a,b), then there exists a c in (a,b)

a. $f'(c)=0$

b. $f'(c)=f(b)-f(a)$

c. $f'(c)=\frac{f(b)-f(a)}{b-a}$

d. $f(b)=f(a)=f(c)=0$

15. Which of the following is a true statement?

a. Every countable subset of 'R' has measure zero

b. Intervals are of measure zero

c. Cantor set is not of measure zero

d. Set of all rational numbers is not of measure zero.

16.If V is the set of all polynomials in x over the real field F, of degree 2 or less and the inner product V is definite by $\langle f(x), g(x) = \int_{-1}^{1} f(x), g(x) dx$ for $f(x), g(x) \in V$ then $\|x\|^2$ is equal to

a. 0 b. $\frac{2}{5}$ c. $\frac{3}{5}$ d. 1

17.The polynomial x^2+1 over the ring of real quaternions has

a. no roots

b. two roots

c. one root

d. infinite number of roots

18.If F is a field then the dimension of the vector space $\frac{F[x]}{(x^2+1)}$ over F is

a. 1 b. 2 c. 4 d. ∞

19.If F is the field of rational numbers and K=$(\sqrt[3]{2})$ then the order of G(K, F) is

a. 6 b. 3 c. 2 d. 1

20.There exists a field consisting of

a. 18 elements
b. 50 elements
c. 512 elements
d. 1000 elements

21. $f \in L^2[0,2\pi], \frac{a_0}{2} + \sum_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx)$ is the Fouier series for f. As $n \to \infty$

a. $a_n \to 0, b_n \to 1$
b. $a_n \to 1, b_n \to 0$
c. $a_n \to 0, b_n \to 0$
d. $a_n \to \infty, b_n \to \infty$

22. Let $\frac{a_0}{2} + \sum_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx)$ be the Fourier series of f(x) in $-\pi \le x \le \pi$.
Then for the function f(x)= $x^5 \sin^3 x$.

a. f is even and $b_n = 0$
b. f is even and $a_n = 0$
c. f is odd and b_n =0
d. f is odd and b_n =0

23. The convolution of two functions f and g is

a. $(f * g)(x) = f(x)g(t-x)$
b. $(f * g)(x) = \int_0^x f(t)g(t)dt$
c. $(f * g)(x) = f(t)g(x-t)$
d. $(f * g)(x) = \int_{-\infty}^{\infty} f(t)g(x-t)dt$

24. If F[f(x)]= $\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x)e^{ixs}dx$ =F(s), then F(f(x-a)) is,

a. F(s+a)
b. F(s-a)
c. e^{ias} F(s)
d. e^{-ias} F(s)

25. If F[f(x)]= $\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x)e^{isx}dx$. Then F$\left[\frac{1}{\sqrt{|x|}}\right]$=

a. $\frac{1}{s}, s > 0$
b. $\frac{1}{\sqrt{s}}, s > 0$
c. $\frac{1}{s^{3/2}}, s > 0$
d. $\frac{1}{s^2}, s > 0$

26. If a function f is not continuous at C, then point C is a removable discontinuity if

a. either f(C+) or f(C-) does not exist.
b. both f(C+) and f(C-) exist but have different values
c. both f(C+) and f(C-) exist and f(C+)=f(C-) $\neq$ f(C)
d. all the above.

27. If f(x)= x^2 in □ , then f is

a. uniformly continuous
b. not uniformly continuous
c. bounded
d. none of the above.

28.Let f(x)= $\frac{1}{1+x^2}$, $x \in \mathbb{R}$, then the value of the Lebesque integral $\int_R f$ is

a. 0　　b. π　　c. $-\pi$　　d. ∞

29.Let $A_n = \left\{ x / 0 \le x \le \frac{1}{n} \right\}, n \in N$. Then $\bigcup_{n \in N} A_n$ is equal to

a. [0, ∞)　　b. (0,1)　　c. (0, ∞)　　d. [0, 1]

30.Let $\{Q_1, Q_2, ...\}$ be a countable collection of non-empty sets in R^n such that $Q_1 \supseteq Q_2 \supseteq ...$ and each set Q_k is closed and Q_1 is bounded then $\bigcap_{K=1}^{\infty} Q_K$ is

a. empty
b. closed and non-empty
c. open and non-empty
d. open

31.The first fundamental form of the surface $\vec{r} = \vec{r}(U,V)$ is

a. L du^2 +2M du dv+Nd v^2
b. Ld v^2 +2Mdu dv+Nd u^2
c. E d u^2 +2F du dv+Gd v^2
c. E d v^2 +2Fdu dv +G d u^2

32.A geodesic on a sphere is

a. a circle
b. any curve on the sphere
c. a great circle
d. ellipse

33.The curve given by x=a $\sin^2 u$, y=a sinu cosu, z=a cosu lies on a

a. cone　　b. sphere　　c. cylinder　　d. circular helix

34.On a right circular cone of semivertical angle α , every point can be joined to itself by a geodesic arc if

a. $\alpha < \pi/6$　　b. $\alpha > \pi/6$　　c. $\alpha = \pi/6$　　d. $\alpha = \pi/2$

35.For any curve $\vec{r} = \vec{r}(u,v)$, the value of $\vec{t}, \vec{b}'$ =?

a. $K\tau$　　b. $-K\tau$　　c. $\frac{K}{\tau}$　　d. $\frac{-K}{\tau}$

36.In a discrete metric space (M,d),d(x,y) for x, y $\in$M, x $\neq$ y is

a. 0 b. 1 c. 2 d. ∞

37.In 'R' every Cauchy sequence is

a. a convergent sequence b. a divergent sequence

c. an oscillating sequence d. none of the above.

38.If f(x)= x^2 ($(0 \le x \le 1)$) and if $\sigma = \left\{0, \frac{1}{3}, \frac{2}{3}, 1\right\}$ is a subdivision of [0,1] then the value of L[f; σ] is

a. $\frac{13}{27}$ b. $\frac{11}{27}$ c. $\frac{7}{27}$ d. $\frac{5}{27}$

39.The open interval (0,1)

a. has no open covering

b. has an open covering $\left\{\left(\frac{1}{n}, \frac{2}{n}\right) / n = 1, 2, 3, ...\right\}$

c. has an open covering $\left\{\left(\frac{1}{n}, \frac{2}{n}\right) / n = 2, 3, ...\right\}$

d. has a finite covering $\left\{\left(\frac{1}{n}, \frac{2}{n}\right) / n = 2, 3, ..., 100\right\}$

40.If f(x)= $\begin{cases} 0 & if \ x \ is \ irrational \\ 1 & if \ x \ is \ rational \end{cases}$ for $x \in [0,1]$, then

a. f is Riemann integrable on [0, 1] but not Lebesque integrable.

b. f is Riemann integrable on [0, 1] and its value is 0

c. f is neither Riemann integrable nor Lebesque integrable on [0, 1]

d. f is not Riemann integrable on [0, 1] but Lesbesque integrable.

41.Find the value of the game with pay-off matrix $P \overset{Q}{\begin{bmatrix} 5 & 2 \\ 3 & 4 \end{bmatrix}}$

a. 3.5 b. 14 c. 1 d. $\frac{13}{7}$

42.In (M/G/1) model if the service time is constant for all customers then variance is

a. same constant b. 1

c. 0 d. not a constant

43.Kuhn-Tucker conditions are related to

a. LPP b. Assignment problem

c. Transportation problems d. Non-LPP

44.In EOQ, problems with no shortages, the lead time is

a. $-\infty$ b. 0 c. ∞ d. 1

45.In a network, an activity is critical if any delay in its start

a. will not affect the project time

b. will delay the project time

c. will terminate the project

d. wil affect the project time

46.In a graphical solution of LPP, the optimal is at atleast one of the points

a. on the boundary of the common region

b. in the common region

c. at the corner points of the boundary

d. none of these.

47.Optimal solution of LPP

max z=15 x_1+30 x_2 subject to

4 x_1+5 $x_2 \leq$ 200,2x_1+4$x_2 \leq$240

a. 1065 b. 1080 c. 1035 d. 975

48.In LPP, number of almost solutions obtained by setting any n variables among (m+n) variables equal to zero is

a. $(m+n)!$ b. $n!$ c. $(m+n)C_m$ d. $(m+n)P_m$

49.In a m x n transportation problem, the number of basic variables is

a. mn+1 b.m+n-1 c.m-n+1 d. m+n+1

50.Find the reduced matrix for the pay-off matrix $\begin{pmatrix} 3 & 4 & 2 \\ 5 & 2 & 4 \\ 3 & 5 & 2 \end{pmatrix}$

a. $\begin{pmatrix} 2 & 4 \\ 5 & 2 \end{pmatrix}$ b. $\begin{pmatrix} 5 & 2 \\ 3 & 5 \end{pmatrix}$ c. $\begin{pmatrix} 4 & 2 \\ 2 & 4 \end{pmatrix}$ d. none of these.

51.Let x= $(x_1, x_2, ...x_n) \in \mathbb{R}^n$. $\|x\| = \left(\sum_{i=1}^{n} |x_i|^p \right)^{1/p}$ does not define a norm when

a. P=100   b. P= $3/2$ c.P=1   d.P= $1/2$

52.If N and N′ are normed linear spaces and $\mathcal{B}$ (N, N′) is the set of all continuous linear transformations of N into N′ with the norm defined by

a. $\mathcal{B}$ (N,N′) is Banach iff both N, N′ are Banach
b. $\mathcal{B}$ (N,N′) is Banach if N is Banach
c. $\mathcal{B}$ (N,N′) is Banach if N′ is Banach
d. $\mathcal{B}$ (N,N′) is always Banach

53.If B and B′ are Banach spaces and if T is a continuous linear transformation from B to B′, T is an open mapping

a. if T is onto   b. if T is one to one
c. iff T is identity   d. always.

54.A Banach space B will be Hilbert space iff for any x, y $\in$ B

a. $\|x+y\| + \|x-y\| = 2\|x\| + 2\|y\|$ b. $\|x+y\| + \|x-y\| = 2\|x\|$
c. $\|x+y\|^2 + \|x-y\|^2 = \|x\|^2 + \|y\|^2$ d. $\|x+y\|^2 + \|x-y\|^2 = 2\|x\|^2 + 2\|y\|^2$

55. T^* is the adjoint of T. Which of the following is false ?

a. $(T_1 + T_2)^* = T_1^* + T_2^*$ b. $(\alpha T)^* = \alpha T^*, \alpha$ complex
c. $(T_1 T_2)^* = T_2^* T_1^*$ d. $\|T^*\| = \|T\|$

56.In PERT, with usual notations, $\sigma^2 =$

a. $\left(\frac{t_p + t_0}{6} \right)^2$ b. $\left(\frac{t_p - t_0}{6} \right)^2$ c. $\left(\frac{t_p - t_0}{3} \right)^2$ d. $\left(\frac{t_p + t_0}{3} \right)^2$

57. The number of basic feasible solutions of three equations in four unknowns is

a. 12 b. 4 c. 7 d. 6

58. In a generalized Poisson Queuing model, define

n = Number of customers in the system

λ_n = Arrival rate of customers given n in the system

μ_n = Departure rate of customers given n in the system

P_n = Steady state probability of n customers in the system

For n=1,2,3,…… the balance equation is

a. $\mu_{n-1}P_{n-1}+\lambda_{n+1}P_{n+1}=(\lambda_n+\mu_n)P_n$

b. $\lambda_{n-1}P_{n-1}+\mu_{n+1}P_{n+1}=(\lambda_n+\mu_n)P_n$

c. $\lambda_{n-1}P_{n-1}+\mu_{n+1}P_{n+1}=(\lambda_{n+2}+\mu_{n+2})P_{n+2}$

d. $\mu_{n-1}P_{n-1}+\lambda_{n+1}P_{n+1}=(\lambda_{n+2}+\mu_{n+2})P_{n+2}$

59. For a two component system in parallel having constant failure rate $R_i(t)=1-e^{-\lambda it}$,

a. $\frac{1}{\lambda_1}+\frac{1}{\lambda_2}-\frac{1}{\lambda_1-\lambda_2}$

b. $\frac{1}{\lambda_1}-\frac{1}{\lambda_2}+\frac{1}{\lambda_1-\lambda_2}$

c. $\frac{1}{\lambda_1}+\frac{1}{\lambda_2}-\frac{1}{\lambda_1+\lambda_2}$

d. $-\frac{1}{\lambda_1}-\frac{1}{\lambda_2}+\frac{1}{\lambda_1+\lambda_2}$

60. The optimal policy to maximize z= y_1y_2 subject to the constraints $y_1+y_2=c$, $y_1, y_2 \geq 0$ and c>0 is

a. $\left(\frac{c}{2},\frac{c}{2}\right)$ and $Z^*=\left(\frac{c}{2}\right)^2$

b. $\left(\frac{c}{4},\frac{3c}{4}\right)$ and $Z^*=\left(\frac{3c^2}{16}\right)$

c. (c, 0) and $Z^*=0$

d. (0, c) and $Z^*=0$

61. The radius of convergence of the series $\sum_{n=1}^{\infty}\left(\frac{n}{2^n}\right)Z^n$ is

a. R = $\frac{1}{2}$ b. R=3 c. R=$\frac{1}{3}$ d.R=2

62. The fixed points of the transformation of $W=\frac{1}{Z}$ are

a. z=0, z=1 b. z=0, z=∞ c. z=-1, z=1 d. z=0, z=-1

63. The equation $\left|\frac{z-p}{z-q}\right|$=k, ($p \neq q$, $0<k<1$) represents _________ with p and q as points inverse with reference to it.

a. straight line
b. circle
c. ellips
d. parabola

64. If f(z) is an entire function, then the Taylor's series is

a. divergent for all z
b. constant
c. convergent for all z
d. an oscillating series

65. If z=a is an isolated singularity of f, then is a pole of f, if $\lim_{z \to a} |f(z)|$ =

a. ∞
b. 0
c. a
d. $\frac{1}{a}$

66. H is a Hilbert space. T is an operator on H. H is finite dimensional. σ (T) denotes the set of eigen values of T. Which of the following is false?

a. T is singular $\Rightarrow \sigma(T) = \{0\}$
b. If T is non singular, $\Rightarrow \sigma(T) \Leftrightarrow \lambda^{-1} \in \sigma(T^{-1})$
c. If A is non singular then $\sigma\left(ATA^{-1}\right) = \sigma(T)$
d. If $\lambda \in \sigma(T)$, $\lambda^2 \in \sigma\left(T^2\right)$

67. Let x be an element in Banach Algebra A. The formula for the spectral radius r(x), is

a. Sup$\left\{\left|\lambda^{-1}\right| / \lambda \in \sigma_A(x)\right\}$ where $\sigma_A(X)$ is spectrum of x
b. Inf $\{\lambda / \lambda \in \sigma_A(X)\}$
c. $\lim \|X\| ^{1/n}$
d. $\lim \left\|X^n\right\| ^{1/n}$

68. The function f(z)= $|z|^2$

a. every where analytic
b. nowhere analytic
c. analytic at z=0
d. none of these.

69. The power series is ________ in the exterior of its circle of convergence.

a. divergent
b. convergent
c. oscillates
d. none of these.

70. The value of the integral $\oint_c \frac{e^z}{z-2} dz$, where c is the circle $|z| = 3$ is

a. 2π
b. $2\pi i$
c. $2\pi i e^2$
d. e^2

71. F(z) is a continuous function is a domain D and the integral of f(z) for every closed contour in D is zero. The F(z) is

a. Analytic
b. Entire
c. Nowhere analytic
d. Bounded

72. The derivative of arc sine of z is

a. $\frac{1}{1+Z^2}$
b. $\frac{1}{\left(1+Z^2\right)^{1/2}}$
c. $\frac{z}{\left(1+Z^2\right)^{1/2}}$
d. $\frac{-z}{\left(1+Z^2\right)^{1/2}}$

73. The particular integral of the differential equation $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 2e^{-3x}$ is

a. $\frac{e^{-3x}}{18}$
b. $2x e^{-3x}$
c. $\frac{x^2}{2} e^{-3x}$
d. $x^2 e^{-3x}$

74. The solution of the total differential equation 2yzdx+zxdy-xy(1+z)dz=0 is

a. $xy^2 = cze^z$
b. $xy = cze^z$
c. $x^2 y = cze^z$
d. $x^2 yz = ce^z$

75. The partial differential equation obtained by eliminating the constants a and b from z= $(x^2+a)(y^2+b)$ is

a. $\frac{\partial z}{\partial x} = \frac{\partial z}{\partial y}$
b. $4xyz = \frac{\partial z}{\partial x}.\frac{\partial z}{\partial y}$
c. $X\frac{\partial z}{\partial x} + Y\frac{\partial z}{\partial y} = Z$
d. $4xy = Z\frac{\partial z}{\partial x}.\frac{\partial z}{\partial y}$

76. Zeros of an analytic functions are

a. zero
b. isolated
c. non-isolated
d. none of these.

77. The removable singularity of f(Z)= $\frac{\sin\sqrt{Z}}{\sqrt{Z}}$ is

a. z=0 b. z=1 c. $z=\infty$ d. z=-1

78. If t_1, t_2, t_3, t_4 are any four numbers, then their cross ratio is

a. $\dfrac{(t_1-t_2)(t_2-t_3)}{(t_3-t_4)(t_4-t_1)}$

b. $\dfrac{(t_1-t_2)(t_3-t_4)}{(t_1-t_4)(t_3-t_2)}$

c. $\dfrac{(t_3-t_1)(t_2-t_3)}{(t_3-t_4)(t_4-t_1)}$

d. $\dfrac{(t_2-t_1)(t_4-t_1)}{(t_3-t_1)(t_1-t_2)}$

79. The value of $\int_c \dfrac{z\,dz}{\sin z}$ where c; $|z|=4$ is

a. $2\pi i$ b. 0 c. $-2\pi i$ d. $4\pi i$

80. The residue of the function $\dfrac{z^3}{z^2-1}$ at $z=\infty$ is

a. -1 b. 0 c. ∞ d. $-\infty$

81. The function $\phi_1(x)$=x and $\phi_2(x)=|x|$, $X \in \mathbb{R}$ are

a. Linearly dependent
b. Linearly independent
c. Functionally dependent
d. Functionally independent.

82. The point x=1 of $(x^2+x-2)^2 y''+3(x+2)y'+(x-1)y=0$, is

a. an ordinary point
b. a singular point
c. a regular singular point
d. an irregular singular point

83. The variance of first n natural numbers is

a. $\dfrac{n^2-1}{12}$ b. $\dfrac{n+1}{2}$ c. $\dfrac{2n+1}{3}$ d. $\sqrt{\dfrac{n^2-1}{12}}$

84. If the frequency distribution is continuous and h is the width of the class interval then μ_4 (corrected) due to W.F. Sheppard is

a. $\mu_4+\dfrac{1}{2}h^2\mu_2+\dfrac{7}{240}h^4$

b. $\mu_4-\dfrac{1}{2}h^2\mu_2-\dfrac{7}{240}h^4$

c. $\mu_4-\dfrac{1}{2}h^2\mu_2+\dfrac{7}{240}h^4$

d. $\mu_4+\dfrac{1}{2}h^2\mu_2-\dfrac{7}{240}h^4$

85. The partial correlation coefficient $r_{12.3}$ between X_1 and X_2 in the case of three variables X_1, X_2, X_3 is

a. $\frac{r_{13}-r_{12}r_{23}}{\sqrt{(1-r_{13}^2)(1-r_{23}^2)}}$

b. $\frac{r_{12}-r_{13}r_{23}}{\sqrt{(1-r_{13}^2)(1-r_{23}^2)}}$

c. $\frac{r_{13}-r_{12}r_{23}}{\sqrt{(1-r_{12}^2)(1-r_{23}^2)}}$

d. $\frac{r_{12}-r_{13}r_{23}}{\sqrt{(1-r_{12}^2)(1-r_{13}^2)}}$

86. If $P_n(t)$ is a Legendre polynomial of degree n, then $\int_{-1}^{1} P_3^2(t)dt$ is

a. 0 b. 9 c. $\frac{2}{7}$ d. $\frac{2}{3}$

87. Which one of the following is a Bessel's equation of order 3?

a. $X^2\frac{d^2y}{dx^2}+X\frac{dy}{dx}+(X^2-9)y=0$

b. $X^2\frac{d^2y}{dx^2}+X\frac{dy}{dx}+(X^2+9)y=0$

c. $X^2\frac{d^2y}{dx^2}+X\frac{dy}{dx}+(9-X^2)y=0$

d. $X^2\frac{dy}{dx}+X\frac{dy}{dx}+(X^2+9)=0$

88. If $H_n(X)$ is the n^{th} Hermite polynomial, then $H_2(X)$=

a. $2x^2-4$ b. $2x^2+4$ c. $4x^2+2$ d. $4x^2-2$

89. If L(y)=y''+a_1y=0, then the value of L(e^{rx}) is

a. P(r) e^{-rx} b. P(r) e^{rx} c. P(-r) e^{rx} d. P(-r) e^{-rx}

90. The Wronskian W of the two linearly independent solutions of y''+a_1y'+a_2y=0 satisfies the equation

a. W''+a_1w=0 b. W''- a_1w=0 c. W'+a_1w=0 d. W'-a_1w=0

91. Suppose 5 men out of 100 and 25 women out of 100000 are colour blind. A colour blind person is chosen at random. The probability of this being a male is equal to (Assume males and females to be equal in number)

a. $\frac{2}{3}$ b. $\frac{20}{21}$ c. $\frac{1}{3}$ d. $\frac{3}{7}$

92. A random variable X assumes only two values +1 and -1 each with equal probability $\frac{1}{2}$. Then E(X) is equal to

a. 1 b. 0 c. $\frac{1}{2}$ d. $\frac{3}{4}$

93. If f(X) is the probability density function of a random variable X then f(x) is

a. -1 b. -2 c. $-\infty$ d. ≥ 0

94. For any two variables X and Y, E(X) is equal to

a. V(E(X/Y)) b. E(X)+E(Y) c. E(E(X/Y)) d. E(V(X/Y))

95. Let X be the number of heads (successes) in n=7 independent tosses of an unbiased coin. Then the p.d.f of X is

a. $\binom{7}{X}\left(\frac{1}{2}\right)^{7-x}$ b. $\binom{7}{X}\left(\frac{1}{2}\right)^{x}$ c. $\binom{7}{X}\left(\frac{1}{2}\right)^{7}$ d. $\binom{7}{X}\left(\frac{1}{2}\right)$

96. Twenty five books are placed at random. The probability that a particular pair of books shall be never together is equal to

a. $\frac{21}{25}$ b. $\frac{2}{25}$ c. $\frac{24}{25}$ d. $\frac{23}{25}$

97. If $B \subset A$ then the probability of $A \cap \overline{B}$ is

a. P(A)+P(B) b. P(A)-P(B) c. P(B)-P(A) d.1-P(A)-P(B)

98. If A and B are two events then P(B/A) is

a. $\frac{P(A \cap B)}{P(A)}$ b. $\frac{P(A \cap B)}{P(B)}$ c. $\frac{P(B)}{P(A \cap B)}$ d. $\frac{P(A)}{P(A \cap B)}$

99. A coin is tossed (m+n) times (m>n). The probability of getting atleast m consecutive heads is

a. $\frac{m+2}{2^{n+1}}$ b. $\frac{m}{2^{n+2}}$ c. $\frac{n+2}{2^{m+1}}$ d. $\frac{n}{2^{m+2}}$

100. A speaks truth 4 out of 5 times. One die is tossed. He reports that there is a six. The chance that actually there was six is

a. $\frac{4}{5}$ b. $\frac{1}{5}$ c. $\frac{5}{6}$ d. $\frac{4}{9}$

101. If u and v are independent Chi-square variables with r_1 and r_2 degrees of freedom, then the distribution of $W = \frac{u/r_1}{v/r_2}$ is called

a. Chi-square distribution b. t-distribution
c. F-distribution d. Poisson distribution

102. The p.d.f. of a Chi-square distribution is

a. $\frac{1}{r\left(r/2\right)2^{r/2}} X^{r/2-1} e^{-x/2}$ b. $\frac{1}{r\left(r/2\right)2^{r/2}} X^{r/2-1}$
c. $\frac{1}{r\left(r/2\right)2^{r/2}} e^{-x/2}$ d. $\frac{1}{r\left(r/2\right)2^{r/2}} X^{r/2} e^{-x/2}$

103. Finding the relation between two random variables is called

a. regression b. analysis
c. sample tests d. binomial

104. Let X_{ij}, i=1,2 and j=1,2,3 denote n=6 random variables that are independent and gave normal distributions with common variance σ^2. The means of these normal distributions are $\mu_{ij} = \mu + \alpha_i + \beta_j$ where

$\sum_{i=1}^{2} \alpha_i = 0$, $\sum_{j=1}^{3} \beta_i = 0$.

This concept is associated with

a. Sampling b. Correlation
c. Regression d. Analysis of variance

105. The arithmetic mean of Poisson distribution is

a. $\frac{\lambda^r e^{-\lambda}}{\lfloor r}$ b. $e^{-\lambda}$ c. λ d. λ^r

106. A lot consists of 100 fuses. Five of these fuses are chosen at random and tested; if all 5 "blow" at the correct amperage, the lot is accepted. In fact, there are 20 defective fuses in the lot. Let the random

variable X be the number of defective fuses among the 5 that are inspected. The random variable X is an example of

a. Beta distribution
b. Hypergeometric distribution
c. Poission distribution
d. Gamma distribution

107. Let X_1, X_2 be a random sample of size n=2 from a standard normal distribution. Let $Y_1 = X_1/X_2$ and $Y_2 = X_2$. Now the marginal p.d.f. of Y_1 is that of a

a. Poisson distribution
b. Negative binomial distribution
c. Multinomial distribution
d. Cauchy distribution

108. Let the random variable X have a distribution with finite variance σ^2 and mean μ. Then for every k>0, the Chebyshev's inequality is

a. $P_r\left(|X-\mu| \geq k\sigma\right) \leq \frac{1}{k^2}$
b. $P_r\left(|X-\mu| \geq k\sigma\right) \geq \frac{1}{k^2}$
c. $P_r\left(|X-\mu| \geq k\sigma\right) \leq 1-\frac{1}{k^2}$
d. $P_r\left(|X-\mu| < k\sigma\right) \leq 1-\frac{1}{k^2}$

109. Let $\overline{X_n}$ denote the mean of a random sample of size n from a distribution that has mean μ and positive variance σ^2. Then $\overline{X_n}$, n=1,2,3,……. Converges in probability to μ if $\sigma^2 < \infty$. This result is called the

a. strong law of large numbers
b. weak law of large numbers
c. law of small numbers
d. weak law of small numbers

110. Let $X_1, X_2, ...X_n$ denote the observations of a random sample from a distribution that has been μ and positive variance σ^2. Then the $Y_n = \left(\sum_{1}^{n} X_i - n\mu\right) \Big/ \sqrt{n}\,\sigma$ has a limiting distribution that is _______ with mean zero and variance 1.

a. Multinomial
b. Binomial
c. Poisson
d. Normal

111. 'Preparing Textbook Manuscripts' (1970) was a publication by

a. United Nations University

b. United Nations Institute for Training and Research
c. United Nations Children's Fund
d. United Nations Educational, Scientific and Cultural Organization.

112. Who was the Chairman of the Committee on Emotional Integration set-up in 1961 by the Ministry of Education?
a. V.V. Giri
b. Dr. Sampurnanand
c. Smt. Indira Gandhi
d. B. Mukherjee

113. "Wastage" was defined by the _______ Committee as the premature withdrawal of a child before the completion of the primary education.
a. Sargent
b. Zakir Hussain
c. Abbot-Wood
d. Hartog

114. Who first introduced the concept of development tasks?
a. Klausmeir
b. Jerome Bruner
c. Robert Havighurst
d. Ivan Pavlov

115. The major divisions of educational psychology were recognized by
a. Kolesnik
b. H.C. Lindgren
c. Garrison et.al
d. Simpson

116. National Adult Education Programme (NAEP) was launched on
a. 2nd October 1068
b. 2nd October 1978
c. 2nd November 1988
d. 2nd October 1986

117. __________ was constituted to look into the causes for lack of public support, particularly in rural areas, for girls education and to enlist public co-operation.
a. Education Commission (1964-66)
b. Smt. Durgabai Deshmukh Committee (1959)
c. M. Bhaktavatsalam Committee (1963)
d. Smt. Hansa Mehta Committee (1962)

118. ‘No religious instruction shall be provided in any educational institution wholly maintained out of state funds’, which Article states this?

a. Article 21 b. Article 28(1) c. Article 30(1) d. Article 45

119. An Interim Indian National Commission for co-operation with UNESCO was set-up in the year ________ by the Ministry of Education, Government of India.

a. 1949 b. 1959 c. 1969 d. 1979

120. In India, National Institute for the visually handicapped was set-up at

a. Kolkata b. Chennai c. Hyderabad d. Dehradun

121. P.E. Vernon who proposed hierarchical theory of intelligence is a ______ psychologist.

a. Russian b. British c. German d. French

122. The study of fluctuation of attention can be experimentally made in the psychology lab using _______.

a. Tachistoscope b. Flash cards
c. Finger dexterity test d. Masson’s disc

123. _________ was designed mainly for the deaf and linguistically backward children.

a. Pinter-Patterson scale b. Picture Construction Test
c. Arthur’s point scale d. Object assembly

124. In an experiment by Watson the subject a human baby named ‘Albert’ was given a ________ to play with.

a. Kitten b. Rabbit c. Dove d. Rat

125. Dart throwing experiment to test the transfer value of generalization was conducted by

a. Carl Jung b. Charles Judd
c. W.C. Bagley d. Sigmund Freud

126. Emotional development of a child bears a ________ correlation with social development.

a. Positive
b. Negative
c. Zero
d. None of the above

127. ________ is defined as the process of interpretation of sensation according to one's experiences.

a. Attention
b. Motivation
c. Perception
d. Generalization

128. 'No stimulus, no response' mechanism in the evolution of behaviours was opposed by

a. B.F. Skiner
b. Thorndike
c. Ivan Pavlov
d. J.B. Watson

129. _______ is affective disposition which evokes attention and maintains it.

a. Attention
b. Motivation
c. Perception
d. Interest

130. Which learning is retained longer than verbal learning?

a. Auditory
b. Memory based
c. Skill
d. Observational

131. 'The noisy child and the silent mind' is the work of

a. Froebel
b. J. Krishnamurti
c. Dewey
d. Maria Montessori

132. 'National Institute of Open Schooling' was established in

a. November, 1986
b. October, 1989
c. November, 1989
d. October, 1986

133. Who introduced the idea of 'non-classroom learning'?

a. Helmberg
b. John Holt
c. Ivan Illich
d. Montessori

134. 'INFLIBNET' is an autonomous inter-university centre of

a. Central universities b. CBSE
c. CIET d. UGC

135. The expansion of 'OPAC' is
a. Open Personal Assessment Criteria
b. Online Public Account Coding
c. Online Programming And Coding
d. Online Public Access Catalog

136. The term 'homeostasis' was coined by
a. Fisher b. Caroll c. W.B. Cannon d. Morgan

137. The term ________ literally means 'splitting of the mind'.
a. Paranoia b. Neurosis
c. Amnesia d. Schizophrenia

138. 'The useful and acceptable features of different philosophies and tendencies in education which are harmoniously blended' is called
a. Realism b. Eclecticism c. Pragmatism d. Naturalism

139. Tagore's 'Visva-Bharati' was declared to be a central university and an institution of national importance in
a. 1919 b. 1921 c. 1956 d. 1951

140. The distinction between 'knowledge by acquaintance' and 'knowledge by description' was promoted by
a. J.J. Rousseau b. Sri Aurobindo
c. Bertrand Russell d. Swami Vivekananda

141. Which of the following is not a Nobel prize for literature, winner?
a. Patrick Modiano b. Alice Munro
c. Mo Yan d. Ed. Silva

142. Which of the following was one of the first recipient of the Bharat Ratna?
a. Rajendra Prasad b. Jawaharlal Nehru

c. M.K. Gandhi
d. C.V. Raman

143. The I Asian Games were held in India in the year

a. 1947 b. 1951 c. 1965 d. 1972

144. The proposed BRICS development bank will have headquarters in

a. Bombay b. Shanhai c. Moscow d. Bejing

145. The Mars Space Craft was launched by which ISRO launch vehicle?

a. GSLV – 5
b. SLV - 2014
c. PSLV - C25
d. GSLV – C26

146. The veda which deals mostly with music is

a. Rig Veda
b. Sama Veda
c. Yajur Veda
d. Athava Veda

147. In India's freedom struggle the non-co-operation movement was launched in

a. 1916 b. 1918 c. 1920 d. 1922

148. The Constitution of India was enacted and adopted by the Government Assembly on

a. 26 January 1950
b. 26 January 1947
c. 26 November 1949
d. 26 January 1950

149. During the Indian Freedom Movement who led the Salt Satyagraga at Vedaranyam in Tamil Nadu?

a. Rajaji
b. Sardar Vedarathinam
c. Sathyamoorthi
d. Jeevanandam

150. Which one of the following gas is responsible for Green House Effect ?

a. Helium
b. Neon
c. Carbon-di-oxide
d. None of these.

TRB P.G. MATHS 2014-15
ANSWER KEYS

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