

1. If  $A = \{x, y \mid x^2 + y^2 = 25\}$  and  $B = \{x, y \mid x^2 + 9y^2 = 144\}$  then  $A \cap B$  contains :  
 (A) One point (B) Two points  
 (C) Three points (D) Four points
2. The number of subsets of a set containing  $n$  elements is :  
 (A)  $n$  (B)  $2^n - 1$   
 (C)  $n^2$  (D)  $2^n$
3. 20 teachers of a school either teach Maths or Physics. 12 of them teach Maths while 4 teach both the subjects. The number of teachers teaching Physics only is :  
 (A) 12 (B) 8  
 (C) 16 (D) None of these
4. If a relation  $R$  is defined on the set  $Z$  of integers as follows : . Then  
 Domain  $(R) =$   
 (A)  $\{3, 4, 5\}$  (B)  $\{0, 3, 4, 5\}$   
 (C)  $\{0, \pm 3, \pm 4, \pm 5\}$  (D) None of these
5. If  $R$  is a relation on a finite set having  $n$  elements, then the number of relations on  $A$  is :  
 (A)  $2^n$  (B)  
 (C)  $n^2$  (D)  $n^n$
6.  $R$  is a relation on the set  $Z$  of integers and it is given by . Then  $R$  is :  
 $(a, b) \in R \Leftrightarrow |a - b| \leq 1$  (A) Reflexive and Transitive (B) Reflexive and Symmetric  
 $(a, b) \in R \Leftrightarrow |a - b| \leq 3$  (C) Symmetric and Transitive (D) An equivalence relation
7. The equation represents a circle of radius :  
 (A) 5 (B)  $2\sqrt{5}$   
 (C)  $\frac{5}{2}$  (D) None of these
8. If  $Z_1, Z_2, Z_3$  are complex numbers such that :  
 $|Z_1| = |Z_2| = |Z_3| = \left| \frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3} \right| = 1$  then  $|Z_1 + Z_2 + Z_3|$  is :  
 (A) Equal to 1 (B) Less than 1  
 (C) Greater than 1 (D) Equal to 3
9. The locus of point  $Z$  satisfying  $\operatorname{Re}(Z^2) = 0$  is :  
 (A) A pair of straight lines (B) A circle  
 (C) A rectangular hyperbola (D) None of these

10. If  $Z_r = \cos\left(\frac{2r\pi}{5}\right) + i \sin\left(\frac{2r\pi}{5}\right)$ ,  $r = 0, 1, 2, 3, 4$  then  $Z_0 \times Z_1 \times Z_2 \times Z_3 \times Z_4$
- (A) -1 (B) 0  
(C) 1 (D) None of these
11. If  $\alpha, \beta, \gamma$  are the roots of the equation  $x^3 + 4x + 1 = 0$ . Then  $(\alpha + \beta)^{-1} + (\beta + \gamma)^{-1} + (\gamma + \alpha)^{-1} =$
- (A) 2 (B) 3  
(C) 4 (D) 5
12. Let A, G and H be the Arithmetic mean, Geometric mean and Harmonic mean of two positive numbers a and b. The quadratic equation whose roots are A and H is :
- (A)  $Ax^2 - (A^2 + G^2)x + AG^2 = 0$  (B)  $Ax^2 - (A^2 + H^2)x + AH^2 = 0$   
(C)  $Hx^2 - (H^2 + G^2)x + HG^2 = 0$  (D) None of these
13. G is a group under  $\otimes_7$  where  $G = \{1, 2, 3, 4, 5, 6\}$ . If  $5 \otimes_7 x = 4$  then  $x =$
- (A) 0.8 (B) 4  
(C) 3 (D) 5
14. In the group  $G = \{1, 3, 7, 9\}$  under multiplication module 10,  $(3 \times 7^{-1})^{-1}$  is equal to :
- (A) 9 (B) 5  
(C) 7 (D) 3
15. The identity element in the group  $M = \left\{ \begin{pmatrix} x & x \\ x & x \end{pmatrix} \mid x \neq 0 \text{ and } x \text{ is real} \right\}$  with respect to matrix multiplication is :
- (A)  $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$  (B)  $\begin{pmatrix} 1 & 1 \\ 2 & 2 \end{pmatrix}$   
(C)  $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$  (D) None of these
16. If  $a * b = a^2 + b^2$ , then the value of  $(4 * 5) * 3$  is :
- (A)  $(4^2 + 5^2) + 3^2$  (B)  $(4 + 5)^2 + 3^2$   
(C)  $41^2 + 3^2$  (D)  $(4 + 5 + 3)^2$

17. In  $Z$ , the set of all integers, the inverse of  $-7$  with respect to  $\oplus$  defined by  $a \oplus b = a + b + 1$  for all  $a, b \in Z$  is :
- (A)  $-14$  (B)  $7$   
 (C)  $-7$  (D) None of these
18. The units of the field  $F = \{0, 2, 4, 6, 8\}$  under  $\oplus$  are :
- (A)  $\{0\}$  (B)  $\{2, 4, 6, 8\}$   
 (C)  $F$  (D) None of these
19.  $(Z_n, \oplus_n, \otimes_n)$  is a field if and only if  $n$  is :
- (A) Even (B) Odd  
 (C) Prime (D) None of these
20. The ideals of a field  $F$  are :
- (A) Only  $\{0\}$  (B) Only  $F$   
 (C) Both  $\{0\}$  and  $F$  (D) None of these
21. Every finite integral domain is :
- (A) Not a field (B) Field  
 (C) Vector space (D) None of these
22. The order of  $i$  in the multiplicative group of fourth roots of unity is :
- (A)  $4$  (B)  $3$   
 (C)  $2$  (D)  $1$
23. The non-zero elements  $a, b$  of a ring  $(R, +, \cdot)$  are called zero divisors if :
- (A)  $a \cdot b = 0$  (B)  $a + b = 0$   
 (C)  $a \cdot b \neq 0$  (D)  $a + b \neq 0$
24. If the ring  $R$  is an integral domain then :
- (A)  $R[x]$  is a field (B)  $R[x]$  is an integral domain  
 (C)  $R[x]$  is not an integral domain (D) None of these
25. The product of an even permutation and an odd permutation is :
- (A) Even (B) Odd  
 (C) Neither even nor odd (D) None of these

26. If \_\_\_\_\_ :

(A)  $\begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$

(B)  $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

(C)  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(D) None of the above

27. If  $AB = A$  and  $BA = B$  where  $A$  and  $B$  are square matrices then :

(A)  $A^2 = A$  and  $B^2 = B$

(B)  $A^2 \neq A$  and  $B^2 = B$

(C)  $A^2 = A$  and  $B^2 \neq B$

(D)  $A^2 \neq A$  and  $B^2 \neq B$

28. If  $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$ , then the value of  $|\text{adj } A|$  is :

(A)  $a^{27}$

(B)  $a^9$

(C)  $a^6$

(D)  $a^2$

29. If  $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$ , then  $|\text{adj}(\text{adj } A)|$  is :

(A)  $14^4$

(B)  $14^3$

(C)  $14^2$

(D)  $14$

30. If  $A = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$ , and  $A^T + A = I_2$  where  $A^T$  is the transpose of  $A$  and  $I_2$  is the  $2 \times 2$  Unit matrix.

Then:

(A)  $\theta = n\pi, n \in \mathbb{Z}$

(B)

(C)  $\theta = 2n\pi + \frac{\pi}{3}, n \in \mathbb{Z}$

(D) None of these

31. The matrix  $A = \begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$  is nilpotent of index :
- (A) 2 (B) 3  
(C) 4 (D) None of these

32. The rank of the matrix  $A = \begin{bmatrix} 2 & 3 & 1 & 4 \\ 0 & 1 & 2 & -1 \\ 0 & -2 & -4 & 2 \end{bmatrix}$  is :
- (A) 2 (B) 3  
(C) 1 (D) Indeterminate

33. For what value of  $\lambda$ , the system of equations

$$x + y + z = 6$$

$$x + 2y + 3z = 10$$

$$x + 2y + \lambda z = 12$$

(A)  $\lambda = 1$

(B)  $\lambda = 2$

(C)  $\lambda = -2$

(D)  $\lambda = 3$

34. If A is a  $3 \times 3$  matrix and B is its adjoint such that  $|B| = 64$ , then  $|A| =$

(A) 64

(B)  $\pm 64$

$\begin{bmatrix} 8 & 2 \\ 3 & 4 \end{bmatrix}$ , then  $(A + A^2 + A^3 + \dots + \infty)$

(D) 18

35. If  $A^3 = 0$ , then  $1 + A + A^2$  equals :

(A)  $1 - A$

(B)  $(1 - A)^{-1}$

(C)  $(1 + A)^{-1}$

(D) None of these

36. If  $A =$  equals to :

(A)  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(B)  $\begin{bmatrix} -1 & -2 \\ -3 & -4 \end{bmatrix}$

(C)  $\begin{bmatrix} \frac{1}{2} & -\frac{1}{3} \\ -\frac{1}{2} & 0 \end{bmatrix}$

(D)  $\begin{bmatrix} -\frac{1}{4} & \frac{1}{3} \\ \frac{1}{2} & 0 \end{bmatrix}$

37. If  $s = a + b + c$  then the value of  $\Delta = \begin{vmatrix} s+c & a & b \\ c & s+a & b \\ c & a & s+b \end{vmatrix}$  is :

- (A)  $2s^2$  (B)  $2s^3$   
 (C)  $s^3$  (D)  $3s^3$

38.  $\lim_{n \rightarrow \infty} \left[ \frac{4^{\frac{1}{n}} - 1}{3^{\frac{1}{n}} - 1} \right]$  is equal to :

- (A)  $\log_4 3$  (B)  $\log_3 4$   
 (C) 1 (D) None of these

39. The value of  $\lim_{n \rightarrow \infty} \left[ \frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots + \frac{1}{(2n+1)(2n+3)} \right]$  is :

- (A) 1 (B)  $\frac{1}{2}$   
 (C)  $-\frac{1}{2}$  (D) None of these

40.  $\lim_{x \rightarrow \infty} \left[ \frac{\int_0^{2x} x e^{x^2} dx}{e^{4x^2}} \right] =$

- (A) 0 (B)  $\infty$   
 (C) 2 (D)

41. The function  $f(x) = \begin{cases} 1 - 2x + 3x^2 - 4x^3 + \dots + \infty & \text{if } x \neq -1 \\ 1 & \text{if } x = -1 \end{cases}$  is :

- (A) Continuous and differentiable at  $x = -1$   
 (B) Neither continuous nor differentiable at  $x = -1$   
 (C) Continuous but not differentiable at  $x = -1$   
 (D) None of the above

42. Let  $f(x) = \begin{cases} \frac{\sin \pi x}{5x} & , x \neq 0 \\ K & , x = 0. \end{cases}$

If  $f(x)$  is continuous at  $x = 0$ , then the value of  $K$  is :

- (A)  $\frac{\pi}{5}$  (B) 1  
(C) 1 (D) 0

43. If  $f(x)$  is differentiable and strictly increasing function, then the value of  $\lim_{x \rightarrow 0} \left[ \frac{f(x^2) - f(x)}{f(x) - f(0)} \right]$  is :

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

44. The number of points at which the function  $f(x) = |x - 3| + |x + 1|$  does not have a derivative in the interval  $[-4, 4]$  is :

- (A) 1 (B) 2  
(C) 3 (D) None of these

45. If  $f(x)$  satisfies the conditions of Rolle's theorem in  $[1, 2]$  and  $f(x)$  is continuous in  $[1, 2]$ , then

$\int_1^2 f'(x) dx$  is equal to :

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

46. Let  $f(x) = e^x$ ,  $x \in [0, 1]$ , then a number 'c' of the Lagrange's mean value theorem is :

- (A)  $\log_e (e - 1)$  (B)  $\log_e (e + 1)$   
(C) 1 (D) None of these

47. The maximum value of  $xy$  subject to  $x + y = 8$  is :

- (A) 8 (B) 16  
(C) 20 (D) 24

48. The series  $n - \frac{n^2}{2} + \frac{n^3}{3} - \frac{n^4}{4} + \dots - 1 < n \leq 1$  represents the function :

- (A)  $\sin n$  (B)  $\cos n$   
(C)  $(1 + n)^n$  (D)  $\log (1 + n)$

49. Expansion of  $\sin x$  in powers of  $\left(x - \frac{\pi}{2}\right)$  is :

(A)  $\left(x - \frac{\pi}{2}\right) - \frac{\left(x - \frac{\pi}{2}\right)^3}{\underline{3}} + \frac{\left(x - \frac{\pi}{2}\right)^5}{\underline{5}} - + \dots$

(B)  $\left(x - \frac{\pi}{2}\right) + \frac{\left(x - \frac{\pi}{2}\right)^3}{\underline{3}} + \frac{\left(x - \frac{\pi}{2}\right)^5}{\underline{5}} + \dots$

(C)  $1 - \frac{\left(x - \frac{\pi}{2}\right)^2}{\underline{2}} + \frac{\left(x - \frac{\pi}{2}\right)^4}{\underline{4}} - + \dots$

(D) None of these

50. The equation of tangent to the curve  $x = t^3 - 4$ ,  $y = 2t^2 + 1$  at the point where  $t = 2$  is :

(A)  $2x - 3y - 19 = 0$

(B)  $2x - 3y + 19 = 0$

(C)  $2x + 3y - 19 = 0$

(D)  $3x + 2y + 6 = 0$

51. If the normal to the curve  $y^2 = 5x - 1$  at the point  $(1, -2)$  is of the form  $ax - 5y + b = 0$ . Then 'a' and 'b' are :

(A) 4, -14

(B) 4, 14

(C) -4, 14

(D) -4, -14

52. The least value of  $f(x) = 2x + \frac{8}{x^2}$ ,  $x > 0$  is :

(A) 4

(B) 6

(C) 8

(D) None of these

53. The radius of curvature for the curve  $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2} - \frac{r^2}{a^2 b^2}$  is :

(A)  $\frac{p^2}{a^2 b^2}$

(B)  $\frac{a^2 p^2}{b^2}$

(C)  $\frac{a^2 b^2}{p^3}$

(D)  $a^2 b^2 p^2$



54. The centre of curvature of the curve  $y = x^2$  at  $(0,0)$  is :
- (A)  $\left(0, \frac{1}{2}\right)$  (B)  $\left(\frac{1}{2}, \frac{1}{2}\right)$   
 (C)  $\left(\frac{1}{2}, 0\right)$  (D) None of these
55. The radius of curvature of the curve  $r = a \sin n \theta$  at origin is :
- (A)  $na$  (B)  $\frac{2na}{3}$   
 (C)  $2an$  (D)  $\frac{2na}{3}$
56. The asymptote parallel to co-ordinate axes of the curve  $(x^2 + y^2)x - ay^2 = 0$  is :
- (A)  $y - a = 0$  (B)  $y + a = 0$   
 (C)  $x - a = 0$  (D)  $x + a = 0$
57. The asymptote of the curve  $y = e^x$  is given by :
- (A)  $y = 0$  (B)  $x = 0$   
 (C)  $y = e$  (D)  $x = e$
58. For the curve  $y^2(1+x) = x^2(1-x)$ , the origin is a :
- (A) Node (B) Cusp  
 (C) Conjugate point (D) None of these
59. The curve  $y = x^3 - 3x^2 - 9x + 9$  has a point of inflexion at :
- (A)  $x = -1$  (B)  $x = 1$   
 (C)  $x = -3$  (D)  $x = 3$
60. The curve  $y = \log x$  is :
- (A) Concave upwards in  $(0, \infty)$  (B) Concave downwards in  $(0, \infty)$   
 (C) Concave upwards in  $(-\infty, \infty)$  (D) Concave downwards in  $(-\infty, \infty)$
61. The points of inflexion on the curve  $x = (\log y)^3$  are :
- (A)  $(0, 1)$  and  $(8, e^2)$  (B)  $(1, 0)$  and  $(8, e^2)$   
 (C)  $(0, 1)$  and  $(e^2, 8)$  (D)  $(1, 0)$  and  $(e^2, 8)$
62. The graph of  $x = \frac{1-t^2}{1+t^2}$ ,  $y = \frac{2t}{1+t^2}$  is a :
- (A) Circle (B) Ellipse  
 (C) Cycloid (D) None of these

63. The number of leaves in the curve  $r = a \sin 5\theta$  are :
- (A) Two (B) Five  
(C) Ten (D) None of these

64. If  $u = f(y+ax) + \phi(y-ax)$  then  $\frac{\partial^2 u}{\partial x^2} =$
- (A)  $\frac{\partial^2 u}{\partial y^2}$  (B)  $a^2 \frac{\partial^2 u}{\partial y^2}$   
(C)  $-a^2 \frac{\partial^2 u}{\partial y^2}$  (D)  $a \frac{\partial^2 u}{\partial y^2}$

65. If  $Z = \log(x^2 + y^2)$  then  $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} =$
- (A) 0 (B) 1  
(C) 2 (D) 3

66. If  $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots + \infty}}}$  then  $(2y-1) \frac{dy}{dx}$  is given by :
- (A)  $\sin x$  (B)  $\cos x$   
(C)  $\tan x$  (D)  $\cot x$

67. The series  $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - + \dots$  is :
- (A) Conditionally Convergent (B) Absolutely Convergent  
(C) Divergent (D) None of the above

68. The series  $1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots$  is :
- (A) Conditionally Convergent (B) Absolutely Convergent  
(C) Oscillatory (D) None of the above

69. The series  $\sum_{n=1}^{\infty} \frac{(n - 2 \log n)^n}{2^n n^n}$  is :
- (A) Convergent (B) Divergent  
(C) Oscillatory (D) None of these

70. The series  $\sum_{n=1}^{\infty} \frac{n \cdot 2^n}{n^n}$  is :

- (A) Convergent (B) Divergent  
(C) Oscillatory (D) None of these

71. The series  $\sum_{n=1}^{\infty} \frac{4 \cdot 7 \cdot \dots \cdot (3x+1)}{1 \cdot 2 \cdot \dots \cdot x} x^n$  is Convergent if :

- (A)  $|x| < 1$  (B)  
(C)  $|x| < \frac{1}{4}$  (D)  $|x| < \frac{1}{2}$

72.  $\int_1^2 \frac{\sqrt{x}}{\sqrt{3-x} + \sqrt{x}} dx =$

- (A) 0 (B)  $\frac{1}{2}$   
(C) 1 (D) None of these

73.  $\int_0^{\frac{\pi}{2}} \frac{2^{\sin x}}{2^{\sin x} + 2^{\cos x}} dx =$

$$\sum_{n=1}^{\infty} \left[ \frac{1}{3n+1} + \frac{1}{2} \frac{1}{n+3} + \dots + \frac{1}{2n} \right] =$$

- (A)  $\frac{\pi}{4}$  (B)  
(C) (D)

74.

- (A)  $\log_e 2$  (B)  $\log_e 3$   
(C)  $\log_e 6$  (D) None of these

75. The entire length of the curve  $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$  is :

- (A) 8a (B)  $4\sqrt{3}a$   
(C) 6a (D)  $\sqrt{8}a$

76. The perimeter of  $r = a(1 + \cos\theta)$  is :  
 (A)  $a$  (B)  $2a$   
 (C)  $4a$  (D)  $8a$
77. The length of one arch of Cycloid  $n = a(\theta + \sin\theta)$   $y = a(1 - \cos\theta)$  is :  
 (A)  $a$  (B)  $4a$   
 (C)  $8a$  (D)  $32a$
78. The area bounded by the curve  $y = 2x$ ,  $x$  - axis and the ordinates  $x = -2$ ,  $x = 3$  is equal to :  
 (A)  $2$  (B)  $13$   
 (C)  $4$  (D)  $8$
79. The area of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  is :  
 (A)  $2\pi ab$  (B)  $\pi ab$   
 (C)  $\frac{\pi ab}{2}$  (D) None of these
80. The area bounded by the curve  $y^2 = x$  and  $x^2 = y$  is given by :  
 (A)  $0$  (B)  $\frac{2}{3}$   
 (C)  $\frac{2}{3}$  (D)  $1$
81. The whole area of the curve  $r = a \cos 2\theta$  is :  
 (A)  $\frac{\pi a^2}{2}$  (B)  $\pi a^2$   
 (C)  $2\pi a^2$  (D)  $\frac{2\pi a^2}{3}$
82. The line  $y = x + 1$  is revolved about  $x$ -axis. The volume of solid of revolution formed by revolving the area covered by the given curve,  $x$ -axis and the lines  $x = 0$ ,  $x = 2$  is :  
 (A)  $\frac{19\pi}{3}$  (B)  $\frac{17\pi}{3}$   
 (C)  $\frac{13\pi}{3}$  (D)

83. The volume generated by revolution of the ellipse about major axis is

[assume that  $a > b$ ]:

- (A)  $\frac{4\pi ab^2}{3}$  (B)  $\frac{4\pi a^2 b}{3}$   
 (C)  $\frac{4\pi a^2 b^2}{3}$  (D) None of these

84. The surface of the solid of revolution about x-axis of the area bounded by the curve  $y = x$ , x-axis and the ordinates  $x = 0$  and  $x = 3$  is equal to :

- (A)  $4\sqrt{2}\pi$  (B)  $9\sqrt{2}\pi$   
 (C)  $11\sqrt{2}\pi$  (D)  $8\sqrt{2}\pi$

85. The value of  $\int_0^{\frac{\pi}{2}} \sin^6 x \, dx = :$

- (A)  $\frac{5\pi}{8}$  (B)  $\frac{5\pi}{16}$   
 (C)  $\frac{5\pi}{32}$  (D)  $\frac{5\pi}{64}$

86.  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2 x \, dx =$

- (A) 0 (B)  $\cos\pi^3$   
 (C)  $2\cos^3\pi$  (D) Does not exist

87. Order and degree of the differential equation  $\sqrt{2\left(\frac{dy}{dx}\right)^3 + 4} = \left(\frac{d^2y}{dx^2}\right)^{3/2}$  are respectively :

- (A) order 2, degree 3 (B) order 1, degree 3  
 (C) order 3, degree 2 (D) order 3, degree 1

88. If P, Q are functions of x, then solution of differential equation  $\frac{dy}{dx} + Py = Q$  is :
- (A)  $y e^{\int P dx} = \int Q e^{\int P dx} dx + c$  (B)  $y = e^{\int P dx} \int Q e^{\int P dx} dx + C$
- (C)  $y = \int Q e^{\int P dx} dx + C$  (D) None of these
89. The differential equation of the form  $\frac{dy}{dx} + Py = Qy^n$  where P and Q are functions of x, is called :
- (A) Auxiliary equation (B) Bessel's equation
- (C) Clairaut's equation (D) Bernoulli's equation
90. The solution of  $(y \cos x + 1) dx + \sin x dy = 0$  is :
- (A)  $x - y \sin x = cx$  (B)  $y + x \sin x = c$
- (C)  $y - x \sin x = c$  (D)  $x + y \sin x = c$
91. If at every point of a certain curve the slope of the tangent equals  $\frac{-2x}{y}$ , the curve is :
- (A) A straight line (B) A parabola
- (C) A circle (D) An ellipse
92. The integrating factor for the differential equation  $(x^2y - 2xy^2) dx - (x^3 - 3x^2y) dy$  is given by :
- (A) (B) xy
- (C)  $x^2y^2$  (D)  $\frac{1}{x^2y^2}$
93. The general solution of  $P = \log(px - y)$  is :
- (A)  $y = cx - e^c$  (B)  $y + cx = e^c$
- (C)  $y + x = \log c$  (D)  $y + c = e^x$
94. The general solution of a differential equation of first order represents :
- (A) A family of surfaces (B) A pair of curves in xy plane
- (C) A family of curves in xy plane (D) None of these

95. The singular solution of the differential equation  $P^3 + Px - y = 0$  is  $\left[ \text{where } P = \frac{dy}{dx} \right]$ :

- (A)  $27y^2 + 4x^3 = 0$  (B)  $y^2 = 4ax$   
 (C)  $x^2 + y^2 = a^2$  (D) None of these

96. The orthogonal trajectory of the family of curves  $ay^2 = x^3$  is:

- (A)  $3y^2 - 2x^2 = \text{constant}$  (B)  $2x^2 + y^2 = \text{constant}$   
 (C)  $3x^2 + y^2 = \text{constant}$  (D)  $2x^2 + 3y^2 = \text{constant}$

97. Solution of  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$  is:

- (A)  $c_1e^{-2x} + c_2e^x$  (B)  $c_1e^{2x} + c_2e^x$   
 (C)  $c_1e^{2x} + c_2e^{-2x}$  (D) None of these

98. The general solution of the differential equation  $D^2(D+1)^2y = e^x$  is:

- (A)  $y = c_1 + c_2x + (c_3 + c_4x)e^x$  (B)  $y = c_1 + c_2x + (c_3 + c_4x)e^{-x} + \frac{e^x}{4}$   
 (C)  $y = c_1 + c_2e^{-x} + (c_3 + c_4x)e^{-x} + \frac{e^x}{4}$  (D) None of these

99. The particular integral of the differential equation  $(D+2)(D-1)^3y = e^x$  is:

- (A)  $\frac{x^3e^x}{18}$  (B)  $x^3e^x$   
 (C)  $\frac{x^3e^x}{3}$  (D) None of these

100. The equation of the cylinder whose generators are parallel to the line  $\frac{x}{1} = \frac{y}{-2} = \frac{z}{3}$  and whose guiding curve is  $x^2 + 2y^2 = 1, z = 0$  is given by:

- (A)  $(3z-x)^2 + 2(2z+3y)^2 = 9$  (B)  $(3x+z)^2 + 2(3y-2z)^2 = 9$   
 (C)  $(3x-z)^2 + 2(3y+2z)^2 = 9$  (D)  $(2z+3x)^2 + 2(3y-x)^2 = 9$