092/2017

Question Booklet Alpha Code **A**

Question Booklet Serial Number **103261**

Total No. of Questions: 100	Maximum : 100 Marks	Time : 75 Minutes

INSTRUCTIONS TO CANDIDATES

1. The question paper will be given in the form of a Question Booklet. There will be four versions of question booklets with question booklet alpha code viz. A, B, C & D.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the question booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a question booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your question booklet is un-numbered, please get it replaced by new question booklet with same alpha code.
6. The question booklet will be sealed at the middle of the right margin. Candidate should not open the question booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the question booklet supplied to him contains all the 100 questions in serial order. The question booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the question booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball-Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

092/2017

Maximum : 100 Marks

Time : 1 hour and 15 minutes

1. The Head Office of NABARD is situated at ________.
   (A) Hyderabad (B) Bhopal
   (C) Coimbatore (D) Mumbai

2. In which state India's first Vertical Garden has set up ?
   (A) Bangaluru (B) Surat
   (C) Ahmedabad (D) Srinagar

3. Who was the father of Nataraja Guru ?
   (A) Ayyappan (B) Ayyankali
   (C) Dr. Palpu (D) G.P. Pillai

4. Who was the first person to offer Individual Satyagraha in Freedom Struggle ?
   (A) Rajendra Prasad (B) Vinobha Bhave
   (C) Nehru (D) Gokhale

5. Which is the Indian River is a part of the Hindu Triveni Sangama Mythology ?
   (A) Saraswathi (B) Tapti
   (C) Hoogli (D) Godavari

6. Author of "Jathi Kummi"
   (A) Sahodaran Ayyappan (B) Yohannan
   (C) Pandit Karuppan (D) Ayyankali

7. Which Cricket Team has won the Deodhar Trophy in 2017 ?
   (A) Goa (B) Tamil Nadu
   (C) Maharashtra (D) Punjab

8. Where did Champaran situated ?
   (A) Bihar (B) Gujarat
   (C) Orissa (D) Uttar Pradesh

9. Name the offer of British Government which was described by Gandhi as "Post-dated Cheque".
   (A) Cabinet Mission (B) Poona Pact
   (C) Cripps Mission (D) Communal Award

10. Name the country that recently hit by the Tropical Cyclone called "Debbie".
   (A) Indonesia (B) Japan
   (C) Peru (D) Australia

11. In which year Kollam Era started ?
   (A) 1000 AD (B) 845 AD
   (C) 825 AD (D) 800 AD

12. Which district is called as "Rice-Bowl of Kerala" ?
   (A) Palaghat (B) Alappuzha
   (C) Ernakulam (D) Thrissur

13. Where did Mar Kuriakose Elias Chavara was born ?
   (A) Kainakari (B) Kottayam
   (C) Mannanam (D) Elturuth

14. When did Bhaghat Singh, Sukdev & Rajguru were hanged ?
   (A) 1935 (B) 1947
   (C) 1932 (D) 1931

15. The country that belongs to Ahmed Kathrada, the famous Anti-Aparthied activist
   (A) America (B) Vietnam
   (C) Congo (D) South Africa

16. Name the year related to Ezhava Memorial
   (A) 1891 (B) 1903
   (C) 1875 (D) 1896

17. Who announced June 3rd Plan for the Partition of India ?
   (A) Lord Mountbatten (B) Winston Churchill
   (C) Clement Atlee (D) Lord Wavell

18. Which Social Reformer of Kerala related to "Siva Raja Yoga" ?
   (A) Maruthu Pandyan (B) Kattabomman
   (C) Thycaud Ayya (D) Kelappan

19. By which Treaty Tipu gave Malabar to British ?
   (A) Madras Treaty (B) Treaty of Srirangapatnam
   (C) Mangalore Treaty (D) Treaty of Paris

20. In which year Akali Dal was founded ?
   (A) 1900 (B) 1920
   (C) 1925 (D) 1910

21. The order of the differential equation of all circles having centres on the x-axis is

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

22. If A is a square matrix of order 3 having eigen values 3, –1 and 2, then det (3A – 4I), where I is the identity matrix of the same order, is

(A) 35
(B) – 6
(C) 6
(D) 70

23. If G is a finite group and a, b ∈ G with |a| = 25 where |a| denotes order of the element a, then $|bab^{-1}|$ is

(A) less than 25
(B) equal to 25
(C) greater than 25
(D) unable to compute with the given data

24. The least natural number having 100 divisors is

(A) 25000
(B) 1006
(C) 45360
(D) 54322

25. The value of the derivative of $x(x-1)(x-2)\ldots(x-n)$ at $x=0$ is

(A) $(-1)^n\, n!$
(B) 0
(C) $(-1)^{n+1}\,(n+1)!$
(D) $(n!)^2$

26. The eccentricity of the ellipse $3x^2+4y^2-6x-8y+6=0$ is

(A) $\frac{2}{\sqrt{3}}$
(B) $\frac{1}{\sqrt{3}}$
(C) $\frac{\sqrt{3}}{2}$
(D) $\frac{\sqrt{3}}{4}$

27. Residue of cot z at z = 0 is

(A) –1
(B) 1
(C) 0
(D) ∞

28. The collection of all points x satisfying $|x-1|<|x|$ belong to the set

(A) $\left(\frac{1}{2},\infty\right)$
(B) $\left(0,\frac{1}{2}\right)$
(C) $\left[-1,\frac{1}{2}\right)$
(D) $\mathbb{R}-\{1\}$

29. $\int_{|z|=2} z\,dz$ is

(A) 0
(B) $2\pi i$
(C) $4\pi i$
(D) $8\pi i$

30. The supremum and infimum of the set S of all numbers of the form $\frac{1}{n}-\frac{1}{m}$ where n, m$\in\mathbb{Z}^+$ are, respectively

(A) $\infty, 0$
(B) 1, –1
(C) $0, -\infty$
(D) 0, – 1

31. The functions $u(x, y) + i\,v(x, y)$ and $v(x, y) + iu(x, y)$ are both analytic if and only if

(A) $|u(x, y)| = |v(x, y)|$

(B) $u(x, y)$ is zero

(C) $u(x, y)$ & $v(x, y)$ are constant functions

(D) $u(x, y) - v(x, y)$ is constant

32. The solution of the differential equation $y'' + 4y = 0$ satisfying $y(0) = y\left(\frac{\pi}{2}\right) = 0$ is

(A) $y = \cos 2x - \sin 2x$

(B) $y = c \sin (2x)$

(C) $y = \cos 2x + \sin 2x$

(D) $y = \cos\left(\frac{x}{2}\right) - \sin\left(\frac{x}{2}\right)$

33. The unit normal vector to the ellipsoid $\frac{x^2}{4} + \frac{y^2}{9} + z^2 = 1$ at $\left(\sqrt{2}, \frac{3\sqrt{2}}{2}, 0\right)$ is

(A) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

(B) $\frac{3\hat{i} + 2\hat{j}}{\sqrt{13}}$

(C) $\frac{2\hat{i} + 3\hat{j}}{\sqrt{13}}$

(D) $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$

34. $\int_{(1,1,1)}^{(2,3,-1)} (y\,dx + x\,dy + 4dz) =$

(A) -3

(B) -2

(C) -1

(D) 0

35. $\tan^{-1}\left[\frac{(1 + x^2)^{1/2} + 1}{x}\right] =$

(A) $\frac{\pi}{2} - \frac{\tan^{-1}x}{2}$

(B) $\frac{\pi}{2} + \tan^{-1}\left(\frac{x}{2}\right)$

(C) $\frac{\pi}{2} - \cot^{-1}\left(\frac{x}{2}\right)$

(D) x

36. The range of the function $z = \sqrt{1 - x^2 - y^2}$ when $0 \le x^2 + y^2 < 1$ is

(A) $\mathbb{R}$

(B) $(-\infty, 0)$

(C) $(0, 1)$

(D) $[0, \infty)$

37. If $\bar{a}$ is a constant vector, then $\nabla \times (\bar{a} \times \bar{r})$ where $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ is

(A) $2\bar{a}$

(B) 0

(C) $\bar{r}$

(D) $2\bar{r}$

38. If $\bar{f}$ and $\bar{g}$ are functions such that $\nabla \times \bar{f} = 0$ & $\nabla \times \bar{g} = 0$, then

(A) $\nabla \times (\bar{f} \times \bar{g})$ is always zero

(B) $\nabla \cdot (\bar{f} \times \bar{g})$ is always zero

(C) $\bar{f} \cdot \bar{g} = 0$

(D) $\bar{f} \times \bar{g} = 0$

39. $\int_{|z|=2} e^{\frac{1}{z^2}}\, dz = \ldots.$

(A) -1 (B) $2\pi i$

(C) 0 (D) $-2\pi i$

40. The principal value of log (–i) is ….

(A) $-\frac{i\pi}{2}$ (B) $\frac{i\pi}{2}$

(C) 0 (D) $\frac{i\pi}{\sqrt{2}}$

41. $\int_0^\infty e^{-x^2}\, dx$ is

(A) $\sqrt{\pi}$ (B) $\frac{\pi}{2}$

(C) $\frac{\sqrt{\pi}}{\sqrt{2}}$ (D) $\frac{\sqrt{\pi}}{2}$

42. If H is a subgroup of G with index 2, then

(A) Every left coset of H in G is a right coset of H in G

(B) H must be a finite subgroup of G

(C) G must be a finite group

(D) H is a trivial subgroup of G

43. If 1, 2 and 3 are the characteristic values of a square matrix B of order 3, then trace of $B^2 + I$ is

(A) 17 (B) 6

(C) 0 (D) 36

44. The analytic function $f(z) = u(x, y) + iv(x, y)$ for which $u(x, y) = e^x(x \cos y - y \sin y)$ is

(A) $f(z) = ze^{iz}$ (B) $f(z) = e^{-zi}$

(C) $f(z) = ze^{|z|}$ (D) $f(z) = ze^z + c$

45. The n^{th} term of the sequence $-x, y, -x, y, \ldots$ is

(A) $(-1)^n xy$ (B) $(x + y) - (-1)^n (x - y)$

(C) $\left(\frac{y-x}{2}\right) + (-1)^n \left(\frac{y+x}{2}\right)$ (D) $(-1)^n x + y$

46. Solution of the equation $e^{x + iy} = 3$ is $(x, y) =$

(A) $(3, 2\pi)$ (B) $(\log 3, 2\pi)$

(C) $(3, 2n\pi)$ (D) $(\log 3, 2n\pi)$

47. The matrix of the operator D on the vector space of all polynomials of degree atmost 2 defined by $D(f(x)) = f'(x)$ with respect to the basis $\{1, x, x^2\}$ is

(A) a square matrix of rank 3 (B) a square matrix of rank 2

(C) a symmetric matrix of rank 2 (D) a skew symmetric matrix of rank 3

48. The first woman fields medalist among the following is :

(A) Mariam Mirzakhani (B) Shakuntala Devi

(C) Lady Ada (D) Madam Tunisia

49. The value of the sum $\tan^{-1}\frac{3}{4} + \tan^{-1}\frac{3}{5} - \tan^{-1}\frac{8}{19}$ is

(A) 0 (B) $\frac{\pi}{2}$

(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

50. The value of the limit of the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$ is

(A) $\frac{\pi^2}{6}$ (B) $\frac{\pi^2}{4}$

(C) $\frac{\pi^2}{2}$ (D) 0

51. $\lim_{n \to \infty} \left(1 + \frac{1}{8n^2}\right)^{\frac{n^2}{8}}$ equals

(A) e^8 (B) 8e

(C) $e^{\frac{1}{64}}$ (D) $e^{\frac{1}{8}}$

52. $(a-b)^3 + (b-c)^3 + (c-a)^3$ is always equal to

(A) $3(a-b)(b-c)(c-a)$ (B) $3(a^3 + b^3 + c^3)$

(C) $3abc - 2b + 6c - 8a$ (D) $3(a^3 + b^3 + c^3 - abc)$

53. The differential equation satisfying $y = Ae^x + Be^{2x} + Ce^{3x}$ is

(A) $y_3 - 6y_2 - 11y_1 - 6y = 0$ (B) $y_3 - 6y_2 + 11y_1 - 6y = 0$

(C) $y_3 + 6y_2 - 11y_1 - 6y = 0$ (D) $y_3 - 11y_2 + y_1 - 5y = 0$

54. The value of the limit of the sequence (x_n) defined by the formula $x_n = \frac{x_{n-1}^2 + 2}{x_{n-1}}$, $n > 1$ and $x_1 = 1.4$ is

(A) $\sqrt{2}$ (B) 0

(C) 2 (D) ∞

55. The parametric representation of the hyperbola $3x^2 - 2y^2 - 6x + 2y = 0$ is

(A) $x = 1 + \sec t$, $y = 1 + \tan t$ (B) $x = 1 + \frac{\sec t}{\sqrt{3}}$, $y = \frac{\tan t}{\sqrt{2}}$

(C) $x = 1 + \frac{\sec t}{\sqrt{3}}$, $y = 1 - \frac{\tan t}{\sqrt{2}}$ (D) $x = 1 + \frac{\sec t}{\sqrt{3}}$, $y = 1 + \frac{\tan t}{\sqrt{2}}$

56. If $y \neq x$, but $x\sqrt{1+y} + y\sqrt{1+x} = 0$, then $\frac{dy}{dx}$ is

(A) 0

(B) $\frac{-1}{(1+x)^2}$

(C) $\frac{-1}{\sqrt{1+x}}$

(D) $\frac{1}{(1+x)^2}$

57. If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$, $\bar{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and $\bar{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$, then the vector form of the line in space $\frac{x-3}{1} = \frac{y+7}{-1} = \frac{z+9}{2}$ expressed as $\bar{r} = \bar{a} + t\bar{b}$ is valid when

(A) $(a_1, a_2, a_3) = (1, -1, 2)$; $(b_1, b_2, b_3) = (3, 7, 9)$

(B) $(a_1, a_2, a_3) = (3, 7, 9)$; $(b_1, b_2, b_3) = (1, -1, 2)$

(C) $(a_1, a_2, a_3) = (3, -7, -9)$; $(b_1, b_2, b_3) = (1, -1, 2)$

(D) $(a_1, a_2, a_3) = (-3, 7, 9)$; $(b_1, b_2, b_3) = (1, -1, 2)$

58. The 100^{th} derivative of $e^x \sin x$ w.r.t x is

(A) $e^x \sin x$

(B) $2^{100} e^x(\sin x + \cos x)$

(C) $2^{50} e^x \cos(x + \pi)$

(D) $2^{50} e^x \sin x$

59. If n is a finite positive integer, then $\sin\alpha + \sin 2\alpha + \ldots + \sin n\alpha$ equals

(A) $\sin\left(\frac{n+1}{2}\right)\alpha \frac{\sin\left(\frac{n\alpha}{2}\right)}{\sin\left(\frac{\alpha}{2}\right)}$

(B) $\cos\frac{(n+1)\alpha}{2} \frac{\sin\left(\frac{n\alpha}{2}\right)}{\sin\left(\frac{\alpha}{2}\right)}$

(C) 0

(D) 1

60. $\int_{\sqrt{2}}^{2} [x^2]\,dx$ equals

(A) 0

(B) $\sqrt{2}$

(C) $6 - \sqrt{3} - 2\sqrt{2}$

(D) $6 - \sqrt{2} - 3\sqrt{3}$

61. The limit of a sequence of real numbers will, if it exists,

(A) always be a natural number.

(B) always be a rational number.

(C) always be an irrational number.

(D) always be a complex number.

62. The value of θ for the quadratic function $f(x) = ax^2 + bx + c$ as per the mean value theorem $f(\beta) = f(\alpha) + (\beta - \alpha) f'(\alpha + \theta(\beta - \alpha))$ in the interval $[\alpha, \beta]$ is

(A) $\theta = 0$

(B) $\theta = \frac{1}{2}$

(C) $\theta = 1$

(D) $\theta = \frac{1}{3}$

63. The maximum and minimum values of $f(x) = 3 \sin x + 5 \cos x$, respectively, are

(A) 13, 51

(B) 8

(C) $-\sqrt{34}, \sqrt{34}$

(D) −5, 5

64. $\int_a^b f(x)\,dx = \int_a^b g(x)\,dx$ implies always that

(A) $f(x) = g(x)\ \forall\, x \in [a, b]$

(B) $f(x) = g(x)\ \forall\, x \in \mathbb{R}$

(C) $|f(x) - g(x)| = $ a constant $\forall\, x \in [a, b]$

(D) $f(x) + g(x)$ is constant

65. The n^{th} term of the Fibonacci sequence 1, 1, 2, 3, 5, ... is given by

(A) $\left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{2}\right)^n$

(B) $\frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^n - \left(\frac{1-\sqrt{5}}{2}\right)^n\right]$

(C) 1

(D) 0

66. $\int_0^{2\pi} \frac{d\theta}{a + b\cos\theta}$ when $a > b$ is

(A) $\frac{2\pi}{\sqrt{a^2 - b^2}}$

(B) 0

(C) ∞

(D) $\frac{\pi}{2\sqrt{a^2 - b^2}}$

67. $\int_0^{2a} f(x)\,dx = 2\int_0^{a} f(x)\,dx$ if

(A) $f(x)$ is even

(B) $f(x)$ is odd

(C) $f(2a - x) = f(x)$

(D) $f(a - x) = f(x)$

68. The number of rectangles in a chess board is

(A) 64

(B) 1096

(C) 1296

(D) 2126

69. The equation of tangent to the parabola $y^2 = 8bx$ at $(2b, 4b)$ is

(A) $2y = x + 2b$

(B) $4y + x = 9b$

(C) $4x - y = b$

(D) $2y - x + 2b = 0$

70. $\int_0^{\pi/2} \sin^7 x \, dx$ equals to

(A) $\frac{16}{5}$
(B) $\frac{8}{35}$
(C) $\frac{16}{37}$
(D) $\frac{16}{35}$

71. The locus of points in the Complex plane satisfying $|z| = 2\,|z-1|$ is

(A) an ellipse
(B) a hyperbola
(C) a circle
(D) a parabola

72. The multiplicative inverse of 4 in the ring $\mathbb{Z}_{10}$ is

(A) 2
(B) 4
(C) 5
(D) 17

73. The number of solutions of the equation $x^2 - 4x + 3 = 0$ in $\mathbb{Z}_{101}$ is

(A) 1
(B) 2
(C) 3
(D) 100

74. The function $f(z) = \frac{az + b}{cz + d}$ satisfies $f(f(z)) = z$ if

(A) d = a
(B) a = b
(C) a = – b
(D) d = – a

75. The number of solutions of the equation $x^2 = e$, the identity element in the Klein group is

(A) 1
(B) 4
(C) ∞
(D) 0

76. The value of λ for which the function $\bar{f} = (\lambda xy - z^3)\,\hat{i} + (\lambda - 2)\,x^2\hat{j} + (1 - \lambda)\,xz^2\,\hat{k}$ is irrotational (i.e $\nabla \times \bar{f} = 0$) is

(A) 4
(B) 3
(C) 2
(D) 1

77. If $\bar{f}(t)$ is a differentiable vector point function of the real variable 't', then $\frac{d}{dt}[\bar{f}, \bar{f}', \bar{f}''] =$

(A) $[f, \bar{f}', f''']$
(B) 0
(C) $[\bar{f}', \bar{f}'', \bar{f}''']$
(D) $[\bar{f}, \bar{f}'', \bar{f}''']$

78. If p is the least prime number dividing a positive integer n, then p satisfies

(A) $1 < p \le \sqrt{n}$

(B) $1 < p \le \frac{\sqrt{n}}{2}$

(C) $1 < p \le \sqrt[3]{n}$

(D) $1 < p \le \frac{\sqrt[3]{n}}{2}$

79. The order of the permutation $\sigma = (1\ 2)\ (3\ 4\ 5)$ in S_5 is

(A) 5

(B) 6

(C) 2

(D) 3

80. The number of injective functions from a set of cardinality 'n' into itself is

(A) n^n

(B) 2^{n^2}

(C) n!

(D) $\frac{n!}{2}$

81. Every group of prime order is

I = cyclic II = abelian

(A) Assertion I only is true

(B) Both I & II are true

(C) Assertion II only is true

(D) Both I & II are false

82. If A is a square matrix of order 5 having eigen values 1, 2, 3, 4 and λ, then the rank of A is le than 5 if and only if

(A) $\lambda > 5$

(B) $0 < \lambda < 5$

(C) $1 < \lambda < 5$

(D) $\lambda = 0$

83. The inequality that $|z_1 - z_2| \ge | |z_1| - |z_2| |$ is

(A) satisfied by all complex numbers z_1 & z_2

(B) only for those complex numbers z_1 & z_2 with $|z_1| > |z_2|$

(C) not valid for every complex numbers

(D) valid only for those purely imaginary numbers z_1 & z_2

84. The function $y = \begin{cases} \frac{\sin x}{x}, & x \ne 0 \\ 1, & x = 0 \end{cases}$ is

(A) only continuous in $\mathbb{R}$

(B) uniformly continuous in $\mathbb{R}$

(C) not continuous at the origin

(D) not uniformly continous in any interval contains 0

85. The dimension of the trivial vector space $V = \{0\}$ over any field $\mathbb{F}$ is

(A) ϕ
(B) $\{0\}$
(C) 0
(D) 1

86. The rule $(x - y)(x + y) = x^2 - y^2$ is valid in a ring R

(A) without any condition to be satisfied by R
(B) if and only if R is non-commutative
(C) if and only if R is a division ring
(D) if and only if R is commutative

87. The number of non-trivial proper subgroups of the group $\langle \mathbb{Z}_{18}, +_{18} \rangle$ is

(A) 4
(B) 16
(C) 10
(D) 2

88. $\int_0^1 \tan^{-1}x \, dx =$

(A) 0
(B) $\frac{\pi}{4}$
(C) $\frac{\pi}{4} - \log\sqrt{2}$
(D) $\pi - \frac{1}{2}\log 4$

89. The derivative of $\cos^{-1}hx$ with respect to $\sin^{-1}hx$ is

(A) $\sqrt{\frac{x^2-1}{x^2+1}}$
(B) $\frac{x^2+\sqrt{1+x^2}}{x}$
(C) $\frac{x^2-1}{x}$
(D) $\sqrt{\frac{x^2+1}{x^2-1}}$

90. If $u = e^x \cos y + e^y \sin x$, then $u_x(0, 0)$ is

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

91. If $u = \tan^{-1}\left(\frac{x^2+y^2}{xy^2}\right)$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ equals

(A) $\frac{\sin 2u}{2}$
(B) $-\sin 2u$
(C) $\tan 2u$
(D) $\frac{-\sin 2u}{2}$

92. If f(z) is analytic, then $\frac{\partial^2}{\partial x^2}(\text{Re}(f(z))) + \frac{\partial^2}{\partial y^2}(\text{Re}(f(z))) =$

(A) $|f(z)|$
(B) $|f'(z)|^2$
(C) 1
(D) 0

93. The formula for calculating the eccentricity 'e' of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 2$ is e =

(A) $\sqrt{\frac{a^2 + b^2}{a}}$ (B) $\sqrt{\frac{a^2 - b^2}{a}}$

(C) $\frac{\sqrt{a^2 + b^2}}{a}$ (D) $\frac{\sqrt{a^2 - b^2}}{a}$

94. Two spheres $x^2 + y^2 + z^2 + 2gx + 2fy + 2hz + c = 0$ & $x^2 + y^2 + z^2 + 2g_1 x + 2f_1 y + 2h_1 z + c_1 = 0$ will intersect orthogonally if

(A) $2gg_1 + 2ff_1 + 2hh_1 = c - c_1$ (B) $gg_1 + ff_1 + hh_1 = c + c_1$

(C) $g + g_1 + f + f_1 + h + h_1 = c + c_1$ (D) None of these

95. Laplace transform of e^{at} sin h(at) is

(A) $\frac{1}{s(s-2a)}$ (B) $\frac{a}{(s-a)(s-2a)}$

(C) $\frac{a}{s(s-2a)}$ (D) $\frac{a}{s(s-a)}$

96. Inverse Laplace transform of $\frac{1}{s(s-2)(s-3)}$ is

(A) $e^{3t} + e^{2t} - 1$ (B) $\frac{e^{3t}}{3} - \frac{e^{2t}}{2} + 1$

(C) $\frac{e^{3t}}{3} - \frac{e^{2t}}{2} + \frac{1}{5}$ (D) $\frac{e^{3t}}{3} - \frac{e^{2t}}{2} + \frac{1}{6}$

97. The function $f(x) = x^3 + x^2$, for $x \in \mathbb{R}$, is

(A) both even and odd (B) neither even nor odd

(C) an even function (D) an odd function

98. The area under the parabola $y^2 = 4bx$ bounded between the vertex and the Latus rectum is

(A) b^2 (B) $\frac{8b^2}{3}$

(C) $\frac{2b^2}{3}$ (D) $\frac{4b^2}{3}$

99. The straight lines $3x + 2y + k = 0$ and $2x + 4by + 3 = 0$ will be orthogonal if

(A) $b = +3/4$ and $k = 0$ (B) $b = +3/4$ and k is any real number

(C) $b = -3/4$ and k is any real number (D) b is any real number and $k = +3/4$

100. The series $1 + \frac{3x}{1!} + \frac{3^2x^2}{2!} + \frac{3^3x^3}{3!} + \ldots$ to ∞ converges

(A) for all real numbers x (B) for x with $|x| < 1$

(C) for $x = 0$ only (D) for x with $|x| \leq 3$