



10. In the group  $(1, 2, 3, 4, 5, 6)$  under multiplication modulo 7,  $2^{-1} \times 4$  is equal to :
- (a) 1 (b) 4  
(c) 2 (d) 3
11. The maximum of the function  $3 \cos x - 4 \sin x$  is :
- (a) 2 (b) 3  
(c) 4 (d) 5
12. If the distance 's' metres traversed by a particle in  $t$  seconds is given by  $s = t^3 - 3t^2$ , then the velocity of the particle when the acceleration is zero, in metre/sec. is :
- (a) 3 (b) - 2  
(c) - 3 (d) 2
13. For the curve  $y^n = a^{n-1} x$  if the subnormal at any point is a constant then  $n$  is equal to :
- (a) 1 (b) 2  
(c) - 2 (d) - 1
14. If  $x = A \cos 4t + B \sin 4t$  then  $\frac{d^2x}{dt^2}$  is equal to :
- (a) - 16x (b) 16x  
(c) x (d) - x
15. If tangent to the curve  $x = at^2, y = 2at$  is perpendicular to x-axis, then its point of contact is :
- (a) (a, a) (b) (0, a)  
(c) (0, 0) (d) (a, 0)
16. The general solution of the differential equation  $\frac{dy}{dx} + \frac{1 + \cos 2y}{1 - \cos 2y} = 0$  is given by :
- (a)  $\tan y + \cot x = c$   
(b)  $\tan y - \cot x = c$   
(c)  $\tan x - \cot y = c$   
(d)  $\tan x + \cot x = c$
17. The degree of the differential equation  $\left(1 + \left(\frac{dy}{dx}\right)^2\right)^{3/4} = \left(\frac{d^2y}{dx^2}\right)^{1/3}$  is :
- (a) 2 (b) 4  
(c) 9 (d) 1
18. The area enclosed between the curves  $y = x^3$  and  $y = \sqrt{x}$  is, (in square units) :
- (a)  $\frac{5}{3}$  (b)  $\frac{5}{4}$   
(c)  $\frac{5}{12}$  (d)  $\frac{12}{5}$
19.  $\int_0^{\pi/8} \cos^3 4\theta d\theta$  is equal to :
- (a)  $\frac{5}{3}$  (b)  $\frac{5}{4}$   
(c)  $\frac{1}{3}$  (d)  $\frac{1}{6}$
20.  $\int_0^{\pi/2} \frac{\cos x - \sin x}{1 + \cos x \sin x} dx$  is equal to :
- (a) 0 (b)  $\frac{\pi}{2}$   
(c)  $\frac{\pi}{4}$  (d)  $\frac{\pi}{6}$
21. If  $ax^2 - y^2 + 4x - y = 0$  represents a pair of lines, then  $a$  is equal to :
- (a) - 16 (b) 16  
(c) 4 (d) - 4
22. What is the equation of the locus of a point which moves such that 4 times its distance from the x-axis is the square of its distance from the origin ?
- (a)  $x^2 + y^2 - 4y = 0$  (b)  $x^2 + y^2 - 4|y| = 0$   
(c)  $x^2 + y^2 - 4x = 0$  (d)  $x^2 + y^2 - 4|x| = 0$
23. Equation of the straight line making equal intercepts on the axes and passing through the point (2, 4) is :
- (a)  $4x - y - 4 = 0$  (b)  $2x + y - 8 = 0$   
(c)  $x + y - 6 = 0$  (d)  $x + 2y - 10 = 0$
24. If the area of the triangle with vertices  $(x, 0), (1, 1)$  and  $(0, 2)$  is 4 square units, then the value of  $x$  is :
- (a) - 2  
(b) - 4  
(c) - 6  
(d) 8

25.  $\lim_{\theta \rightarrow \frac{\pi}{2}} \frac{\frac{\pi}{2} - \theta}{\cot \theta}$   
 (a) 0 (b) -1  
 (c) 1 (d)  $\infty$
26. The co-axial system of circles given by  $x^2 + y^2 + 2gx + c = 0$  for  $c < 0$  represents :  
 (a) intersecting circles  
 (b) non intersecting circles  
 (c) touching circles  
 (d) touching or non-intersecting circles
27. The radius of the circle passing through the point (6, 2) and two of whose diameters are  $x + y = 6$  and  $x + 2y = 4$  is :  
 (a) 4 (b) 6  
 (c) 20 (d)  $\sqrt{20}$
28. If (0, 6) and (0, 3) are respectively the vertex and focus of a parabola, then its equation is :  
 (a)  $x^2 + 12y = 72$  (b)  $x^2 - 12y = 72$   
 (c)  $y^2 - 12x = 72$  (d)  $y^2 + 12x = 72$
29. For the ellipse  $24x^2 + 9y^2 - 150x - 90y + 225 = 0$  the eccentricity  $e$  is equal to :  
 (a)  $\frac{2}{5}$  (b)  $\frac{3}{5}$   
 (c)  $\frac{4}{5}$  (d)  $\frac{1}{5}$
30. If the foci of the ellipse  $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$  and the hyperbola  $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$  coincide, then the value of  $b^2$  is :  
 (a) 1 (b) 7  
 (c) 5 (d) 9
31. The differential coefficient is  $f(\sin x)$  with respect to  $x$  where  $f(x) = \log x$  is :  
 (a)  $\tan x$  (b)  $\cot x$   
 (c)  $f(\cos x)$  (d)  $\frac{1}{x}$
32. If  $f(x) = \begin{cases} \cos x & x > 0 \\ k & x = 0 \end{cases}$  for  $\lim_{x \rightarrow 0} f(x)$  to exist, then the value of  $k$  is :  
 (a) 0 (b)  $\frac{1}{2}$   
 (c)  $\frac{1}{4}$  (d)  $-\frac{1}{2}$
33. If  $\omega = \frac{-1 + \sqrt{3}i}{2}$  then  $(3 + \omega + 3\omega^2)^4$  is :  
 (a) 16 (b) -16  
 (c)  $16\omega$  (d)  $16\omega^2$
34. If  $y = \tan^{-1}(\sec x - \tan x)$ , then  $\frac{dy}{dx}$  is equal to :  
 (a) 2 (b) -2  
 (c)  $\frac{1}{2}$  (d)  $-\frac{1}{2}$
35. If  $x + \frac{1}{x} = 2 \cos \alpha$  then  $x^n + \frac{1}{x^n}$  is equal to :  
 (a)  $2^n \cos \alpha$  (b)  $2^n \cos n\alpha$   
 (c)  $2i \sin n\alpha$  (d)  $2 \cos n\alpha$
36.  $\int_{-1}^1 |1 - x| dx$  is equal to :  
 (a) -2  
 (b) 0  
 (c) 2  
 (d) 4
37.  $\int \frac{dx}{x(x^7 + 1)}$  is equal to :  
 (a)  $\log \left( \frac{x^7}{x^7 + 1} \right) + c$  (b)  $\frac{1}{7} \log \left( \frac{x^7}{x^7 + 1} \right) + c$   
 (c)  $\log \left( \frac{x^7 + 1}{x^7} \right) + c$  (d)  $\frac{1}{7} \log \left( \frac{x^7 + 1}{x^7} \right) + c$
38.  $\int \sqrt{x} e^{\sqrt{x}} dx$  is equal to :  
 (a)  $2\sqrt{x} - e^{\sqrt{x}} - 4\sqrt{x} e^{\sqrt{x}} + c$   
 (b)  $(2x - 4\sqrt{x} + 4)e^{\sqrt{x}} + c$   
 (c)  $(2x + 4\sqrt{x} + 4)e^{\sqrt{x}} + c$   
 (d)  $(1 - 4\sqrt{x})e^{\sqrt{x}} + c$

39.  $\int \frac{dx}{x^2 + 2x + 2}$  is equal to :
- (a)  $\sin^{-1}(x+1) + c$   
 (b)  $\sin h^{-1}(x+1) + c$   
 (c)  $\tan h^{-1}(x+1) + c$   
 (d)  $\tan^{-1}(x+1) + c$
40. If a tangent to the curve  $y = 6x - x^2$  is parallel to the line  $4x - 2y - 1 = 0$ , then the point of tangency on the curve is :
- (a) (2, 8) (b) (8, 2)  
 (c) (6, 1) (d) (4, 2)
41. 0.5737373 ... is equal to :
- (a)  $\frac{284}{497}$  (b)  $\frac{284}{495}$   
 (c)  $\frac{568}{999}$  (d)  $\frac{567}{990}$
42. The number of solutions for the equation  $x^2 - 5|x| + 6 = 0$  is :
- (a) 4 (b) 3  
 (c) 2 (d) 1
43. How many numbers of 6 digits can be formed from the digits of the number 112233 ?
- (a) 30 (b) 60  
 (c) 90 (d) 120
44. The last digit in  $7^{300}$  is :
- (a) 7 (b) 9  
 (c) 1 (d) 3
45. If  $\frac{\log x}{a-b} = \frac{\log y}{b-c} = \frac{\log z}{c-a}$ , then  $xyz$  is equal to :
- (a) 0 (b) 1  
 (c) -1 (d) 2
46. The smallest positive integer  $n$  for which  $(1+i)^{2n} = (1-i)^{2n}$  is :
- (a) 1 (b) 2  
 (c) 3 (d) 4
47. If  $\cos^{-1} p + \cos^{-1} q + \cos^{-1} r = \pi$  then  $p^2 + q^2 + r^2 + 2pqr$  is equal to :
- (a) 3 (b) 1  
 (c) 2 (d) -1
48. If  $\sin^{-1} \frac{x}{5} + \cos^{-1} \frac{y}{2} = \frac{\pi}{2}$  then
- to :
- (a) 1 (b) 4  
 (c) 3 (d) 5
49. If  $0 \leq x \leq \pi$  and  $81^{\sin^2 x} + 81^{\cos^2 x} = 30$ , then  $x$  is equal to :
- (a)  $\frac{\pi}{6}$  (b)  $\frac{\pi}{2}$   
 (c)  $\frac{\pi}{4}$  (d)  $\frac{3\pi}{4}$
50. The equation of the director circle of the hyperbola  $\frac{x^2}{16} - \frac{y^2}{4} = 1$  is given by :
- (a)  $x^2 + y^2 = 16$   
 (b)  $x^2 + y^2 = 4$   
 (c)  $x^2 + y^2 = 20$   
 (d)  $x^2 + y^2 = 12$
51. If  $Q_1$  is the set of all relations other than 1 with the binary operation  $*$  defined by  $a * b = a + b - ab$  for all  $a, b$  in  $Q_1$ , then the identity in  $Q_1$  with respect to  $*$  is :
- (a) 1  
 (b) 0  
 (c) -1  
 (d) 2
52. The circle  $x^2 + y^2 - 8x + 4y + 4 = 0$  touches :
- (a)  $x$ -axis  
 (b)  $y$ -axis  
 (c) both axis  
 (d) neither  $x$ -axis nor  $y$ -axis
53. Which of the following is true ?
- (a) The set of all fourth roots of unity is a multiplicative group  
 (b) The set of all cube roots of unity is an additive group  
 (c)  $(ab)^{-1} = a^{-1} b^{-1}$  for all  $a, b$  in any group  $G$   
 (d) If  $(ab)^2 = a^2 b^2$  for all  $a, b$  in any group  $G$ , then the group  $G$  is non abelian

54. The set of all integral multiples of 5 is a subgroup of :
- The set of all rational numbers under multiplication
  - The set of all integers under multiplication
  - The set of all non zero rational numbers under multiplication
  - The set of all integers under addition
55. The value of  $k$  so that  $x^2 + y^2 + kx + 4y + 2 = 0$  and  $2(x^2 + y^2) - 4x - 3y + k = 0$  cut orthogonally is :
- $\frac{10}{3}$
  - $-\frac{8}{3}$
  - $-\frac{10}{3}$
  - $\frac{8}{3}$
56.  $\lim_{x \rightarrow \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1}$  is equal to :
- $e^{12}$
  - $e^{-12}$
  - $e^4$
  - $e^3$

57. If  $A + B + C = \frac{\pi}{2}$  then  $\tan A \tan B \tan C$  equal to :
- 0
  - 1
  - 2
  - 3
58. In a triangle  $ABC$  if  $b = 2, B = 30^\circ$  then the area of the circumcircle of triangle  $ABC$  in square units is :
- $\pi$
  - $2\pi$
  - $4\pi$
  - $6\pi$
59. If  $\sin x + \sin^2 x = 1$ , then  $\cos^{12} x + 3 \cos^{10} x + 3 \cos^8 x + \cos^6 x$  is equal to :
- 1
  - 2
  - 3
  - 0
60. If  $R$  denotes the set of all real number, then the function  $f: R \rightarrow R$  defined  $f(x) = |x|$  is :
- one-one only
  - onto only
  - both one-one and onto
  - neither one-one nor onto

### Answer – Key

1. d	2. b	3. a	4. c	5. b	6. a	7. d	8. b	9. b	10. c
11. d	12. c	13. b	14. a	15. c	16. b	17. b	18. c	19. d	20. a
21. b	22. b	23. c	24. c	25. c	26. a	27. d	28. a	29. c	30. b
31. b	32. a	33. c	34. d	35. d	36. c	37. b	38. b	39. d	40. a
41. b	42. a	43. c	44. c	45. b	46. b	47. b	48. c	49. a	50. d
51. b	52. b	53. a	54. d	55. b	56. b	57. b	58. c	59. a	60. d