NDA/NA

National Defence Academy/Naval Academy

SOLVED PAPER 2017 (II)

PAPER I : Mathematics

1. If $x+\log_{10}(1+2^x)=x\log_{10}5+\log_{10}6$ then x is equal to

(a) 2, –3 (b) 2 only (c) 1 (d) 3

2. The remainder and the quotient of the binary division $(101110)_2 \div (110)_2$ are respectively

(a) $(111)_2$ and $(100)_2$ (b) $(100)_2$ and $(111)_2$

(c) $(101)_2$ and $(101)_2$ (d) $(100)_2$ and $(100)_2$

3. The matrix A has x rows and $x+5$ columns. The matrix B has y rows and $11-y$ columns. Both AB and BA exist. What are the values of x and y respectively?

(a) 8 and 3 (b) 3 and 4

(c) 3 and 8 (d) 8 and 8

4. If $S_n = nP + \frac{n(n-1)Q}{2}$, where S_n denotes the sum of the first n terms of an AP, then the common difference is

(a) $P + Q$ (b) $2P + 3Q$

(c) $2Q$ (d) Q

5. The roots of the equation $(q-r)x^2+(r-p)x+(p-q)=0$ are

(a) $\frac{(r-p)}{(q-r)}, \frac{1}{2}$

(b) $\frac{(p-q)}{(q-r)}, 1$

(c) $\frac{(q-r)}{(p-q)}, 1$

(d) $\frac{(r-p)}{(p-q)}, \frac{1}{2}$

6. If E is the universal set and $A = B \cup C$, then the set $E-(E-(E-(E-(E-A))))$ is same as the set

(a) $B' \cup C'$ (b) $B \cup C$

(c) $B' \cap C'$ (d) $B \cap C$

7. If $A=\{x : x \text{ is a multiple of } 2\}$, $B=\{x : x \text{ is a multiple of } 5\}$ and $C=\{x : x \text{ is a multiple of } 10\}$, then $A \cap (B \cap C)$ is equal to

(a) A (b) B

(c) C

(d) $\{x : x \text{ is a multiple of } 100\}$

8. If α and β are the roots of the equation $1+x+x^2=0$, then the matrix product

$$\begin{bmatrix} 1 & \beta \\ \alpha & \alpha \end{bmatrix}\begin{bmatrix} \alpha & \beta \\ 1 & \beta \end{bmatrix}$$

is equal to

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & -1 \\ -1 & 2 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & -1 \\ -1 & -2 \end{bmatrix}$

9. If $|a|$ denotes the absolute value of an integer, then which of the following are correct?

1. $|ab| = |a||b|$
2. $|a+b| \le |a| + |b|$
3. $|a-b| \ge |a| - |b|$

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

10. How many different permutation can be made out of the letters of the word 'PERMUTATION'?

(a) 19958400 (b) 19954800

(c) 19952400 (d) 39916800

11. If $A=\begin{bmatrix} 4i-6 & 10i \\ 14i & 6+4i \end{bmatrix}$ and $k=\frac{1}{2i}$, where $i=\sqrt{-1}$, then kA is equal to

(a) $\begin{bmatrix} 2+3i & 5 \\ 7 & 2-3i \end{bmatrix}$ (b) $\begin{bmatrix} 2-3i & 5 \\ 7 & 2+3i \end{bmatrix}$

(c) $\begin{bmatrix} 2-3i & 7 \\ 5 & 2+3i \end{bmatrix}$ (d) $\begin{bmatrix} 2+3i & 5 \\ 7 & 2+3i \end{bmatrix}$

12. The sum of all real roots of the equation $|x-3|^2+|x-3|-2=0$ is

(a) 2 (b) 3

(c) 4 (d) 6

13. It is given that the roots of the equation $x^2-4x-\log_3 P=0$ are real. For this the minimum value of P is

(a) $\frac{1}{27}$ (b) $\frac{1}{64}$

(c) $\frac{1}{81}$ (d) 1

14. If A is a square matrix, then the value of $\text{adj}\, A^T - (\text{adj}\, A)^T$ is equal to

(a) A
(b) $2|A|I$, where I is the identity matrix
(c) null matrix whose order is same as that of A
(d) unit matrix whose order is same as that of A

15. The value of the product $6^{\frac{1}{2}} \times 6^{\frac{1}{4}} \times 6^{\frac{1}{8}} \times 6^{\frac{1}{16}} \times \ldots$ up to infinite terms is

(a) 6 (b) 36 (c) 216 (d) 512

16. The value of the determinant

$$\begin{vmatrix} \cos^2\frac{\theta}{2} & \sin^2\frac{\theta}{2} \\ \sin^2\frac{\theta}{2} & \cos^2\frac{\theta}{2} \end{vmatrix}$$

for all values of θ, is

(a) 1 (b) $\cos\theta$ (c) $\sin\theta$ (d) $\cos 2\theta$

17. The number of terms in the expansion of $(x+a)^{100} + (x-a)^{100}$ after simplification is

(a) 202 (b) 101 (c) 51 (d) 50

18. In the expansion of $(1+x)^{50}$, the sum of the coefficients of odd powers of x is

(a) 2^{26} (b) 2^{49}
(c) 2^{50} (d) 2^{51}

19. If a, b, c are non-zero real numbers, then the inverse of the matrix

$$A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$$

is equal to

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

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

(c) $\frac{1}{abc}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(d) $\frac{1}{abc}\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$

20. A person is to count 4500 notes. Let a_n denote the number of notes he counts in the n^{th} minute. If $a_1 = a_2 = a_3 = \ldots = a_{10} = 150$, and $a_{10}, a_{11}, a_{12}, \ldots$ are in AP with the common difference -2, then the time taken by him to count all the notes is

(a) 24 minutes (b) 34 minutes
(c) 125 minutes (d) 135 minutes

21. The smallest positive integer n for which $\left(\frac{1+i}{1-i}\right)^n = 1$, is

(a) 1 (b) 4 (c) 8 (d) 16

22. If we define a relation R on the set $N \times N$ as $(a, b)\, R\, (c, d) \Leftrightarrow a + d = b + c$ for all $(a, b), (c, d) \in N \times N$, then the relation is

(a) symmetric only
(b) symmetric and transitive only
(c) equivalence relation
(d) reflexive only

23. If $y = x + x^2 + x^3 + \ldots$ up to infinite terms where $x < 1$, then which one of the following is correct?

(a) $x = \frac{y}{1+y}$ (b) $x = \frac{y}{1-y}$
(c) $x = \frac{1+y}{y}$ (d) $x = \frac{1-y}{y}$

24. If α and β are the roots of the equation $3x^2 + 2x + 1 = 0$, then the equation whose roots are $\alpha + \beta^{-1}$ and $\beta + \alpha^{-1}$ is

(a) $3x^2 + 8x + 16 = 0$
(b) $3x^2 - 8x - 16 = 0$
(c) $3x^2 + 8x - 16 = 0$
(d) $x^2 + 8x + 16 = 0$

25. The value of

$$\frac{1}{\log_3 e} + \frac{1}{\log_3 e^2} + \frac{1}{\log_3 e^4} + \ldots \text{up}$$

to infinite terms is

(a) $\log_e 9$ (b) 0 (c) 1 (d) $\log_e 3$

26. A tea party is arranged for 16 people along two sides of a long table with eight chairs on each side. Four particular men wish to sit on one particular side and two particular men on the other side. The number of ways they can be seated is

(a) $24 \times 8! \times 8!$ (b) $(8!)^3$
(c) $210 \times 8! \times 8!$ (d) 16!

27. The system of equations $kx + y + z = 1$, $x + ky + z = k$ and $x + y + kz = k^2$ has no solution if k equals.

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

28. If $1.3 + 2.3^2 + 3.3^3 + \ldots + n.3^n = \frac{(2n-1)3^a + b}{4}$ then a and b are respectively

(a) $n, 2$ (b) $n, 3$
(c) $n+1, 2$ (d) $n+1, 3$

29. In ΔPQR, $\angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of the equation $ax^2 + bx + c = 0$, then which one of the following is correct?

(a) $a = b + c$ (b) $b = c + a$
(c) $c = a + b$ (d) $b = c$

30. If $\left|z - \frac{4}{z}\right| = 2$, Then the maximum value of $|z|$ is equal to

(a) $1 + \sqrt{3}$ (b) $1 + \sqrt{5}$
(c) $1 - \sqrt{5}$ (d) $\sqrt{5} - 1$

31. The angle of elevation of a stationary cloud from a point 25 m above a lake is 15° and the angle of depression of its image in the lake is 45°. The height of the cloud above the lake level is

(a) 25 m (b) $25\sqrt{3}$ m
(c) 50 m (d) $50\sqrt{3}$ m

32. The value of $\tan 9° - \tan 27° - \tan 63° + \tan 81°$ is equal to

(a) -1 (b) 0
(c) 1 (d) 4

33. The value of $\sqrt{3}\,\text{cosec}\, 20° - \sec 20°$ is equal to

(a) 4 (b) 2
(c) 1 (d) -4

34. Angle α is divided into two parts A and B such that $A - B = x$ and $\tan A : \tan B = p : q$. The value of $\sin x$ is equal to

(a) $\frac{(p+q)\sin\alpha}{p-q}$ (b) $\frac{p\sin\alpha}{p+q}$

(c) $\frac{p\sin\alpha}{p-q}$ (d) $\frac{(p-q)\sin\alpha}{p+q}$

35. The value of

$\sin^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right)$ is equal to

(a) 0 (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

36. The angles of elevation of the top of a tower from the top and foot of a pole are respectively 30° and 45°. If h_T is the height of the tower and h_P is the height of the pole, then which of the following are correct?

1. $\frac{2h_P h_T}{3+\sqrt{3}} = h_P^2$
2. $\frac{h_T - h_P}{\sqrt{3}+1} = \frac{h_P}{2}$
3. $\frac{2(h_P + h_T)}{h_P} = 4 + \sqrt{3}$

Select the correct answer using the code given below.

(a) 1 and 3 only (b) 2 and 3 only

(c) 1 and 2 only (d) 1, 2 and 3

37. In a triangle ABC, $a - 2b + c = 0$. The value of $\cot\left(\frac{A}{2}\right)\cot\left(\frac{C}{2}\right)$ is

(a) $\frac{9}{2}$ (b) 3 (c) $\frac{3}{2}$ (d) 1

38. $\sqrt{1+\sin A} = -\left(\sin\frac{A}{2} + \cos\frac{A}{2}\right)$ is true if

(a) $\frac{3\pi}{2} < A < \frac{5\pi}{2}$ only (b) $\frac{\pi}{2} < A < \frac{3\pi}{2}$ only

(c) $\frac{3\pi}{2} < A < \frac{7\pi}{2}$ (d) $0 < A < \frac{3\pi}{2}$

39. In triangle ABC, if

$\frac{\sin^2 A + \sin^2 B + \sin^2 C}{\cos^2 A + \cos^2 B + \cos^2 C} = 2$

then the triangle is

(a) right-angled (b) equilateral

(c) isosceles (d) obtuse-angled

40. The principal value of $\sin^{-1} x$ lies in the interval

(a) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (b) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

(c) $\left[0, \frac{\pi}{2}\right]$ (d) $[0, \pi]$

41. The points $(a, b), (0, 0), (-a, -b)$ and (ab, b^2) are

(a) the vertices of a parallelogram

(b) the vertices of a rectangle

(c) the vertices of a square

(d) collinear

42. The length of the normal from origin to the plane $x + 2y - 2z = 9$ is equal to

(a) 2 units (b) 3 units

(c) 4 units (d) 5 units

43. If α, β and γ are the angles which the vector $\overrightarrow{\mathbf{OP}}$ (O being the origin) makes with positive direction of the coordinate axes, then which of the following are correct?

1. $\cos^2\alpha + \cos^2\beta = \sin^2\gamma$
2. $\sin^2\alpha + \sin^2\beta = \cos^2\gamma$
3. $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

44. The angle between the lines $x + y - 3 = 0$ and $x - y + 3 = 0$ is α and the acute angle between the lines $x - \sqrt{3}y + 2\sqrt{3} = 0$ and $\sqrt{3}x - y + 1 = 0$ is β. Which one of the following is correct?

(a) $\alpha = \beta$ (b) $\alpha > \beta$

(c) $\alpha < \beta$ (d) $\alpha = 2\beta$

45. Let $\vec{\alpha} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{\beta} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{\gamma} = 2\hat{i} + \hat{j} + 6\hat{k}$ be three vectors. If $\vec{\alpha}$ and $\vec{\beta}$ are both perpendicular to the vector δ and $\delta \cdot \gamma = 10$, then what is the magnitude of δ?

(a) $\sqrt{3}$ units (b) $2\sqrt{3}$ units

(c) $\frac{\sqrt{3}}{2}$ unit (d) $\frac{1}{\sqrt{3}}$ unit

46. If $\hat{a}$ and $\hat{b}$ are two unit vectors, then the vector $(\hat{a} + \hat{b}) \times (\hat{a} \times \hat{b})$ is parallel to

(a) $(\hat{a} - \hat{b})$ (b) $(\hat{a} + \hat{b})$

(c) $(2\hat{a} - \hat{b})$ (d) $(2\hat{a} + \hat{b})$

47. A force $\vec{F} = \hat{i} + 3\hat{j} + 2\hat{k}$ acts on a particle to displace it from the point $A(\hat{i} + 2\hat{j} - 3\hat{k})$ to the point $B(3\hat{i} - \hat{j} + 5\hat{k})$. The work done by the force will be

(a) 5 units (b) 7 units

(c) 9 units (d) 10 units

48. For any vector $\vec{a}$

$|\vec{a} \times \hat{i}|^2 + |\vec{a} \times \hat{j}|^2 + |\vec{a} \times \hat{k}|^2$

is equal to

(a) $|\vec{a}|^2$ (b) $2|\vec{a}|^2$ (c) $3|\vec{a}|^2$ (d) $4|\vec{a}|^2$

49. A man running round a racecourse notes that the sum of the distances of two flag-posts from him is always 10 m and the distance between the flag-posts is 8 m. The area of the path he encloses is

(a) 18π square metres

(b) 15π square metres

(c) 12π square metres

(d) 8π square metres

50. The distance of the point (1, 3) from the line $2x + 3y = 6$, measured parallel to the line $4x + y = 4$, is

(a) $\frac{5}{\sqrt{13}}$ units (b) $\frac{3}{\sqrt{17}}$ units

(c) $\sqrt{17}$ units (d) $\frac{\sqrt{17}}{2}$ units

51. If the vectors $a\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + b\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + c\hat{k}$ $(a, b, c \neq 1)$ are coplanar, then the value of

$\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c}$

is equal to

(a) 0 (b) 1

(c) $a + b + c$ (d) abc

52. The point of intersection of the line joining the points $(-3, 4, -8)$ and $(5, -6, 4)$ with XY-plane is

(a) $\left(\frac{7}{3}, -\frac{8}{3}, 0\right)$ (b) $\left(-\frac{7}{3}, -\frac{8}{3}, 0\right)$

(c) $\left(-\frac{7}{3}, \frac{8}{3}, 0\right)$ (d) $\left(\frac{7}{3}, \frac{8}{3}, 0\right)$

53. If the angle between the lines whose direction ratios are $(2, -1, 2)$ and $\langle x, 3, 5\rangle$ is $\frac{\pi}{4}$, then the smaller value of x is

(a) 52 (b) 4 (c) 2 (d) 1

54. The position of the point $(1, 2)$ relative to the ellipse $2x^2 + 7y^2 = 20$ is

(a) outside the ellipse
(b) inside the ellipse but not at the focus
(c) on the ellipse
(d) at the focus

55. The equation of straight line which cuts off an intercept of 5 units on negative direction of Y-axis and makes and angle 120° with positive direction of X-axis is

(a) $y + \sqrt{3}x + 5 = 0$
(b) $y - \sqrt{3}x + 5 = 0$
(c) $y + \sqrt{3}x - 5 = 0$
(d) $y - \sqrt{3}x - 5 = 0$

56. The equation of the line passing through the point (2, 3) and the point of intersection of lines $2x - 3y + 7 = 0$ and $7x + 4y + 2 = 0$ is

(a) $21x + 46y - 180 = 0$
(b) $21x - 46y + 96 = 0$
(c) $46x + 21y - 155 = 0$
(d) $46x - 21y - 29 = 0$

57. The equation of the ellipse whose centre is at origin, major axis is along X-axis with eccentricity $\frac{3}{4}$ and latus rectum 4 units is

(a) $\frac{x^2}{1024} + \frac{7y^2}{64} = 1$ (b) $\frac{49x^2}{1024} + \frac{7y^2}{64} = 1$

(c) $\frac{7x^2}{1024} + \frac{49y^2}{64} = 1$ (d) $\frac{x^2}{1024} + \frac{y^2}{64} = 1$

58. The equation of the circle which passes through the points (1, 0), (0, −6) and (3, 4) is

(a) $4x^2 + 4y^2 + 142x + 47y + 140 = 0$
(b) $4x^2 + 4y^2 - 142x - 47y + 138 = 0$
(c) $4x^2 + 4y^2 - 142x + 47y + 138 = 0$
(d) $4x^2 + 4y^2 + 150x - 49y + 138 = 0$

59. A variable plane passes through a fixed point (a, b, c) and cuts the axes in A, B and C respectively. The locus of the centre of the sphere $OABC$, O being the origin, is

(a) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ (b) $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 1$

(c) $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 2$ (d) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 2$

60. The equation of the plane passing through the line of intersection of the planes $x + y + z = 1$, $2x + 3y + 4z = 7$, and perpendicular to the plane $x - 5y + 3z = 5$ is given by

(a) $x + 2y + 3z - 6 = 0$
(b) $x + 2y + 3z + 6 = 0$
(c) $3x + 4y + 5z - 8 = 0$
(d) $3x + 4y + 5z + 8 = 0$

61. The inverse of the function $y = 5^{\ln x}$ is

(a) $x = y^{\frac{1}{\ln 5}}$, $y > 0$
(b) $x = y^{\ln 5}$, $y > 0$
(c) $x = y^{\frac{1}{\ln 5}}$, $y < 0$
(d) $x = 5 \ln y$, $y > 0$

62. A function is defined as follows :

$$f(x) = \begin{cases} -\frac{x}{\sqrt{x^2}}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

Which one of the following is correct in respect of the above function?

(a) $f(x)$ is continuous at $x = 0$ but not differentiable at $x = 0$
(b) $f(x)$ is continuous as well as differentiable at $x = 0$
(c) $f(x)$ is discontinuous at $x = 0$
(d) None of the above

63. If $y = (\cos x)^{(\cos x)^{(\cos x)\cdots\infty}}$, then $\frac{dy}{dx}$ is equal to

(a) $-\frac{y^2 \tan x}{1 - y \ln(\cos x)}$ (b) $\frac{y^2 \tan x}{1 + y \ln(\cos x)}$

(c) $\frac{y^2 \tan x}{1 - y \ln(\sin x)}$ (d) $\frac{y^2 \sin x}{1 + y \ln(\sin x)}$

64. Consider the following

1. $x + x^2$ is continuous at $x = 0$
2. $x + \cos\frac{1}{x}$ is discontinuous at $x = 0$
3. $x^2 + \cos\frac{1}{x}$ is continuous at $x = 0$

Which of the above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

65. Consider the following statements :

1. $\frac{dy}{dx}$ at a point on the curve gives slope of the tangent at that point.
2. If $a(t)$ denotes acceleration of a particle, then $\int a(t)dt + c$ gives velocity of the particle.
3. If $s(t)$ gives displacement of a particle at time t, then $\frac{ds}{dt}$ gives its acceleration at that instant.

Which of the above statements is/are correct?

(a) 1 and 2 only (b) 2 only
(c) 1 only (d) 1, 2 and 3

66. If $y = \sec^{-1}\left(\frac{x+1}{x-1}\right) + \sin^{-1}\left(\frac{x-1}{x+1}\right)$, then $\frac{dy}{dx}$ is equal to

(a) 0 (b) 1
(c) $\frac{x-1}{x+1}$ (d) $\frac{x+1}{x-1}$

67. What is $\int \tan^{-1}(\sec x + \tan x)dx$ equal to?

(a) $\frac{\pi x}{4} + \frac{x^2}{4} + C$ (b) $\frac{\pi x}{2} + \frac{x^2}{4} + C$

(c) $\frac{\pi x}{4} + \frac{\pi x^2}{4} + C$ (d) $\frac{\pi x}{4} - \frac{x^2}{4} + C$

68. A function is defined in $(0, \infty)$ by

$$f(x) = \begin{cases} 1 - x^2 & \text{for} \quad 0 < x \leq 1 \\ \ln x & \text{for} \quad 1 < x \leq 2 \\ \ln 2 - 1 + 0.5x & \text{for} \quad 2 < x < \infty \end{cases}$$

Which one of the following is correct in respect of the derivative of the function, i.e., $f'(x)$?

(a) $f'(x) = 2x$ for $0 < x \leq 1$
(b) $f'(x) = -2x$ for $0 < x \leq 1$
(c) $f'(x) = -2x$ for $0 < x < 1$
(d) $f'(x) = 0$ for $0 < x < \infty$

69. Which one of the following is correct in respect of the function $f(x) = x(x-1)(x+1)$?

(a) The local maximum value is larger than local minimum value

(b) The local maximum value is smaller than local minimum value

(c) The function has no local maximum

(d) The function has no local minimum

70. Consider the following statements :

1. Derivative of $f(x)$ may not exist at some point.
2. Derivative of $f(x)$ may exist finitely at some point.
3. Derivative of $f(x)$ may be infinite (geometrically) at some point.

Which of the above statements are correct?

(a) 1 and 2 only (b) 2 and 3 only

(c) 1 and 3 only (d) 1, 2 and 3

71. The maximum value of $\frac{\ln x}{x}$ is

(a) e (b) $\frac{1}{e}$ (c) $\frac{2}{e}$ (d) 1

72. The function $f(x) = |x| - x^3$ is

(a) odd

(b) even

(c) both even and odd

(d) neither even nor odd

73. If $l_1 = \frac{d}{dx}(e^{\sin x})$

$$l_2 = \lim_{x \to 0} \frac{e^{\sin(x+h)} - e^{\sin x}}{h}$$

$$l_3 = \int e^{\sin x} \cos x \, dx$$

then which one of the following is correct?

(a) $l_1 \neq l_2$ (b) $\frac{d}{dx}(l_3) = l_2$

(c) $\int l_3 dx = l_2$ (d) $l_2 = l_3$

74. The general solution of

$$\frac{dy}{dx} = \frac{ax+h}{by+k}$$

represents a circle only when

(a) $a = b = 0$ (b) $a = -b \neq 0$

(c) $a = b \neq 0, h = k$ (d) $a = b \neq 0$

75. If $\lim_{x \to \frac{\pi}{2}} \frac{\sin x}{x} = l$ and $\lim_{x \to \infty} \frac{\cos x}{x} = m$, then which one of the following is correct?

(a) $l = 1, m = 1$ (b) $l = \frac{2}{\pi}, m = \infty$

(c) $l = \frac{2}{\pi}, m = 0$ (d) $l = 1, m = \infty$

76. What is $\int_0^{2\pi} \sqrt{1 + \sin \frac{x}{2}} dx$ equal to?

(a) 8 (b) 4

(c) 2 (d) 0

77. The area bounded by the curve $|x| + |y| = 1$

(a) 1 square unit

(b) $2\sqrt{2}$ square units

(c) 2 square units

(d) $2\sqrt{3}$ square units

78. If x is any real number, then $\frac{x^2}{1+x^4}$ belongs to which one of the following intervals?

(a) (0, 1) (b) $\left(0, \frac{1}{2}\right]$

(c) $\left(0, \frac{1}{2}\right)$ (d) [0, 1]

79. The left-hand derivative of $f(x) = [x]\sin(\pi x)$ at $x = k$ where k is an integer and $[x]$ is the greatest integer function, is

(a) $(-1)^k(k-1)\pi$ (b) $(-1)^{k-1}(k-1)\pi$

(c) $(-1)^k k\pi$ (d) $(-1)^{k-1}k\pi$

80. If $f(x) = \frac{x}{2} - 1$, then on the interval $[0, \pi]$ which one of the following is correct?

(a) $\tan[f(x)]$, where $[\cdot]$ is the greatest integer function, and $\frac{1}{f(x)}$ are both continuous

(b) $\tan[f(x)]$, where $[\cdot]$ is the greatest integer function, and $f^{-1}(x)$ are both continuous

(c) $\tan[f(x)]$, where $[\cdot]$ is the greatest integer function, and $\frac{1}{f(x)}$ are both discontinuous

(d) $\tan[f(x)]$, where $[\cdot]$ is the greatest integer function is discontinuous but $\frac{1}{f(x)}$ is continuous

81. The order and degree of the differential equation

$$\left[1 + \left(\frac{dy}{dx}\right)^2\right]^3 = \rho^2 \left[\frac{d^2y}{dx^2}\right]^2$$

are respectively

(a) 3 and 2 (b) 2 and 2

(c) 2 and 3 (d) 1 and 3

82. If $y = \cos^{-1}\left(\frac{2x}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to

(a) $-\frac{2}{1+x^2}$ for all $|x| < 1$

(b) $-\frac{2}{1+x^2}$ for all $|x| > 1$

(c) $\frac{2}{1+x^2}$ for all $|x| < 1$

(d) None of the above

83. The set of all points, where the function $f(x) = \sqrt{1 - e^{-x^2}}$ is differentiable, is

(a) $(0, \infty)$ (b) $(-\infty, \infty)$

(c) $(-\infty, 0) \cup (0, \infty)$ (d) $(-1, \infty)$

84. Match List-I with List-II and select the correct answer using the code given below the lists :

List-I (Function)	List-II (Maximum value)
A. sinx + cosx	1. $\sqrt{10}$
B. 3sinx + 4cosx	2. $\sqrt{2}$
C. 2sinx + cosx	3. 5
D. sinx + 3cosx	4. $\sqrt{5}$

Code

	A	B	C	D
(a)	2	3	1	4
(b)	2	3	4	1
(c)	3	2	1	4
(d)	3	2	4	1

85. If $f(x) = x(\sqrt{x} - \sqrt{x+1})$, then $f(x)$ is

(a) continuous but not differentiable at $x = 0$

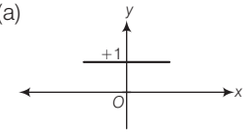
(b) differentiable at $x = 0$

(c) not continuous at $x = 0$

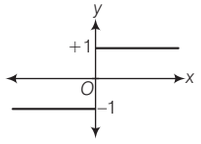
(d) None of the above

86. Which one of the following graph represents the function $f(x)=\frac{x}{x}$, $x \neq 0$?

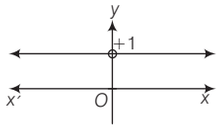
(a)



(b)



(c)



(d) None of the above

87. Let $f(n)=\left[\frac{1}{4}+\frac{n}{1000}\right]$, where $[x]$ denot the integral part of x. Then the value of $\sum_{n=1}^{1000} f(n)$ is

(a) 251 (b) 250 (c) 1 (d) 0

88. $\int(\ln x)^{-1}dx-\int(\ln x)^{-2}dx$ is equal to

(a) $x(\ln x)^{-1}+C$ (b) $x(\ln x)^{-2}+C$

(c) $x(\ln x)+C$ (d) $x(\ln x)^{2}+C$

89. A cylindrical jar without a lid has to be constructed using a given surface area of a metal sheet. If the capacity of the jar is to be maximum, then the diameter of the jar must be k times the height of the jar. The value of k is

(a) 1 (b) 2 (c) 3 (d) 4

90. The value of

$\int_0^{\frac{\pi}{4}}\sqrt{\tan x}\,dx+\int_0^{\frac{\pi}{4}}\sqrt{\cot x}\,dx$ is equal to

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{2\sqrt{2}}$ (d) $\frac{\pi}{\sqrt{2}}$

91. Let g be the greatest integer function. Then the function $f(x)=(g(x))^2-g(x)$ is discontinuous at

(a) all integers

(b) all integers except 0 and 1

(c) all integers except 0

(d) all integers except 1

92. The differential equation of minimum order by eliminating the arbitral constants A and C in the equation

$y=A[\sin(x+C)+\cos(x+C)]$ is

(a) $y''+(\sin x+\cos x)y'=1$

(b) $y''=(\sin x+\cos x)y'$

(c) $y''=(y')^2+\sin x\cos x$

(d) $y''+y=0$

93. Consider the following statements:

Statement I :

$x>\sin x$ for all $x>0$

Statement II :

$f(x)=x-\sin x$ is an increaser function for all $x>0$

Which one of the following is correct is respect of the above statements?

(a) Both Statement I and Statement II are true and Statement II is the correct explanation of StatementI

(b) Both Statement I and Statement II are true and Statement II is not the correct explanation of Statement I

(c) Statement I is true but Statement II is false

(d) Statement I is false but Statement II is true

94. The solution of the differential equation

$\frac{dy}{dx}=\frac{y\phi'(x)-y^2}{\phi(x)}$ is

(a) $y=\frac{x}{\phi(x)+c}$

(b) $y=\frac{\phi(x)}{x}+c$

(c) $y=\frac{\phi(x)+c}{x}$

(d) $y=\frac{\phi(x)}{x+c}$

95. If $f(x)=\frac{4x+x^4}{1+4x^3}$ and $g(x)=\ln\left(\frac{1+x}{1-x}\right)$, then what is the value of $fg\left(\frac{e-1}{e+1}\right)$ equal to?

(a) 2 (b) 1 (c) 0 (d) $\frac{1}{2}$

96. The value of the determinant

$$\begin{vmatrix}1-\alpha & \alpha-\alpha^2 & \alpha^2\\ 1-\beta & \beta-\beta^2 & \beta^2\\ 1-\gamma & \gamma-\gamma^2 & \gamma^2\end{vmatrix}$$

is equal to

(a) $(\alpha-\beta)(\beta-\gamma)(\alpha-\gamma)$

(b) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$

(c) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)(\alpha+\beta+\gamma)$

(d) 0

97. The adjoint of the matrix

$A=\begin{bmatrix}1 & 0 & 2\\ 2 & 1 & 0\\ 0 & 3 & 1\end{bmatrix}$ is

(a) $\begin{bmatrix}-1 & 6 & 2\\ -2 & 1 & -4\\ 6 & 3 & 1\end{bmatrix}$ (b) $\begin{bmatrix}1 & 6 & -2\\ -2 & 1 & 4\\ 6 & -3 & 1\end{bmatrix}$

(c) $\begin{bmatrix}6 & 1 & 2\\ 4 & -1 & 2\\ 6 & 3 & -1\end{bmatrix}$ (d) $\begin{bmatrix}-6 & 2 & 1\\ 4 & -2 & 1\\ 3 & 1 & -6\end{bmatrix}$

98. If $A=\begin{pmatrix}-2 & 2\\ 2 & -2\end{pmatrix}$, then which one of the following is correct?

(a) $A^2=-2A$ (b) $A^2=-4A$

(c) $A^2=-3A$ (d) $A^2=4A$

99. Geometrically $\mathrm{Re}(z^2-i)=2$, where $i=\sqrt{-1}$ and Re is the real part, represents

(a) circle (b) ellipse

(c) rectangular hyperbola

(d) parabola

100. If $p+q+r=a+b+c=0$, then the determinant

$\begin{vmatrix}pa & qb & rc\\ qc & ra & pb\\ rb & pc & qa\end{vmatrix}$ equals

(a) 0 (b) 1

(c) $pa+qb+rc$

(d) $pa+qb+rc+a+b+c$

101. A committee of two persons is selected from two men and two women. The probability that the committee will have exactly one woman is

(a) $\frac{1}{6}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

102. Let a die be loaded in such a way that even faces are twice likely to occur as the odd faces. What is the probability that a prime number will show up when the die is tossed?

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{4}{9}$ (d) $\frac{5}{9}$

103. Let the sample space consist of non-negative integers up to 50, X denote the numbers which are multiples of 3 and Y denote the odd numbers. Which of the following is/are correct?

1. $P(X) = \frac{8}{25}$ 2. $P(Y) = \frac{1}{2}$

Select the correct answer using the code given below.

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

104. For two events A and B, let $P(A) = \frac{1}{2}$, $P(A \cup B) = \frac{2}{3}$ and $P(A \cap B) = \frac{1}{6}$. What is $P(\overline{A} \cap B)$ equal to?

(a) $\frac{1}{6}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

105. Consider the following statements :

1. Coefficient of variation depends on the unit of measurement of the variable.
2. Range is a measure of dispersion.
3. Mean deviation is least when measured about median.

Which of the above statements are correct?

(a) 1 and 2 only (b) 2 and 3 only

(c) 1 and 3 only (d) 1, 2 and 3

106. Given that the arithmetic mean and standard deviation of a sample of 15 observations are 24 and 0 respectively. Then which one of the following is the arithmetic mean of the smallest five observations in the data?

(a) 0 (b) 8 (c) 16 (d) 24

107. Which one of the following can be considered as appropriate pair of values of regression coefficient of y on x and regression coefficient of x on y?

(a) (1, 1) (b) (–1, 1)

(c) $\left(-\frac{1}{2}, 2\right)$ (d) $\left(\frac{1}{3}, \frac{10}{3}\right)$

108. Let A and B be two events with $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{6}$ and $P(A \cap B) = \frac{1}{12}$. What is $P(B|\overline{A})$ equal to?

(a) $\frac{1}{5}$ (b) $\frac{1}{7}$

(c) $\frac{1}{8}$ (d) $\frac{1}{10}$

109. In a binomial distribution, the mean is $\frac{2}{3}$ and the variance is $\frac{5}{9}$. What is the probability that $X = 2$?

(a) $\frac{5}{36}$ (b) $\frac{25}{36}$

(c) $\frac{25}{216}$ (d) $\frac{25}{54}$

110. The probability that a ship safely reaches a port is $\frac{1}{3}$. The probability that out of 5 ships, at least 4 ships would arrive safely is

(a) $\frac{1}{243}$ (b) $\frac{10}{243}$

(c) $\frac{11}{243}$ (d) $\frac{13}{243}$

111. What is the probability that at least two persons out of a group of three persons were born in the same month (disregard year)?

(a) $\frac{33}{144}$ (b) $\frac{17}{72}$

(c) $\frac{1}{144}$ (d) $\frac{2}{9}$

112. It is given that $\overline{X} = 10$, $\overline{Y} = 90$, $\sigma_X = 3$, $\sigma_Y = 12$ and $r_{XY} = 0.8$. The regression equation of X on Y is

(a) $Y = 3.2X + 58$

(b) $X = 3.2Y + 58$

(c) $X = -8 + 0.2Y$

(d) $Y = -8 + 0.2X$

113. If $P(B) = \frac{3}{4}$, $P(A \cap B \cap \overline{C}) = \frac{1}{3}$ and $P(\overline{A} \cap B \cap \overline{C}) = \frac{1}{3}$, then what is $P(B \cap C)$ equal to?

(a) $\frac{1}{12}$ (b) $\frac{3}{4}$

(c) $\frac{1}{15}$ (d) $\frac{1}{9}$

114. The following table gives the monthly expenditure of two families :

	Expenditure (in ₹)	
Items	**Family** A	**Family** B
Foods	3,500	2,700
Clothing	500	800
Rent	1,500	1,000
Education	2,000	1,800
Miscellaneous	2,500	1,800

In construction a pie diagram to the above data, the radii of the circles are to be chosen by which one of the following ratios?

(a) 1 : 1 (b) 10 : 9

(c) 100 : 91 (d) 5 : 4

115. If a variable takes values 0, 1, 2, 3, ..., n with frequencies

$1, C(n, 1), C(n, 2), C(n, 3), \ldots, C(n, n)$

respectively, then the arithmetic mean is

(a) $2n$ (b) $n + 1$

(c) n (d) $\frac{n}{2}$

116. In a multiple-choice test, an examinee either knows the correct answer with probability p, or guesses with probability $1 - p$. The probability of answering a question correctly is $\frac{1}{m}$, if he or she merely guesses. If the examinee answers a question correctly, the probability that he or she really knows the answer is

(a) $\frac{mp}{1 + mp}$ (b) $\frac{mp}{1 + (m-1)p}$

(c) $\frac{(m-1)p}{1 + (m-1)p}$ (d) $\frac{(m-1)p}{1 + mp}$

117. If x_1 and x_2 are positive quantities, then the condition for the difference between the arithmetic mean and the geometric mean to be greater than 1 is

(a) $x_1 + x_2 > 2\sqrt{x_1 x_2}$

(b) $\sqrt{x_1} + \sqrt{x_2} > \sqrt{2}$

(c) $|\sqrt{x_1} - \sqrt{x_2}| > \sqrt{2}$

(d) $x_1 + x_2 < 2(\sqrt{x_1 x_2} + 1)$

118. Consider the following statements :

1. Variance is unaffected by change of origin and change of scale.
2. Coefficient of variance is independent of the unit of observations.

Which of the statements given above is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

119. Five sticks of length 1, 3, 5, 7 and 9 feet are given. Three of these sticks are selected at random. What is the probability that the selected sticks can form a triangle?

(a) 0.5 (b) 0.4 (c) 0.3 (d) 0

120. The coefficient of correlation when coefficients of regression are 0.2 and 1.8 is

(a) 0.36 (b) 0.2 (c) 0.6 (d) 0.9

PAPER II English Language and General Studies

Part A (English Language)

Directions (Q. Nos. 1-10) *Each item in this section consists of a sentence with an underlined word/words followed by four options. Select the option that is nearest in meaning to the underlined word/words.*

1. The discussion was wound up after a long fruitful exchange of view.

(a) postponed (b) cut short
(c) interrupted (d) concluded

2. He was fully alive to the need for making adjustments.

(a) concerned about
(b) worried about
(c) aware of
(d) indifferent about

3. The police officer tried to intimidate the witness but in vain.

(a) inform (b) reward
(c) frighten (d) persuade

4. We must adopt drastic measures to control population growth.

(a) simple (b) dramatic
(c) realistic (d) severe

5. He is extremely meticulous in his approach.

(a) simple (b) careful
(c) fair (d) reasonable

6. The experts' minute examination brought to light some important clues.

(a) quick (b) detailed
(c) superficial (d) prolonged

7. The decision of the Union government to repeal the Urban Land Ceiling Act has been welcomed by all.

(a) suppress (b) amend
(c) cancel (d) withhold

8. This is his maiden appearance on the screen.

(a) first (b) last (c) girlish (d) shy

9. At the end of the marathon everybody was exhauste(d)

(a) weakened (b) honoured
(c) satisfied (d) tired

10. He gave me a counterfeit coin.

(a) rare (b) fake
(c) unmatured (d) inferior

Directions (Q. Nos. 11-20) *Each item in this section consists of a sentence with an underlined word/words followed by four options. Select the option that is* ***opposite*** *in meaning to the underlined word/words.*

11. My mother has been working hard for the last two weeks and she feels run down.

(a) morbid (b) energetic
(c) exhausted (d) emotional

12. The President condemned the Act of violence during the celebration of the festival.

(a) reason (b) instigation
(c) restraint (d) sobriety

13. The students made a generous contribution to the flood relief fun(d)

(a) niggard (b) selfish
(c) spendthrift (d) indecent

14. He was just idle by temperament.

(a) employed (b) occupied
(c) industrious (d) happy

15. Most of the decisions taken by the officer were unjust.

(a) serious (b) lenient
(c) correct (d) imbecile

16. He is a loving father and takes great delight in his children.

(a) revolt (b) dissatisfaction
(c) enjoyment (d) disgust

17. He was quite concerned about his son's career.

(a) unrelated (b) indifferent
(c) dispassionate (d) carefree

18. They are confident of success.

(a) imprudent (b) impatient
(c) diffident (d) reluctant

19. We carried on the search for the missing person.

(a) delayed
(b) reconsidered
(c) broke up
(d) called off

20. This TV has many indigenous components.

(a) Indian (b) foreign
(c) unnatural (d) genuine

Directions (Q. Nos. 21-30) *In the following passage, at certain points you are given a choice of four words marked (a), (b), (c) and (d), one of which fits the meaning of the passage. Choose the best word out of the four. Mark the letter, viz., (a), (b), (c) or (d), relating to this wor(d)*

Passage

After this incident I went to Nainital and returned after nearly a month, I had **21.** _____ **22.** _____ my clothes when I saw Gangu standing **23.** _____a new baby. He was **24.**_____with joy. Even Nanda **25.** _____ not have **26.** _____ such joy **27.** _____ getting Krishna. His face had the same **28.** _____ on that **29.** _____ face of a **30.** _____ man after a full meal

21. (a) hardly (b) barely (c) merely (d) rarely taken
22. (a) out (b) away (c) off (d) on
23. (a) by (b) near (c) with (d}) at
24. (a) jumping (b) bursting (c) dancing (d) singing
25. (a) could (b) would (c) should (d) ought
26. (a) experimented (b) shown (c) felt (d) heard
27. (a) at (b) in (c) on (d) into
28. (a) light (b) glow (c) sense (d) hope
29. (a) comes (b) appears (c) rices (d) shows
30. (a) starved (b) starving (c) hungry (d) satisfied

Directions (Q. Nos. 31-35) *Each of the following items in this section consists of a sentence, the parts of which have been jumble(d) These parts have been labelled P, Q, R and S. Given below each sentence are four sequences namely (a), (b), (c) and (d). You are required to re-arrange the jumbled parts of the sentence and mark your response accordingly.*

31. The Spirit of man has slowly and (P) painfully surmounted and his (Q) growing intelligence all the obstacles (R) that have come in his way has faced (S) all kinds of danger
(a) Q P S R (b) S Q P R
(c) R P Q S (d) P R Q S

32. After our school boys had won a well-contested hockey match so that they might communicate the (P) news of their victory to the headmaster who is a keen sportsman (Q) they came to school in high spirits (R) and takes a very lively interest in (S) school games
(a) Q P S R (b) S Q P R
(c) R P Q S (d) P R Q S

33. Even a leisurely game like cricket demanding grace rather than (P) strength and over the rough tactics (Q) of the Australian team that visited England in 1921 as we saw in the (R) controversy over body-line bowling can cause much ill-will (S)
(a) P S R Q (b) R S P Q
(c) S R Q P (d) Q P R S

34. Scientists point out of sunspot (P) activity that it is an aftermath that (Q) has now reached its peak of the (R) eleven-year cycle (S)
(a) R S P Q (b) P Q S R
(c) Q R P S (d) Q S P R

35. As the ship streams from San Diego as walls of gray water from a distant (P) storm in the North Pacific making (Q) the greener among us miserable with sea sickness rock and toss the (R) ship those of us aboard have a (S) personal demonstration of powerful ocean movement
(a) P Q R S (b) S R P Q
(c) S P R Q (d) Q S R P

Directions (Q. Nos. 36-40) *Each item in this section has a sentence with three underlined parts labelled as (a), (b) and (c). Read each sentence to find out whether there is any error in any underlined part and mark your response to corresponding letter i.e. (a), (b) or (c). If you find no error, your response should be indicated as (d).*

36. An electrical circuit (a) is the complete (b) path traversed by electric current. (c) No error (d)

37. He waved us a by-by (a) as he boarded (b) the train which disappeared into (c) the tunnel. No error (d)

38. There was great deal that had to be (a) scrapped, that must be scrapped; but surely India could not have (b) been what she undoubtedly was, and could not have continued a (c) cultured existence for thousands of years. No error (d)

39. With regard to interior decoration, (a) it is the attention given to the less overt aspects of using space that (c) give it life, an identity, a quality that makes it exciting and unusual. (c) No error (d)

40. A small parcel (a) of novels is (b) better (c) than none. No error (d)

Directions (Q. Nos. 41-50) *Each of the following sentence in this section has a blank space and four words/group of words given after the sentence. Select the word or group/words you consider most appropriate for the blank space and mark your response accordingly.*

41. He looks as if he ..... weary.
(a) is (b) was
(c) would be (d) were

42. My house is insured ..... theft and fire.
(a) for (b) against
(c) in (d) towards

43. The result of the prolonged discussion was..... .
(a) disappointment (b) disappointing
(c) disappointed (d) to disappoint

44. You are lucky ..... in the 20th century.
(a) by being born (b) to have been born
(c) for being born (d) to have born

45. Sita is true to..... .
(a) word (b) her words
(c) the words (d) words

46. Years ..... since I saw her last.
(a) have passed
(b) had passed
(c) had been passing
(d) have been passing

47. When he heard the terrible noise he asked me what was ..... on.
(a) happening (b) being
(c) getting (d) going

48. Could you lend me some money ? I am very ..... of cash at the moment.
(a) down (b) low (c) short (d) scarce

49. I saw her when she was standing.....the side of the old statue.
(a) by
(b) at
(c) in
(d) beyond

50. True friends never ..... their loved ones in adversity.
(a) abuse
(b) criticise
(c) befool
(d) desert

Part B (General Studies)

51. According to the Travel and Tourism Competitiveness Index (TTCI) 2017 released by the World Economic Forum, among the 136 economies across the World, India ranked
(a) 50th (b) 40th
(c) 30th (d) 20th

52. Which one of the following is the theme of the 'World Health Day', 2017 celebrated by the World Health Organisation?
(a) Diabetes
(b) Food safety
(c) Depression : Let's Talk
(d) Ageing and Health

53. Which one of the following ministries has launched a new programme on Interdisciplinary Cyber Physical Systems (ICPS) to foster and promote R and D?
(a) Ministry of Earth Sciences
(b) Ministry of Science and Technology
(c) Ministry of Information and Broadcasting
(d) Ministry of New and Renewable Energy

54. Consider the following statements about the Nagara style of temple architecture :
1. This style of temples are commonly found in the areas between Himalayas and Vindhyas.
2. The most striking feature of this style is its pyramidal shikhara

Which of the statements given above is/are correct?
(a) Only 1 (b) Only 2
(c) 1 and 2 (d) Neither 1 nor 2

55. Ashoka's connection with Buddhism is evident from which one of the following edicts?
(a) Major Rock Edict 13
(b) Rock Edict 6
(c) Minor Rock Edict 1
(d) Pillar Edict 4

56. The Cabinet Mission Plan for India envisaged a
(a) Federation
(b) Confederation
(c) Unitary from of government
(d) Union of States

57. The creation of the institution of Lokpal was first recommended by
(a) Law Commission
(b) Santhanam Committee
(c) Shah Commission
(d) Administrative Reforms Commission

58. Which one of the following is a cause of acid rains?
(a) Ozone (b) Ammonia
(c) Sulphur dioxide (d) Carbon monoxide

59. The desirable range of pH for drinking water is
(a) 6.5 to 8.5 (b) 5.0 to 6.5
(c) 6.5 to 7.0 (d) 7.0 to 8.5

60. Consider the following reaction :
$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$
Which of the following about the reaction given above is/are correct?
1. Carbon is oxidised
2. Hydrogen is oxidised
3. Hydrogen is reduced
4. Carbon is reduced

Select the correct answer using the code given below :
(a) Only 1 (b) 1 and 2
(c) 2 and 3 (d) 2 and 4

61. Sunrise in Eastern Arunachal Pradesh would be about how many hours before the sunrise in Western Gujarat?
(a) One hour (b) Two hours
(c) Three hours (d) Four hours

62. Consider the following States of India in terms of percentage of forest area in relation to the total area of the State.
1. Karnataka 2. Odisha
3. Kerala 4. Andhra Pradesh

Which one of the following is the correct descending order?
(a) 1-2-4-3 (b) 3-1-2-4
(c) 3-2-1-4 (d) 2-3-1-4

63. Which one of the following States in India has the longest coastline?
(a) Odisha (b) Tamil Nadu
(c) Karnataka (d) West Bengal

64. Which one of the following states in India has the largest area under forest cover?
(a) Maharashtra (b) Chhattisgarh
(c) Madhya Pradesh (d) Andhra Pradesh

65. Which one of the following is not an igneous rock?
(a) Gabbro (b) Granite
(c) Dolomite (d) Basalt

66. The Coriolis effect is the result of
(a) Pressure gradient
(b) Earth's axis of inclination
(c) Earth's rotation
(d) Earth's revolution

67. Where is Mekong Delta located?
(a) Thailand (b) Cambodia
(c) Myanmar (d) Vietnam

68. Which one of the following pairs of rivers and tributaries is not correctly matched?
(a) Godavari : Indravati
(b) Ganga : Penganga
(c) Krishna : Bhima
(d) Luni : Sukri

69. Consider the following characteristics of a tropical cyclone :
1. A warm sea temperature of > 26° C
2. High relative humidity of atmosphere at a height of > 700 m.

3. Atmospheric instability.

The above mentioned characteristics are associate with which one of the following cycles of its development?

(a) Formulation and initial stage
(b) Modification stage
(c) Full maturity
(d) Decay

70. In the Mesopotamian records, which one of the following terms was used for the Indus Valley (Harappans)?

(a) Dilmun (b) Meluha
(c) Magan (d) Failaka

71. Who among the following is the Chairman of interdisciplinary committee constituted recently by the Government of India to examine framework for virtual currencies?

(a) Secretary, Department of Financial Services
(b) Special Secretary, Department of Revenue
(c) Special Secretary, Department of Economic Affairs
(d) Deputy Governor, Reserve Bank of India

72. SAMPADA scheme is being implemented by the Ministry of

(a) Finance
(b) Housing and Urban Affairs
(c) Food Processing Industries
(d) Earth Sciences

73. The shortest day length that occurs in the Northern hemisphere is on

(a) March 21 (b)September 23
(c) November 22 (d)December 22

74. The Indian Railways have gone in for qualitative improvements since independence. Which of the following have taken place in recent years?

1. Gauge conversion
2. Track electrification
3. Automatic Signals

Select the correct answer using the codes given below :

(a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) All of these

75. In India, maximum rainfall is received from

(a) Western Disturbances
(b) North-East Monsoon
(c) South-West Monsoon
(d) Retreating Monsoon

76. Which set of the following biosphere reserves in India is included in the World Network of Biosphere Reserves?

(a) Gulf of Mannar, Nokrek, Panchmarhi and Simlipal
(b) Gulf of Mannar, Kanchenjunga, Nokrek and Seshachalam
(c) Nilgiri, Nokrek, Panchmarhi and Panna
(d) Nilgiri, Nokrek, Panchmarhi and Seshachalam

77. Which of the following statements about magnetite ore of iron is/are correct?

1. It is known as black ore.
2. It contains 60% to 70% of pure iron.
3. It possesses magnetic properties.

Select the correct answer using the codes given below:

(a) Only 1 (b) 2 and 3
(c) 1 and 3 (d) All of these

78. Which one of the following vitamins has a role in blood clotting?

(a) Vitamin-A (b) Vitamin-D
(c) Vitamin-E (d) Vitamin-K

79. The term 'Probiotic' is applied to

(a) organic food (b)antacid
(c) antibiotic
(d) live microbial food supplement

80. Which one of the following microbes causes acidification and curding of milk?

(a) *Lactic Acid Bacillus*
(b) *Clostridium botulinum*
(c) *Vibrio cholerae*
(d) *Saccharomyces cerevisiae*

81. Who among the following shared the Nobel Prize in 1962 along with Francis Crick and James Watson for their discoveries concerning the molecular structure of nucleic acids?

(a) Erwin Chargaff
(b) Maurice Hugh Frederick Wilkins
(c) Rosalind Franklin
(d) Phoebus Levene

82. Water boils at a lower temperature at high altitudes, because

(a) the air pressure is less
(b) outside temperature is less
(c) latent heat is less
(d) None of the above

83. Concave mirror is used in headlights of vehicles, because it

(a) focuses light from the bulb onto nearby vehicles
(b) sends parallel rays
(c) fits well into the shape of the headlight
(d) is cheaper than other mirrors

84. If some object is weighed when submerged in water, what will happen to its weight compared to its weight in air?

(a) Increase
(b) Decrease
(c) Remain exactly the same
(d) Increase or decrease cannot be predicted

85. Light year is a measure of

(a) time
(b) distance
(c) total amount of light falling on the Earth in a year
(d) average intensity of light falling on the Earth in a year

86. Which one of the following was set as a target of average growth of GDP of India over the plan period 2012-17 by the Approach Paper to the Twelfth Five Year Plan?

(a) 7% (b) 8% (c) 9% (d) 10%

87. Which one of the following is not a subject that has been devolved to the Panchayati Raj Institutions by the 11th Schedule of the Constitution of India?

(a) Non-conventional energy resources
(b) Roads
(c) Higher education
(d) Libraries

88. Who among the following used the term Industrial Revolution for the first time in English to describe the changes that occurred in the British industrial development between 1760 and 1820?

(a) Friedrich Engels (b) Eric Hobsbawm
(c) Arnold Toynbee (d) Georges Michelet

89. Who among the following is the author of the book 'The Indian Struggle, 1920-34'?

(a) Maulana Abul Kalam
(b) Jayprakash Narayan
(c) Subhash Chandra Bose
(d) Manabendra Nath Roy

90. Which one of the following about the Swadeshi Campaign in 1896 is not correct?

(a) Its centre was Maharashtra
(b) Its main participants were students.
(c) It opposed the levy of tariff on imports.
(d) It publicly burnt foreign clothes.

91. Which one of the following associations was founded in London by Dadabhai Naoroji in 1866?

(a) The Bengal British India Society
(b) The East India Association
(c) The British Indian Association
(d) The Madras Native Association

92. Mariana Trench is located in the ocean floor of
(a) Southern Atlantic Ocean
(b) Western Pacific Ocean
(c) Eastern Pacific Ocean
(d) Northern Atlantic Ocean

93. Taklamakan Desert is situated in
(a) Western Asia
(b) Southern fringe of Sahara in Africa
(c) South America
(d) Central Asia

94. Rudraprayag is situated at the confluence of rivers Alakananda and
(a) Bhagirathi (b) Mandakini
(c) Nandakini (d) Dhauliganga

95. Arrange the following Indian cities according to their locations from West to East :
1. Bilaspur 2. Jodhpur
3. Bhopal 4. Ranchi
Select the correct answer using the code given below :
(a) 3-2-1-4 (b) 2-3-1-4
(c) 4-1-2-3 (d) 2-1-3-4

96. The Kashmir region receives additional amount of precipitation during the winter brought by
(a) South-West Monsoon
(b) Western Disturbances
(c) Retreating Monsoon
(d) Temperate Cyclone

97. Which part of India has the Kalakot tertiary coal field?
(a) Brahmaputra river basin of Assam
(b) Damodar river basin of Jharkhand and West Bengal
(c) Himalayan mountain region
(d) Cardamom hills in Kerala

98. Tendons through which muscles are connected to bones are tightly compacted bundles of which one of the following long fibrous protein?
(a) Fibrin (b) Collagen
(c) Elastin (d) Cellulose

99. Which one of the following is the scientific name of the causal organism elephantiasis?
(a) *Ascaris lumbricoides*
(b) *Culex pipiens*
(c) *Wuchereria bancrofiti*
(d) *Fasciola hepatica*

100. Melanin is the natural pigment that gives colour to human skin, hair and the iris provides protection against
(a) Ultraviolet radiation
(b) Infrared radiation
(c) X-ray radiation
(d) Short wave radio radiation

101. Which one of the following statements about a satellite orbiting around the Earth is correct?
(a) Satellite is kept in orbit by remote control from ground station.
(b) Satellite is kept in orbit by retro-rocket and solar energy keeps it moving around the Earth.
(c) Satellite requires energy from solar panels and solid fuels for orbiting.
(d) Satellite does not required any energy for orbiting.

102. Which one of the following statements about energy is correct?
(a) Energy can be created as well as destroyed
(b) Energy can be created but not destroyed
(c) Energy can neither be created nor destroyed
(d) Energy cannot be created but can be destroyed

103. Step-up transformers are used for
(a) increasing electrical power
(b) decreasing electrical power
(c) decreasing voltage
(d) increasing voltage

104. Which one among the following waves carries the maximum energy per photon?
(a) X-rays (b) Radio waves
(c) Light waves (d) Microwaves

105. How much CO_2 is produced on heating of 1 kg of carbon?
(a) $\frac{11}{3}$ kg (b) $\frac{3}{11}$ kg (c) $\frac{4}{3}$ kg (d) $\frac{3}{4}$ kg

106. Zinc is used to protect iron form corrosion because zinc is
(a) more electropositive than iron
(b) cheaper than iron
(c) a bluish white metal
(d) a good conductor of heat and electricity

107. Which one of the following gases is placed second in respect of abundance in the Earth's atmosphere?
(a) Oxygen (b) Hydrogen
(c) Nitrogen (d) Carbon dioxide

108. Which one of the following is a chemical change?
(a) Cutting of hair
(b) Graying of hair naturally
(c) Swelling of resin in water
(d) Cutting of fruit

109. Which one among the following chemicals is used as washing soda?
(a) Calcium carbonate
(b) Calcium bicarbonate
(c) Sodium carbonate
(d) Sodium bicarbonate

110. Why is potassium permanganate used for purifying drinking water?
(a) It kills germs
(b) It dissolves the impurities
(c) It is a reducting agent
(d) It is an oxidising agent

111. Consider the following movements :
1. Moplah Rebellion
2. Bardoli Satyagraha
3. Champaran Satyagraha
4. Salt Satyagraha
Which one of the following is the correct chronological order of the above ascending order?
(a) 1-3-4-2 (b) 3-1-2-4
(c) 2-3-1-4 (d) 4-2-1-3

112. Which one of the following travelogues has given an insight on the reign of Muhammed-bin-Tughlaq?
(a) Ibn Battuta's *Rihla*
(b) Francois Bernier's *Travels in the Mogul Empire*
(c) Niccolao Manucci's *Storia do Mogor*
(d) Tavernier's *Travels in India*

113. Which one of the following was not a Chishti Sufi saint?
(a) Khwaja Moinuddin
(b) Baba Fariduddin Gani-i-Shakar
(c) Nizamuddin Auliya
(d) Shaikh Bahauddin Zakariya

114. In April, 2017, India celebrated 100 years of Mahatma Gandhi's
(a) Satyagraha in Kheda
(b) Dandi March
(c) Satyagraha in Champaran
(d) Return from South Africa

115. A rainbow is produced due to which one of the following phenomena?
(a) Dispersion of light
(b) Interference of light
(c) Diffraction of light
(d) Scattering of light by atmospheric dust

116. Bats detect obstacles in their path by receiving the reflected
(a) Infrasonic waves (b) Ultrasonic waves
(c) Radio waves (d) Microwaves

117. The statement that 'heat cannot flow by itself from a body at a lower temperature to a body at a higher temperature', is known as
(a) Zeroth law of thermodynamics
(b) First law of thermodynamics
(c) Second law of thermodynamics
(d) Third law of thermodynamics

118. Which one of the following waves does not belong to the category of the other three?

(a) X-rays (b) Microwaves
(c) Radiowaves (d) Sound waves

119. Which one of the following statements is not correct?
(a) Human eye is a refracting system containing a diverging lens.
(b) The retina of the human eye contains millions of light sensitive cells, called rods and cones, which convert the light into electrical messages.
(c) Every image that is focussed on the retina is upside down.
(d) We need both eyes to judge the relative positions of objects accurately.

120. Which one of the following statements is not corect?
(a) Ultrasonic waves cannot get reflected, refracted or absorbed.
(b) Ultrasonic waves are used to detect the presence of defects like cracks, porsity, etc in the internal structure of common structure materials.
(c) Ultrasonic waves can be used for making holes in very hard materials like diamond.
(d) Ultrasonic waves cannot travel through vacuum.

121. The principal use of hydrofluoric acid is
(a) in etching glass
(b) as a bleaching agent
(c) as an extremely strong oxidising agent
(d) in the preparation of strong organic fluorine compounds

122. The species that has the same number of electrons as $^{35}_{17}Cl$ is
(a) $^{32}_{16}S$ (b) $^{34}_{16}S^{+}$ (c) $^{40}_{18}Ar^{+}$ (d) $^{35}_{16}S^{2-}$

123. The compound $C_6H_{12}O_4$ contains
(a) 22 atoms per mole
(b) twice the mass percent of H as compared to the mass percent of C
(c) six times the mass percent of C as compared to the mass percent of H
(d) thrice the mass percent of H as compared to the mass percent of O

124. The proposition 'equal volumes of different gases contain equal numbers of molecules at the same temperature and pressure' is known as
(a) Avogadro's hypothesis
(b) Gay-Lussac's hypothesis
(c) Planck's hypothesis
(d) Kirchhoff's theory

125. Which one of the following statements about the Ilbert Bill is correct?
(a) It proposed that the Indian magistrates would try Europeans in criminal cases.
(b) It allowed Indians to file criminal cases against Europeans.
(c) It authorised Indian ICS officers to try Europeans in courts.
(d) It was an agitation led by Ilbert in support of the nationalists.

126. Who among the following can attend the meetings of both Houses of Parliament while not being a member of either House?
(a) The Solicitor General of India
(b) The Vice-President of India
(c) The Comptroller and Auditor General of India
(d) The Attorney General of India

127. Who among the following was believed to be a leader of the Sanyasis and Fakirs conspiring against the British in 1857?
(a) Mangal Pandey (b) Bahadur Shah II
(c) Queen Zeenat Mahal
(d) Nana Sahib

128. Who among the following was the founder of the Avadh Kingdom in the 18th century?
(a) Murshid Quli Khan (b) Saadat Khan
(c) Alivardi Khan (d)Sarfaraz Khan

129. Who among the following was the founder of the Young Bengal Movement?
(a) Henry Vivian Derozio
(b) David Hare
(c) Dwarkanath Tagore
(d) Prasanna Kumar Tagore

130. Which one of the following statements about the Quit Indian Movement is not correct?
(a) It broke out in August, 1942.
(b) Ahmedabad Textile Mills went on strike for more than three months.
(c) Muslim League and Hindu Mahasabha actively participated in the movement.
(d) Communist Party did not support the movement.

131. Who among the following is the winner of the Singapore Open Superseries Badminton Men's Singles title 2017?
(a) Kidambi Srikanth (b) Lin Dan
(c) B Sai Praneeth (d) Kento Momota

132. Koradi Thermal Power Station is located in
(a) Nagpur (b) Raipur
(c) Mumbai (d) Secunderabad

133. Which one of the following is the theme of the International Day for Monuments and Sites (World Heritage Day) 2017?
(a) The Heritage of Sport
(b) Cultural Heritage and Sustainable Tourism
(c) Past and Present Heritage
(d) Heritage and Science

134. In April, 2017, the USA dropped MOAB (Massive Ordinance Air Blast popularly known as the Mother of All Bombs) in the suspected hideouts of militants in which one of the following countries?
(a) Iran (b) Syria
(c) Afghanistan (d) Somalia

135. Intake of which one of the following food components should be minimised by patients having Gouty Arthritis due to elevated serum uric acid level?
(a) Food fibres (b)Nucleic acids
(c) Lipids (d)Carbohydrates

136. Which one of the following statements about microbes is not correct?
(a) They are used in sewage treatment plants.
(b) They are used in industrial fermenters for the production of beverages.
(c) No antibiotic has been obtained from any microbe.
(d) They are used to get many bioactive molecules for the treatment of diseases.

137. Golden rice is a genetically -modified crop plant where the incorporated gene is meant for biosynthesis of
(a) Omega-3 fatty acids
(b) Vitamin-A
(c) Vitamin-B
(d) Vitamin-C

138. An object moves in a circular path with a constant speed Which one of the following statements is correct?
(a) The centripetal acceleration of the object is smaller for a gentle curve (i.e., curve of larger radius) than that for a sharp curve (i.e., curve of smaller radius).
(b) The centripetal acceleration is greater for a gentle curve than that for a sharp curve.
(c) The centripetal acceleration is the same for both, the gentle and sharp curves.
(d) The centripetal acceleration causes the object to slow down.

139. The force acting on a particle of mass m moving along the x-axis is given by $F(x) = Ax^2 - Bx$. Which one of the following is the potential energy of the particle?
(a) $2Ax - B$ (b) $-\frac{x^2}{6}(2Ax - 3B)$
(c) $Ax^3 - Bx^2$ (d) Zero

140. The symbol of SI unit of inductance is H. It stands for
(a) Holm (b) Halogen
(c) Henry (d) Hertz

141. In a vacuum, a five-rupee coin, a feather of sparrow bird and a mango are dropped simultaneously from the same height. The time taken by them to reach the bottom is t_1, t_2 and t_3 respectively. In this situation, we will observe that
(a) $t_1 > t_2 > t_3$ (b) $t_1 > t_3 > t_2$
(c) $t_3 > t_1 > t_2$ (d) $t_1 = t_2 = t_3$

142. Electron emission from a metallic surface by application of light is known as
(a) Thermionic emission
(b) Photo electric emission
(c) High field emission
(d) Auto electronic emission

143. How long does light take to reach the Earth from the Sun?
(a) About 4 minutes (b) About 8 minutes
(c) About 24 minutes (d) About 24 hours

144. Radioactivity is measured by
(a) GM Counter (b)Polarimeter
(c) Calorimeter (d)Colorimeter

145. The mirrors used as rear-view mirrors in vehicles are
(a) concave (b) convex
(c) cylindrical (d) plane

146. Which one of the following waves is used for detecting forgery in currency notes?
(a) Ultraviolet waves (b) Infrared waves
(c) Radio waves (d) Microwaves

147. The majority charge carriers in a *p*-type semiconductor are
(a) free electrons
(b) conduction electrons
(c) ions
(d) holes

148. The ionisation energy of hydrogen atom in the ground state is
(a) 13.6 Me V (b) 13.6 eV
(c) 13.6 Joule (d) Zero

149. When pure water boils vigorously, the bubbles that rise to the surface are composed primarily of
(a) air
(b) hydrogen
(c) hydrogen and oxygen
(d) water vapour

150. Which compound, when dissolved in water, conducts electricity and forms a basic solution?
(a) HCl (b) CH_3COOH
(c) CH_3OH (d) NaOH

ANSWERS

Paper I Elementary Mathematics

1	c	2	b	3	c	4	d	5	b	6	c	7	c	8	b	9	d	10	a
11	a	12	d	13	c	14	c	15	a	16	b	17	c	18	b	19	a	20	b
21	b	22	c	23	a	24	a	25	a	26	c	27	d	28	d	29	c	30	b
31	b	32	d	33	a	34	d	35	b	36	c	37	b	38	a	39	a	40	b
41	d	42	b	43	c	44	b	45	b	46	a	47	c	48	b	49	b	50	d
51	b	52	a	53	b	54	a	55	a	56	b	57	b	58	c	59	c	60	a
61	a	62	c	63	a	64	a	65	a	66	a	67	a	68	b	69	a	70	d
71	b	72	d	73	d	74	b	75	c	76	a	77	c	78	*	79	a	80	c
81	b	82	a	83	c	84	b	85	b	86	c	87	a	88	a	89	b	90	d
91	d	92	d	93	b	94	d	95	b	96	b	97	b	98	b	99	c	100	a
101	b	102	c	103	d	104	a	105	a	106	d	107	a	108	c	109	c	110	c
111	b	12	c	113	a	114	b	115	d	116	b	117	c	118	b	119	c	120	c

Paper II English Language and General Studies

1	d	2	c	3	c	4	d	5	b	6	b	7	c	8	a	9	d	10	b
11	b	12	d	13	a	14	c	15	c	16	d	17	b	18	c	19	d	20	b
21	b	22	a	23	b	24	b	25	a	26	b	27	b	28	a	29	a	30	b
31	b	32	c	33	c	34	c	35	c	36	c	37	a	38	d	39	b	40	d
41	a	42	b	43	b	44	b	45	b	46	a	47	d	48	c	49	a	50	d
51	b	52	c	53	b	54	a	55	a	56	d	57	d	58	c	59	c	60	a
61	b	62	c	63	b	64	c	65	c	66	c	67	d	68	b	69	c	70	b
71	c	72	c	73	d	74	d	75	c	76	a	77	d	78	d	79	d	80	a
81	b	82	a	83	b	84	b	85	b	86	b	87	c	88	c	89	c	90	d
91	b	92	b	93	d	94	b	95	b	96	b	97	c	98	b	99	c	100	a
101	d	102	c	103	d	104	a	105	a	106	a	107	a	108	b	109	c	110	d
111	b	112	a	113	d	114	c	115	a	116	b	117	c	118	d	119	a	120	a
121	a	122	c	123	c	124	a	125	a	126	d	127	b	128	b	129	a	130	c
131	c	132	a	133	b	134	c	135	b	136	c	137	b	138	a	139	b	140	c