JNU MCA 2015

Original Paper

1. If the lines $ax + 2y + 1 = 0$, $bx + 3y + l = 0$ and $cx + 4y + l = 0$ are concurrent, then a, b and c are in
   (a) AP (b) GP
   (c) HP (d) None of the above

2. If $\sec 4\theta - \sec 2\theta = 2$, then general value of θ is
   (a) $(2n+1)\frac{\pi}{4}$ (b) $\frac{(2n+1)\pi}{10}$
   (c) $n\pi + \frac{\pi}{2}$ (d) None of the above

3. The value of k such that $3x^2 - 11xy + l0y^2 - 7x + 13y + k = 0$ may represent a pair of straight lines is
   (a) 3 (b) 4 (c) 6 (d) 8

4. In a triangle ABC, if $\angle A = 45^0, \angle B = 75°$, then $a + c\sqrt{2}$ is equal to
   (a) 0 (b) 1 (c) b (d) 2b

5. The circles whose equations $x^2 + y^2 + c^2 = 2ax$ and $x^2 + y^2 + c^2 - 2by = 0$ will touch one another externally, if
   (a) $\frac{1}{b^2+c^2} = \frac{1}{a^2}$ (b) $\frac{1}{c^2} + \frac{1}{a^2} = \frac{1}{b^2}$
   (c) $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$ (d) None of the above

6. Which word is least like the other words in the group?
   (a) Geometry (b) Algebra
   (c) Mathematics (d) Trigonometry

7. The solution of the equation $\begin{vmatrix} \cos\theta & \sin\theta & \cos\theta \\ -\sin\theta & \cos\theta & \sin\theta \\ -\cos\theta & -\sin\theta & \cos\theta \end{vmatrix} = 0$ is
   (a) $\theta = n\pi$ (b) $\theta = 2n\pi \pm \frac{\pi}{2}$
   (c) $\theta = n\pi \pm (-1)^n \frac{\pi}{4}$ (d) $\theta = 2n\pi \pm \frac{\pi}{4}$

8. If p is a variable point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with AA' as major axis, then the maximum area $\Delta APA'$ is
   (a) ab (b) $2ab$ (c) $\frac{ab}{2}$ (d) None of these

9. The number of values of x in the interval $[0, 5\pi]$ satisfying the equation $3\sin^2 x - 7\sin x + 2 = 0$, is
   (a) 0 (b) 5 (c) 6 (d) 10

10. The combined equation of the asymptotes of the hyperbola $2x^2 + 5xy + 2y^2 + 4x + 5y = 0$ is
    (a) $2x^2 + 5xy + 2y^2 + 4x + 5y + 2 = 0$
    (b) $2x^2 + 5xy + 2y^2 + 4x + 5y - 2 = 0$
    (c) $2x^2 + 5xy + 2y^2 = 0$
    (d) None of the above

11. The roots of the equation $1 - \cos\theta = \sin\theta . \sin\frac{\theta}{2}$ is
    (a) $k\pi, k \in I$
    (b) $2k\pi, k \in I$
    (c) $\frac{k\pi}{2}, k \in I$
    (d) None of the above

12. The number of boys in a class is three times the number of girls, which one of the following numbers cannot represent the total number of children in the class?
    (a) 48 (b) 44 (c) 42 (d) 40

13. The equation $y^2 - x^2 + 2ax - 1 = 0$, represents
    (a) a pair of straight lines (b) a circle
    (c) a parabola (d) an ellipse

14. The period of the function $|\sin \pi x|$ is
    (a) π^2 (b) 2π
    (c) 2 (d) 1

15. The two circles $x^2 + y^2 - 2x - 3 = 0$ and $x^2 + y^2 - 4x - 6y - 8 = 0$ are such that
    (a) they touch each other
    (b) they intersect each other
    (c) one lies inside the other
    (d) each lies outside the other

16. If $\cos^2 A + \cos^2 C = \sin^2 B$, then ΔABC is
    (a) equilateral (b) right-angled
    (c) isosceles (d) None of the above

17. The line $y = mx + 1$ is a tangent to the parabola $y^2 = 4x$, if
    (a) m = 1 (b) m = 2
    (c) m = 4 (d) None of the above

18. A and B can do a work separately in 10 days and 15 days respectively, In how many days they can finish it together?
(a) 2 (b) 3 (c) 5 (d) 6

19. The value of $\tan^{-1}1+\cos^{-1}\left(-\frac{1}{2}\right)+\sin^{-1}\left(-\frac{1}{2}\right)$ is equal to
(a) $\frac{\pi}{4}$ (b) $\frac{5\pi}{12}$ (c) $\frac{3\pi}{4}$ (d) $\frac{3\pi}{12}$

20. The equation of the normal to the parabola $y^2=8x$ having slop 1 is
(a) $x+y+6=0$ (b) $x-y-6=0$
(c) $x-y+6=0$ (d) $x+y-6=0$

21. The smallest angle of the triangle whose sides are $6+\sqrt{12}$, $\sqrt{48}$ and $\sqrt{24}$ is
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{2}$

22. An ellipse is described by using an endless string which is passed over two pins. If the axes are 6 cm and 4 cm, then the necessary length of string and the distance between the pins respectively in cm are
(a) $6, 2\sqrt{5}$ (b) $6, \sqrt{5}$
(c) $4, 2\sqrt{5}$ (d) None of the above

23. If the radius of the circumcircle of an isosceles triangle PQR is equal to PQ(= PR), then the angle P is
(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{2\pi}{3}$

24. How much does a watch loose per day, if its hands coincide every 64 minutes?
(a) 96 minutes (b) 90 minutes
(c) $30\frac{10}{11}$ minutes (d) $32\frac{8}{11}$ minutes

25. If e and e_1 are eccentricities of the hyperbola $xy=c^2$ and $x^2-y^2=c^2$, then $e^2+e_1^2$ is equal to
(a) 1 (b) 4 (c) 6 (d) 8

26. The domain of definition of the function $y(x)$ given by $2^x+2^y=2$ is
(a) $(0,1]$ (b) $[0,1]$ (c) $(-\infty,0]$ (d) $(-\infty,1)$

27. In order that a relation R defined on a non-empty set A is an equivalence relation, it is sufficient, if R
(a) is reflexive (b) is symmetric
(c) is transitive (d) All of the above

28. If $\lim_{x\to a}\frac{a^x-x^a}{x^x-a^a}=-1$, then
(a) $a=1$ (b) $a=0$
(c) $a=e$ (d) None of above

29. If $|z|=3$, then the point representing the complex number $-1+4z$ lie on a
(a) line (b) circle
(c) parabola (d) None of the above

30. If $f(x)=\begin{cases} xe^{-\left(\frac{1}{|x|}+\frac{1}{x}\right)} & x\neq 0 \\ 0, & x=0 \end{cases}$, then $f(x)$ is
(a) continuous as well as differentiable for all x
(b) continuous for all x but not differentiable at $x=0$
(c) neither differentiable nor continuous at $x=0$
(d) discontinuous everywhere

31. Let a, b and c be in AP and $|a|<1, |b|<1, |c|<1$, if $x=1+a+a^2+\cdots\infty$,
$y=1+b+b^2+\cdots\infty$,
$z=1+c+c^2+\cdots+\infty$, then x, y and z are in
(a) AP (b) GP
(c) HP (d) None of the above

32. $\lim_{x\to 0}(\cos x)^{\cot x}$ is
(a) – 1 (b) 0
(c) 1 (d) None of above

33. If $\log_x a, a^{x/2}$ and $\log_b x$ are in GP, then x is equal to
(a) $\log_a(\log_b a)$
(b) $\log_a(\log_e a)+\log_a(\log_e b)$
(c) $-\log_a(\log_a b)$
(d) $\log_a(\log_e b)-\log_a(\log_e a)$

34. The left-hand derivative of $f(x)=[x]\sin(\pi x)$ at $x=k, k$ is an integer and $[x]$ =greatest integer $\leq x$, is
(a) $(-1)^k(k-1)\pi$ (b) $(-1)^{k-1}(k-1)\pi$
(c) $(-1)^k k\pi$ (d) $(-1)^{k-1}k\pi$

35. The wheel of a train $4\frac{2}{7}$ meters in circumference makes 7 revolutions in 4 seconds. Find the speed of the train (in km/h)
(a) 18 (b) 24 (c) 27 (d) 36

36. If $x^3+3x^2-9x-c=0$ is of the form $(x-\alpha)^2(x-\beta)$, then c equals to
(a) -5 (b) 27 (c) -27 (d) 0

37. A differentiable function $f(x)$ is defined for all $x>0$ and satisfies $f(x^3)=4x^4$ for all $x>0$. The value of $f'(8)$ is
(a) $\frac{16}{3}$ (b) $\frac{32}{3}$ (c) $\frac{16\sqrt{2}}{3}$ (d) $\frac{32\sqrt{2}}{3}$

38. If the product of the roots of the equal $x^2-2\sqrt{2}kx+2e^{2\log k}-1=0$ is 31, then the roots of the equation are real for k equals to
(a) 1 (b) 2 (c) 3 (d) 4

39. Let $f(x)=\begin{cases} x^p\sin\frac{1}{x} & x\neq 0 \\ 0, & x=0 \end{cases}$, then $f(x)$ is continuous but not differentiable at $x=0$, if
(a) $0<p\leq 1$ (b) $1\leq p<\infty$

(c) $-\infty < p < 0$ (d) $p = 0$

40. The coefficient of x^5 in the expansion of $(1 + x^2 - x^3)^8$ is
(a) 80 (b) 84 (c) 88 (d) 92

41. In what ratio should water and 66% wine solution be mixed to obtain 55% Wine solution?
(a) 2:5 (b) 2:3 (c) 1:4 (d) 1:5

42. $f(x) = \begin{cases} x^2 + k & , x \geq 0 \\ -x^2 - k & , x < 0 \end{cases}$ and the function $f(x)$ be continuous at $x = 0$, then k is equal to
(a) 0 (b) 1 (c) 2 (d) -2

43. The value of $1^2.C_1 + 3^2.C_3 + 5^2.C_5 + \ldots$. is
(a) $n(n-1)2^{n-2} + n.2^{n-1}$
(b) $n(n-1)2^{n-2}$
(c) $n(n-1)2^{n-3}$
(d) None of the above

44. The range of $f(x) = \cos 2x - \sin 2x$ contains the set
(a) [2,4] (b) $[-1,1]$ (c) $[-2\ 2]$ (d) $[-4, 4]$

45. If in the expansion of $(1+x)^m(1-x)^n$, the coefficient of x and x^2 are 3 and – 6 respectively, then m is
(a) 6 (b) 9 (c) 12 (d)

46. Which of the following functions has an inverse function?
(a) $f(x) = \frac{1}{x-1}$ (b) $f(x) = x^2$ for all x
(c) $f(x) = x^2, x \geq 0$ (d) $f(x) = x^2, x \leq 0$

47. Find the next term of the series 7, 13, 25, 49, ……
(a) 96 (b) 97 (c) 98 (d) 99

48. If A and B are two matrices: such that $AB = B$ and $BA = A$, then $A^2 + B^2$ is
(a) $2AB$ (b) $2BA$ (c) $A + B$ (d) AB

49. The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$ are
(a) $1, -2$ (b) $-1,2$ (c) $1, -2$ (d) 1,2

50. If $X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then the value of x^n is
(a) $\begin{bmatrix} 3n & -4n \\ n & -n \end{bmatrix}$ (b) $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$
(c) $\begin{bmatrix} 3^n & (-4)^n \\ 1^n & (-1)^n \end{bmatrix}$ (d) None of these

51. If $x = 2 + \sqrt{3},\ xy = 1$, then $\frac{x}{\sqrt{2}+\sqrt{x}} + \frac{y}{\sqrt{2}-\sqrt{y}} =$
(a) $\sqrt{2}$ (b) $\sqrt{3}$ (c) 1 (d) None of above

52. If $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = -(a+b+c)(a+bk+ck^2)(a+bk^2+ck)$, where to is a complex cube root of unity, then k equals to
(a) 1 (b) -1 (c) ω (d) $-\omega$

53. If the fourth day after January 6 is Saturday, which day of the week was on, December 1, of the previous year?
(a) Saturday (b) Friday
(c) Sunday (d) Thursday

54. A number is chosen at random among the first 120 natural numbers. The probability of the number chosen being a multiple of 5 or 15 is
(a) $\frac{1}{5}$ (b) $\frac{1}{8}$ (c) $\frac{1}{24}$ (d) $\frac{1}{6}$

55. If A is square matrix of order $nx\ n$, then $adj(adjA)$ is equal to
(a) $|A|^n A$ (b) $|A|^{n-1} A$
(c) $|A|^{n-2} A$ (d) $|A|^{n-3} A$

56. A coin is tossed $m + n$ times, Where $m \geq n$. The probability of getting at least m consecutive heads is
(a) $\frac{n+1}{2^{m+1}}$ (b) $\frac{n+1}{2^{m+1}}$
(c) $\frac{m+2}{2^{n+1}}$ (d) None of these

57. If $\vec{a} = x(\vec{a} \times \vec{b}) + y(\vec{b} \times \vec{c}) + \vec{z}(\vec{c} \times \vec{a})$ and $[\vec{a}\ \vec{b}\ \vec{c}] = \frac{1}{8}$, then $x + y + z =$
(a) $8\vec{a}.x(\vec{a} + \vec{b} + \vec{c})$ (b) $\vec{a}(\vec{a} + \vec{b} + \vec{c})$
(c) $8(\vec{a} + \vec{b} + \vec{c})$ (d) None of these

58. A bag contains equal number of one rupee, 50 paisa and 25 paisa coins respectively. If the total value is 35 rupees, how many coins of each type are there?
(a) 25 (b) 20 (c) 18 (d) 16

59. In a clock, the angle between the hour hand and minute hand at 5 hours 10 minutes, is
(a) 60° (b) 95° (c) 70° (d) 90°

60. If A and B are two events such that $P(A) \neq 0$ and $P(B) \neq 1$, then $= P\left(\frac{\bar{A}}{B}\right) =$
(a) $1 - P\left(\frac{A}{B}\right)$ (b) $P\left(\frac{\bar{A}}{B}\right)$
(c) $\frac{1-P(A \cup B)}{\bar{B}}$ (d) $\frac{P(\bar{A})}{P(\bar{B})}$

61. If the vector $-\hat{\imath} + \hat{\jmath} + \hat{k}$ bisects the angle between the vector $\vec{c}$ and the vector $3\hat{\imath} + 4\hat{\jmath}$, then the unit vector in the direction of $\vec{c}$ is
(a) $\frac{1}{15}(11\hat{\imath} + 10\hat{\jmath} + 2\hat{k})$ (b) $\frac{-1}{15}(11\hat{\imath} - 10\hat{\jmath} + 2\hat{k})$
(c) $\frac{-1}{15}(11\hat{\imath} + 10\hat{\jmath} - 2\hat{k})$ (d) $\frac{-1}{15}(11\hat{\imath} + 10\hat{\jmath} + 2\hat{k})$

62. If a, b and c are in GP, then the equation $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root if $\frac{d}{a}, \frac{e}{b}$ and $\frac{f}{c}$ are in

(a) AP (b) GP
(c) HP (d) None of these

63. If $\vec{a}$ and $\vec{b}$ are unit vector such that the vector $\vec{a}+3\vec{b}$ is perpendicular to $7\vec{a}-5\vec{b}$ and $\vec{a}-4\vec{b}$ is perpendicular to $7\vec{a}-2\vec{b}$, then the angle between a and b is
(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

64. If the equation $x^2+px+q=0$ and $x^2+p'x+q'=0$ have common root, then it is equal to
(a) $\frac{p-p'}{q-q'}$ (b) $\frac{p+p'}{q+q'}$
(c) $-\left(\frac{q-q'}{p-p'}\right)$ (d) $\left(\frac{q+q'}{p+p'}\right)$

65. How many such pairs of letters are in the word COMPUTERS each of which has as many letters between them in the word as in English alphabets?
(a) None (b) One
(c) Two (d) More than three

66. If z is a complex number having least absolute value $and\ |z-2+2i=1|$, then $z=$
(a) $\left(2-\frac{1}{\sqrt{2}}\right)(1-i)$ (b) $\left(2-\frac{1}{\sqrt{2}}\right)(1+i)$
(c) $\left(1+\frac{1}{\sqrt{2}}\right)(1-i)$ (d) $\left(2+\frac{1}{\sqrt{2}}\right)(1+i)$

67. The sum of first n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+\cdots$ is equal to
(a) 2^n-n+1 (b) $n+2^{-n}-1$
(c) 2^n-1 (d) $1-2^n$

68. If $|x|<\sqrt{2}-1$, then $|z^2+2z\cos\alpha|$ is
(a) less than 1 (b) $\sqrt{2}+1$
(c) $\sqrt{2}-1$ (d) None of these

69. If $x^2-2x\cos\theta+1=0$, then the value of $x^{2n}-2x^n\cos n\theta+1=0$, is equal to
(a) $\cos 2n\theta$ (b) $\sin 2n\theta$
(c) 0 (d) some real numbers other than 0

70. Unit digit of $1!+2!+3!+4!+\cdots$ is
(a) 3 (b) 4 (c) 5 (d) 7

71. If $a,b,c\in R$ and $a+b+c=0$, then the quadratic equation $4ax^2+3bx+2c=0$ has
(a) one positive root and one negative root
(b) imaginary root
(c) real root
(d) None of the above

72. Two trains leave the same station at 9:00 am and 8:30 am and travel at 90 km / h and 80 km/ h respectively in the same route. How many kilometers from the starting station will the two trains be together?
(a) 360 km (b) 320 km
(c) 270 km (d) 280 km

73. Let $a_1,a_2,a_3,\ldots,a_{10}$ be in AP and $h_1,h_2,h_3,\ldots,h_{10}$ be in HP, if $a_1=h_1=2$ and $a_{10},=h_{10}=3$, then a_4h_7 is
(a) 2 (b) 3 (c) 5 (d) 6

74. If ${}^nC_4,{}^nC_5,{}^nC_6$ are in AP, then n is equal to
(a) 12 (b) 11 (c) 7 (d) 8

75. $0<\theta<\frac{\pi}{2}$ and $\begin{vmatrix}1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta\\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta\\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta\end{vmatrix}=0$ then θ is equal to
(a) $\frac{\pi}{24},\frac{5\pi}{24}$ (b) $\frac{5\pi}{24},\frac{7\pi}{24}$
(c) $\frac{7\pi}{24},\frac{11\pi}{24}$ (d) None of these

76. If $(1+x)^n=C_0+C_1x+C_2x^2+\ldots+C_nx^n$, $then C_1^2+C_2^2+\ldots+C_n^2$ is equal to
(a) 2^{2n-2} (b) 2^n
(c) 2^{2n+2} (d) $\frac{(2n)!}{(n!)^2}$

77. If $A=\frac{1}{3}\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & -2\\ x & 2 & y\end{bmatrix}$ is orthogonal, then $x+y=$
(a) 3 (b) 0 (c) – 3 (d) 1

78. If $'A\ means\times, B\ means\ \div, C\ means+$ and $D\ means-$, then what is the value of $180B15D11C8A10$
(a) 80 (b) 81 (c) 83 (d) 92

79. If $\left(\frac{3}{2}+\frac{i\sqrt{3}}{2}\right)^{50}=3^{25}(x+iy)$, where x and y are reals, then the ordered pair (x,y) is given by
(a) (0,3) (b) $\left(\frac{1}{2},\frac{\sqrt{3}}{2}\right)$
(c) $(-3,0)$ (d) $(0,-3)$

80. If ω is one of the cube roots of the unity, then
(a) ω (b) ω^2 (c) 0 (d) – 1

81. The equation of the curve satisfying the differential equation $y''(x^2+1)=2xy'$ passing through the point $(0,1)$ and having slope of tangent at $x=0$ as 3 is
(a) $y=x^2+3x+2$ (b) $y=x^2+3x-1$
(c) $y=x^3+3x+y$ (d) $y=x^3+3x-2$

82. The value of $\sqrt{8+2\sqrt{8+2\sqrt{8+2\sqrt{8+2\sqrt{8}}}}}$ is
(a) 10 (b) 6 (c) 8 (d) 4

83. A woman introduces a man as the son of the brother of her mother. How is that man related to the woman?

(a) Nephew (b) Son
(c) Cousin (d) Uncle

84. The quadratic equation whose roots are AM and HM between the roots of the equation $ax^2 + bx + c = 0$
(a) $abx^2 + (b^2 + ac)x + bc = 0$
(b) $2abx^2 + (b^2 + 4ac)x + 2bc = 0$
(c) $2abx^2 + (b^2 + ac)x + bc = 0$
(d) None of these

85. The order and degree of the differential equation of all tangent lines to the parabola $x^2 = 4y$ is
(a) 1, 2 (b) 2, 2 (c) 3, 1 (d) 4, 1

86. The roots of the equation $\left(a + \sqrt{b}\right)^{x^2-15} + \left(a - \sqrt{b}\right)^{x^2-15} = 2a$, where $a^2 - b = 1$ are
(a) $\pm 2, \pm\sqrt{3}$ (b) $\pm 4, \pm\sqrt{14}$
(c) $\pm 3, \pm\sqrt{5}$ (d) $\pm 6, \pm\sqrt{20}$

87. A solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - x\left(\frac{dy}{dx}\right) + y = 0$ is
(a) $y = 2$ (b) $y = 2x$
(c) $y = 2x - 1$ (d) $y = 2x^2 - 4$

88. A is heavier than G. M is lighter than J. P is heavier, than J but lighter than G. Who among them is heaviest?
(a) G (b) J (c) P (d) A

89. The number of ways in which n distinct objects can be put into two different boxes so that no box remain empty, is
(a) $2^n - 1$ (b) $n^2 - 1$
(c) $2^n - 2$ (d) $n^2 + 1$

90. The differential equation, representing the family of curves $y^2 = 2c(x + \sqrt{c})$, c is positive parameter, is of
(a) order 1 (b) order 2
(c) degree 3 (d) Both (a) and (c)

91. The number of ways in which one can post 5 letters in 2 letter boxes is
(a) 35 (b) 7^5
(c) 5^7 (d) None of these

92. The relation $R = \{(1,1), (2,2), (3,3), (1,2)\ (2,3)\ (1,3)\}$ on set $A = \{1,2,3\}$ is
(a) reflexive but not symmetric
(b) reflexive but not transitive
(c) symmetric and transitive
(d) neither symmetric nor transitive

93. Introducing a man, Neeraj said "his wife is the only daughter of my wife". How is Neeraj related to that man?
(a) Father (b) Grandfather
(c) Father-in-law (d) Son

94. There are m copies of each of different books in a university library. The number of ways in which one or more than one book can be selected is
(a) $m^n + 1$ (b) $(m + n)^n - 1$
(c) $(n + 1)^n - m$ (d) $(m + 1)^n - 1$

95. If R is the relation on a finite set having n elements, then the number of relations on A is
(a) 2^n (b) 2^{n^2} (c) n^2 (d) n^n

96. $\int e^{3\log x\left(x^4+1\right)^{-1}} dx$ is equal to
(a) $\log(x^4 + 1) + C$ (b) $\frac{1}{4}\log(x^4 + 1) + C$
(c) $-\log(x^4 + 1) + C$ (d) $\log(x^4 - 1) + C$

97. Let R be a reflexive relation on a finite set A having n elements, and let there be m ordered pairs in R. Then
(a) $m \geq n$ (b) $m \leq n$
(c) $m = n$ (d) None of these

98. $\int [f(x)g''(x) - f''(x)g(x)]$ is equal to
(a) $\frac{f(x)}{g'(x)}$
(b) $f'(x)g(x) - f(x)g'(x)$
(c) $f(x)g'(x) - f'(x)g(x)$
(d) $f(x)g'(x) + f'(x)g(x)$

99. If $g(f(x)) = |\sin x|$ and $f(g(x)) = (\sin\sqrt{x})^2$, then
(a) $f(x) = \sin^2 x, g(x) = \sqrt{x}$
(b) $f(x) = \sin x, g(x) = |x|$
(c) $f(x) = x^2, g(x) = \sin\sqrt{x}$
(d) f and g cannot be determined

100. Which of the following pair of words expresses a relationship similar to that expressed between CURD and MILK?
(a) FLOW : WATER (b) DECANT : WINE
(c) BREW : COFFEE (d) CLOT : BLOOD

101. $\int \frac{x+2}{(x^2+3x+3)\sqrt{x+1}} dx$ is equal to
(a) $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)$
(b) $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{3(x+1)}}\right)$
(c) $\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{x}{\sqrt{(x+1)}}\right)$
(d) None of these

102. If $f: R \to R$ is given by $f(x) = 3x - 5$, then $f^{-1}(x)$
(a) is given by $\frac{1}{3x-5}$
(b) does not exist because f is not onto
(c) does not exist because f is not one-one

(d) is given by $\frac{x+5}{3}$

103. $\int \frac{1}{x(x^n+1)}dx$ is equal to

(a) $\frac{1}{n}\log\left(\frac{x^n}{x^n+1}\right)+C$

(b) $\frac{1}{n}\log\left(\frac{x^n+1}{x^n}\right)+C$

(c) $\log\left(\frac{x^n}{x^n+1}\right)+C$

(d) None of the above

104. If $2^x+2^y=2^{x+y}$, then the value of $\frac{dy}{dx}$ at $x=y=1$ is

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

105. If $\int x\log\left(1+\frac{1}{x}\right)dx = f(x).\log(x+1).g(x).x^2 + Ax+C$, then

(a) $f(x)=\frac{1}{2}x^2$ (b) $A=1$

(c) $g(x)=\log x$ (d) None of these

106. Which word is least like the other words 1n the group?

(a) Arc (b) Radius

(c) Tangent (d) Diagonal

107. If $F(x)=\frac{1}{x^2}\int_4^x(4t^2-2F'(t))\,dt$, then $F'(4)$ equals

(a) $\frac{32}{9}$ (b) $\frac{64}{3}$

(c) $\frac{64}{9}$ (d) None of these

108. Let $f(x)=x-[x]$, for every real number x, where $[x]$ is integral part of x.

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

109. Then $x^py^q=(x+y)^{p+q}$, then $\frac{dy}{dx}$ is equal to

(a) $\frac{y}{x}$ (b) $\frac{py}{qx}$ (c) $\frac{x}{y}$ (d) $\frac{qy}{px}$

110. If $I_1=\int_e^{e^2}\frac{dx}{\log x}$ and $I_2=\int_1^2\frac{e^x}{x}dx$,then

(a) $I_1=I_2$ (b) $2I_1=I_2$

(c) $I_1=2I_2$ (d) None of the above

111. 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

(a) 1 (b) $\left(\frac{x-1}{x+1}\right)$

(c) $\left(\frac{x+1}{x-1}\right)$ (d) 0

112. A man is facing south. He turns 135° in the anticlockwise direction and then 180° in the clockwise direction. Which direction is he facing now?

(a) North-east (b) North-west

(c) South-east (d) South-west

113. The value of the integral $\int_0^{\frac{\pi}{2}}\log|\tan x+\cot x|dx$ is

(a) $\pi\log 2$ (b) $-\pi\log 2$

(c) $\log 2$ (d) 0

114. If $f(x)=\cot^{-1}\left(\frac{x^x-x^{-x}}{2}\right)$, then $f'(1)$ equals

(a) -1 (b) 1

(c) 0 (d) None of the above

115. $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}}\frac{1}{1+\cos x}dx$

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

116. If influenza is related to virus, then typhoid is related to

(a) bacillus (b) parasite

(c) protozoa (d) bacteria

117. If $f(x)=\log_x\{\ln(x)\}$, then $f'(x)$ at $x=e$ is

(a) $-e$ (b) e

(c) e^2 (d) e^{-1}

118. If $f(x)$ is function satisfying $f\left(\frac{1}{x}\right)+x^2f(x)=0$ for all non-zero, then $\int_{\sin\theta}^{cosec\ \theta}f(x)dx$ is equal to

(a) $\sin\theta+cosec\,\theta$ (b)$\sin^2\theta$

(c) $cosec^2$ (d) None of the above

119. If g is inverse of f and $f'(x)=\frac{1}{1+x^n}$, then $g'(x)$ is equal to

(a) $1+x^n$ (b) $1+[f(x)]^n$

(c) $1+[g(x)]^n$ (d) None of the above

120. If $\frac{dy}{dx}=e^{-2y}$ and $y=0$, when $x=5$, the value of x for $y=3$ is

(a) e^5 (b) e^6+1

(c) $\frac{e^6+9}{2}$ (d) $\log_e 6$