It is Challenge that you can get 80+ Marks

Objective Section

1. If $f(x) = x^2 - 2x + 1$, then $f(0) =$
   (a) -1 (b) 0 (c) 1 ✓ (d) 2
2. When we say that f is function from set X to set Y, then X is called
   (a) Domain of f ✓ (b) Range of f (c) Codomain of f (d) None of these
3. The term "Function" was recognized by_____ to describe the dependence of one quantity to another.
   (a) Lebnitz ✓ (b) Euler (c) Newton (d) Lagrange
4. If $f(x) = x^2$ then the range of f is
   (a) $[0,\infty)$ ✓ (b) $(-\infty, 0]$ (c) $(0, \infty)$ (d) None of these
5. $\text{Cosh}^2x - \text{Sinh}^2x =$
   (a) -1 (b) 0 (c) 1 ✓ (d) None of these
6. cosechx is equal to
   (a) $\frac{2}{e^x+e^{-x}}$ (b) $\frac{1}{e^x-e^{-x}}$ (c) $\frac{2}{e^x-e^{-x}}$ ✓ (d) $\frac{2}{e^{-x}+e^x}$
7. The domain and range of identity function , $I: X \to X$ is
   (a) X ✓ (b) +iv real numbers (c) –iv real numbers (d) integers
8. The linear function $f(x) = ax + b$ is constant function if
   (a) $a \neq 0, b = 1$ (b) $a = 1, b = 0$ (c) $a = 1, b = 1$ (d) $a = 0$ ✓
9. If $f(x) = 2x + 3, g(x) = x^2 - 1$, then $(gof)(x) =$
   (a) $2x^2 - 1$ (b) $4x^2 + 4x$✓ (c) $4x + 3$ (d) $x^4 - 2x^2$
10. If $f(x) = 2x + 3, g(x) = x^2 - 1$, then $(gog)(x) =$
   (a) $2x^2 - 1$ (b) $4x^2 + 4x$ (c) $4x + 3$ (d) $x^4 - 2x^2$✓
11. The inverse of a function exists only if it is
   (a) an into function (b) an onto function (c) (1-1) and into function ✓ (d) None of these
12. If $f(x) = 2 + \sqrt{x-1}$, then domain of f^{-1} =
   (a) $]2,\infty[$ (b) $[2,\infty[$ ✓ (c) $[1,\infty[$ (d) $]1,\infty[$
13. $\lim_{x\to\infty} e^x =$
   (a) 1 (b) ∞ (c) 0 ✓ (d) -1
14. $\lim_{x\to 0} \frac{\sin(x-3)}{x-3} =$
   (a) 1 ✓ (b) ∞ (c) $\frac{\sin 3}{3}$ (d) -3
15. $\lim_{x\to 0} \frac{\sin(x-a)}{x-a} =$
   (a) 1 ✓ (b) ∞ (c) $\frac{\sin a}{a}$ (d) -3
16. If $f(x) = x^3 + x$ is :
   (a) Even (b) Odd ✓ (c) Neither even nor odd (d) None
17. If $f: X \to Y$ is a function, then elements of x are called
   (a) Images (b) Pre-Images ✓ (c) Constant (d) Ranges
18. $\lim_{x\to 0} \left(\frac{x}{1+x}\right) =$
   (a) e (b) e^{-1}✓ (c) e^2 (d) $\sqrt{e}$
19. $\lim_{x\to 0} \frac{a^x-1}{x}$ is equal to
   (a) $\log_{e^x}$ (b) $\log_{a^x}$ (c) a (d) $\log_{e^a}$✓
20. $\lim_{x\to 0} \frac{\text{Sin}x^\circ}{x} =$

(a) $\frac{\pi}{180°}$ ✓ (b) $\frac{180°}{\pi}$ (c) 180π (d) 1

21. A function is said to be continuous at $x = c$ if
(a) $\lim_{x\to c} f(x)$ exists (b) $f(c)$ is defined (c) $\lim_{x\to c} f(x) = f(c)$ (d) All of these ✓

22. The function $f(x) = \frac{x^2-1}{x-1}$ is discontinuous at
(a) 1 ✓ (b) 2 (c) 3 (d) 4

23. L.H.L of $f(x) = |x-5|$ at $x = 5$ is
(a) 5 (b) 0 ✓ (c) 2 (d) 4

24. The change in variable x is called increment of x. It is denoted by δx which is
(a) +iv only (b) –iv only (c) +iv or –iv ✓ (d) none of these

25. The notation $\frac{dy}{dx}$ or $\frac{df}{dx}$ is used by
(a) Leibnitz ✓ (b) Newton (c) Lagrange (d) Cauchy

26. The notation $\dot{f}(x)$ is used by
(a) Leibnitz (b) Newton ✓ (c) Lagrange (d) Cauchy

27. The notation $f'(x)$ or y' is used by
(a) Leibnitz (b) Newton (c) Lagrange ✓ (d) Cauchy

28. The notation $Df(x)$ or Dy is used by
(a) Leibnitz (b) Newton (c) Lagrange (d) Cauchy ✓

29. $\lim_{x\to a} \frac{f(x)-f(a)}{x-a} =$
(a) $f'(x)$ ✓ (b) $f'(a)$ (c) $f(0)$ (d) $f(x-a)$

30. $\frac{d}{dx}(x^n) = nx^{n-1}$ is called
(a) Power rule ✓ (b) Product rule (c) Quotient rule (d) Constant

31. The derivative of a constant function is
(a) one (b) zero ✓ (c) undefined (d) None of these

32. The process of finding derivatives is called
(a) Differentiation ✓ (b) differential (c) Increment (d) Integration

33. If $f(x) = \frac{1}{x}$, then $f''(a) =$
(a) $-\frac{2}{(a)^3}$ (b) $-\frac{1}{a^2}$ (c) $\frac{1}{a^2}$ (d) $\frac{2}{a^3}$ ✓

34. $(fog)'(x) =$
(a) $f'g'$ (b) $f'g(x)$ (c) $f'(g(x))g'(x)$ ✓ (d) cannot be calculated

35. $\frac{d}{dx}(g(x))^n =$
(a) $n[g(x)]^{n-1}$ (b) $n[(g(x)]^{n-1}g(x)$ (c) $n[(g(x)]^{n-1}g'(x)$ ✓ (d) $[g(x)]^{n-1}g'(x)$

36. $\frac{d}{dx}\left(3x^{\frac{4}{3}}\right) =$
(a) $4x^{\frac{2}{3}}$ (b) $4x^{\frac{1}{3}}$ ✓ (c) $2x^{\frac{1}{3}}$ (d) $3x^{\frac{1}{3}}$

37. If $x = at^2$ and $y = 2at$ then $\frac{dy}{dx} =$
(a) $\frac{2}{ya}$ (b) $\frac{y}{2a}$ (c) $\frac{2a}{y}$ ✓ (d) $\frac{2}{y}$

38. $\frac{d}{dx}(\tan^{-1}x - \cot^{-1}x) =$
(a) $\frac{2}{\sqrt{1+x^2}}$ (b) $\frac{2}{1+x^2}$ ✓ (c) 0 (d) $\frac{-2}{1+x^2}$

39. If $\sin\sqrt{x}$, then $\frac{dy}{dx}$ is equal to
(a) $\frac{\cos\sqrt{x}}{2\sqrt{x}}$ ✓ (b) $\frac{\cos\sqrt{x}}{\sqrt{x}}$ (c) $\cos\sqrt{x}$ (d) $\frac{\cos x}{\sqrt{x}}$

40. $\frac{d}{dx}\sec^{-1}x =$
(a) $\frac{1}{|x|\sqrt{x^2-1}}$ ✓ (b) $\frac{-1}{|x|\sqrt{x^2-1}}$ (c) $\frac{1}{|x|\sqrt{1+x^2}}$ (d) $\frac{-1}{|x|\sqrt{1+x^2}}$

41. $\frac{d}{dx}\text{cosec}^{-1}x =$
(a) $\frac{1}{|x|\sqrt{x^2-1}}$ (b) $\frac{-1}{|x|\sqrt{x^2-1}}$ ✓ (c) $\frac{1}{|x|\sqrt{1+x^2}}$ (d) $\frac{-1}{|x|\sqrt{1+x^2}}$

42. Differentiating $\sin^3 x$ w.r.t $\cos^2 x$ is
(a) $-\frac{3}{2}\sin x$ ✓ (b) $\frac{3}{2}\sin x$ (c) $\frac{2}{3}\cos x$ (d) $-\frac{2}{3}\cos x$

43. If $\frac{y}{x} = \text{Tan}^{-1}\frac{x}{y}$ then $\frac{dy}{dx} =$
(a) $\frac{x}{y}$ (b) $-\frac{x}{y}$ (c) $\frac{y}{x}$ ✓ (d) $-\frac{y}{x}$

44. If $\tan y(1+\tan x) = 1-\tan x$, show that $\frac{dy}{dx} =$
(a) 0 (b) 1 (c) -1 ✓ (d) 2

45. $\frac{d}{dx}(\text{Sin}^{-1}x) = \frac{1}{\sqrt{1-x^2}}$ is valid for
(a) $0 < x < 1$ (b) $-1 < x < 0$ (c) $-1 < x < 1$ ✓ (d) None of these

46. If $y = x\sin^{-1}\left(\frac{x}{a}\right) + \sqrt{a^2-x^2}$ then $\frac{dy}{dx} =$
(a) $\text{Cos}^{-1}\frac{x}{a}$ (b) $\text{Sec}^{-1}\frac{x}{a}$ (c) $\text{Sin}^{-1}\frac{x}{a}$ ✓ (d) $\text{Tan}^{-1}\frac{x}{a}$

47. If $y = e^{-ax}$, then $y\frac{dy}{dx} =$
(a) $-ae^{-2ax}$ ✓ (b) $-a^2e^{ax}$ (c) a^2e^{-2ax} (d) $-a^2e^{-2ax}$

48. $\frac{d}{dx}(10^{\sin x}) =$
(a) $10^{\cos x}$ (b) $10^{\sin x}.\cos x.\ln 10$ ✓ (c) $10^{\sin x}.\ln 10$ (d) $10^{\cos x}.\ln 10$

49. If $y = e^{ax}$ then $\frac{dy}{dx} =$
(a) $\frac{1}{e^x}$ (b) ae^{ax} ✓ (c) e^{ax} (d) $\frac{1}{a}e^{ax}$

50. $\frac{d}{dx}(a^x) =$
(a) a^x (b) $e^x\ln a$ (c) $a^x.\ln a$ ✓ (d) $x^a.\ln a$

51. The function $f(x) = a^x, a > 0, a \neq 0$, and x is any real number is called
(a) Exponential function ✓ (b) logarithmic function (c) algebraic function (d) composite function

52. If $a > 0, a \neq 1$, and $x = a^y$ then the function defined by $y = \log_a{}^x$ $(x > 0)$ is called a logarithmic function with base
(a) 10 (b) e (c) a ✓ (d) x

52. $\log_a{}^a =$
(a) 1 ✓ (b) e (c) a^2 (d) not defined

53. $\frac{d}{dx}\log_a{}^x =$
(a) $\frac{1}{x}\log a$ (b) $\frac{1}{x\ln a}$ ✓ (c) $\frac{\ln x}{x\ln x}$ (d) $\frac{\ln a}{x\ln x}$

54. $\frac{d}{dx}\ln[f(x)] =$
(a) $f'(x)$ (b) $\ln f'(x)$ (c) $\frac{f'(x)}{f(x)}$ ✓ (d) $f(x).f'(x)$

55. If $y = \log 10^{(ax^2+bx+c)}$ then $\frac{dy}{dx} =$
(a) $\frac{1}{(ax^2+bx+c)\ln 10}$ ✓ (b) $\frac{2ax+b}{(ax^2+bx+c)}$ (c) $10^{ax^2+bx+c}\ln 10$ (d) $\frac{2ax+b}{(ax^2+bx+c)\ln a}$

56. $\ln a^e =$
(a) $\ln a$ (b) $\frac{1}{\ln a}$ ✓ (c) $\frac{1}{\ln a^e}$ (d) $\ln e^e$

57. If $y = e^{2x}$, then $y_4 =$
(a) $16e^{2x}$ ✓ (b) $8e^{2x}$ (c) $4e^{2x}$ (d) $2e^{2x}$

58. If $f(x) = e^{2x}$, then $f'''(x) =$
(a) $6e^{2x}$ (b) $\frac{1}{6}e^{2x}$ (c) $8e^{2x}$ ✓ (d) $\frac{1}{8}e^{2x}$

59. If $f(x) = x^3 + 2x + 9$ then $f''(x) =$
(a) $3x^2 + 2$ (b) $3x^2$ (c) $6x$ ✓ (d) $2x$

60. If $y = x^7 + x^6 + x^5$ then $D^8(y) =$
(a) 7! (b) $7!\,x$ (c) $7! + 6!$ (d) 0 ✓

61. $1 - x + x^2 - x^3 + x^4 + \cdots + (-1)^n x^n + \cdots$ is the expansion of
(a) $\frac{1}{1-x}$ (b) $\frac{1}{1+x}$ ✓ (c) $\frac{1}{\sqrt{1-x}}$ (d) $\frac{1}{\sqrt{1+x}}$

62. $f(x) = f(0) + xf'(x) + \frac{x^2}{2!}f''(x) + \frac{x^3}{3!}f'''(x) + \cdots \ldots + \frac{x^n}{n!}f^n(x) \ldots$ is called_____ series.
(a) Machlaurin's ✓ (b) Taylor's (c) Convergent (d) Divergent

63. $1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots\ldots\ldots\ldots$ is an expression of
(a) e^x (b) Sinx (c) Cosx ✓ (d) e^{-x}

64. $a_0 + a_1x + a_2x^2 + \cdots + a_nx^n + \cdots$ is
(a) Maclaurin's series (b) Taylor Series (c) Power Series ✓ (d) Bionomial Serie

65. A function f(x) is such that, at a point $x = c$, $f'(x) > 0$ at $x = c$, then f is said to be
(a) Increasing ✓ (b) decreasing (c) constant (d) 1-1 function

66. A function f(x) is such that, at a point $x = c$, $f'(x) < 0$ at $x = c$, then f is said to be
(a) Increasing (b) decreasing ✓ (c) constant (d) 1-1 function

67. A function f(x) is such that, at a point $x = c$, $f'(x) = 0$ at $x = c$, then f is said to be
(a) Increasing (b) decreasing (c) constant ✓ (d) 1-1 function

68. A stationary point is called _____ if it is either a maximum point or a minimum point
(a) Stationary point (b) turning point ✓ (c) critical point (d) point of inflexion

69. If $f'(c)$ does not change before and after $x = c$, then this point is called______
(a) Stationary point (b) turning point (c) critical point (d) point of inflexion ✓

70. Let f be a differentiable function such that $f'(c) = 0$ then if $f'(x)$ changes sign from -iv to +iv i.e., before and after $x = c$, then it occurs relative _____ at $x = c$
(a) Maximum (b) minimum ✓ (c) point of inflexion (d) none

71. Let f be a differentiable function such that $f'(c) = 0$ then if $f'(x)$ does not change sign i.e., before and after $x = c$, then it occurs _____ at $x = c$
(a) Maximum (b) minimum (c) point of inflexion ✓ (d) none

72. Let f be differentiable function in neighborhood of c and $f'(c) = 0$ then f(x) has relative maxima at c if
(a) $f''(c) > 0$ (b) $f''(c) < 0$ ✓ (c) $f''(c) = 0$ (d) $f''(c) \neq 0$

73. If $\int f(x)dx = \varphi(x) + c$, then f(x) is called
(a) Integral (b) differential (c) derivative (d) integrand ✓

74. Inverse of $\int \ldots .dx$ is:
(a) $\frac{d}{dx}$ ✓ (b) $\frac{dy}{dx}$ (c) $\frac{d}{dy}$ (d) $\frac{dx}{dy}$

75. Differentials are used to find:
(a) Approximate value ✓ (b) exact value (c) Both (a) and (b) (d) None of these

76. $xdy + ydx =$
(a) $d(x + y)$ (b) $d\left(\frac{x}{y}\right)$ ✓ (c) $d(x - y)$ (d) $d(xy)$

77. If $dy = \cos x dx$ then $\frac{dx}{dy} =$
(a) sinx (b) cosx (c) cscx (d) secx ✓

78. If $\int f(x)dx = \varphi(x) + c$, then f(x) is called
(a) Integral (b) differential (c) derivative (d) integrand ✓

79. If $y = f(x)$, then differential of y is
(a) $dy = f'(x)$ (b) $dy = f'(x)dx$ ✓ (c) $dy = f(x)dx$ (d) $\frac{dy}{dx}$

80. The inverse process of derivative is called:
(a) Anti-derivative (b) Integration ✓ (c) Both (a) and (b) (d) None of these

81. If $n \neq 1$, then $\int (ax + b)^n dx =$
(a) $\frac{n(ax+b)^{n-1}}{a} + c$ (b) $\frac{n(ax+b)^{n+1}}{n} + c$ (c) $\frac{(ax+b)^{n-1}}{n+1} + c$ (d) $\frac{(ax+b)^{n+1}}{a(n+1)} + c$ ✓

82. $\int \sin(ax+b)\,dx=$
(a) $\frac{-1}{a}\cos(ax+b)+c$ ✓ (b) $\frac{1}{a}\cos(ax+b)+c$ (c) $a\cos(ax+b)+c$ (d) $-a\cos(ax+b)+c$

83. $\int e^{-\lambda x}dx=$
(a) $\lambda e^{-\lambda x}+c$ (b) $-\lambda e^{-\lambda x}+c$ (c) $\frac{e^{-\lambda x}}{\lambda}+c$ (d) $\frac{e^{-\lambda x}}{-\lambda}+c$ ✓

84. $\int a^{\lambda x}dx=$
(a) $\frac{a^{\lambda x}}{\lambda}$ (b) $\frac{a^{\lambda x}}{\ln a}$ (c) $\frac{a^{\lambda x}}{\lambda \ln a}$ ✓ (d) $a^{\lambda x}\lambda.\ln a$

85. $\int [f(x)]^n f'(x)dx=$
(a) $\frac{f^n(x)}{n}+c$ (b) $f(x)+c$ (c) $\frac{f^{n+1}(x)}{n+1}+c$ ✓ (d) $nf^{n+1}(x)+c$

86. $\int \frac{f'(x)}{f(x)}dx=$
(a) $f(x)+c$ (b) $f'(x)+c$ (c) $\ln|x|+c$ ✓ (d) $\ln|f'(x)|+c$

87. $\int \frac{dx}{\sqrt{x+a}+\sqrt{x}}$ can be evaluated if
(a) $x>0, a>0$ ✓ (b) $x<0, a>0$ (c) $x<0, a<0$ (d) $x>0, a<0$

88. $\int \frac{x}{\sqrt{x^2+3}}dx=$
(a) $\sqrt{x^2+3}+c$ ✓ (b) $-\sqrt{x^2+3}+c$ (c) $\frac{\sqrt{x^2+3}}{2}+c$ (d) $-\frac{1}{2}\sqrt{x^2+3}+c$

89. $\int \frac{dx}{x\sqrt{x^2-1}}=$
(a) $\text{Sec}^{-1}x+c$ ✓ (b) $\text{Tan}^{-1}x+c$ (c) $\text{Cot}^{-1}x+c$ (d) $\text{Sin}^{-1}x+c$

90. $\int \frac{dx}{x\ln x}=$
(a) $\ln\ln x+c$ ✓ (b) $x+c$ (c) $\ln f'(x)+c$ (d) $f'(x)\ln f(x)$

91. In $\int (x^2-a^2)^{\frac{1}{2}}dx$, the substitution is
(a) $x=a\tan\theta$ (b) $x=a\sec\theta$ ✓ (c) $x=a\sin\theta$ (d) $x=2a\sin\theta$

92. The suitable substitution for $\int \sqrt{2ax-x^2}dx$ is:
(a) $x-a=a\cos\theta$ (b) $x-a=a\sin\theta$ ✓ (c) $x+a=a\cos\theta$ (d) $x+a=a\sin\theta$

93. $\int \frac{x+2}{x+1}dx=$
(a) $\ln(x+1)+c$ (b) $\ln(x+1)-x+c$ (c) $x+\ln(x+1)+c$ ✓ (d) None

94. The suitable substitution for $\int \sqrt{a^2+x^2}dx$ is:
(a) $x=a\tan\theta$ ✓ (b) $x=a\sin\theta$ (c) $x=a\cos\theta$ (d) None of these

95. $\int udv$ equals:
(a) $udu-\int vu$ (b) $uv+\int vdu$ (c) $uv-\int vdu$ ✓ (d) $udu+\int vdu$

96. $\int x\cos x\,dx=$
(a) $\sin x+\cos x+c$ (b) $\cos x-\sin x+c$ (c) $x\sin x+\cos x+c$ ✓ (d) None

97. $\int \frac{e^{\text{Tan}^{-1}x}}{1+x^2}dx=$
(a) $e^{\text{Tan}x}+c$ (b) $\frac{1}{2}e^{\text{Tan}^{-1}x}+c$ (c) $x\,e^{\text{Tan}^{-1}x}+c$ (d) $e^{\text{Tan}^{-1}x}+c$ ✓

98. $\int e^x\left[\frac{1}{x}+\ln x\right]=$
(a) $e^x\frac{1}{x}+c$ (b) $-e^x\frac{1}{x}+c$ (c) $e^x\ln x+c$ ✓ (d) $-e^x\ln x+c$

99. $\int e^x\left[\frac{1}{x}-\frac{1}{x^2}\right]=$
(a) $e^x\frac{1}{x}+c$ ✓ (b) $-e^x\frac{1}{x}+c$ (c) $e^x\ln x+c$ (d) $-e^x\frac{1}{x^2}+c$

100. $\int \frac{2a}{x^2-a^2}dx=$
(a) $\frac{x-a}{x+a}+c$ (b) $\ln\frac{x-a}{x+a}+c$ ✓ (c) $\ln\frac{x+a}{x-a}+c$ (d) $\ln|x-a|+c$

101. $\int_{\pi}^{-\pi}\sin x\,dx=$
(a) 2 ✓ (b) -2 (c) 0 (d) -1

102. $\int_{-1}^{2}|x|dx=$

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) $\frac{5}{2}$ (d) $\frac{3}{2}$ ✓

103. $\int_0^1 (4x+k)dx = 2$ then $k =$
(a) 8 (b) -4 (c) 0 ✓ (d) -2

104. $\int_0^3 \frac{dx}{x^2+9} =$
(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{12}$ ✓ (c) $\frac{\pi}{2}$ (d) None of these

105. $\int_0^{-\pi} \sin x dx$ equals to:
(a) -2 (b) 0 (c) 2 ✓ (d) 1

106. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos t dt =$
(a) $\frac{\sqrt{3}}{2} - \frac{1}{2}$ ✓ (b) $\frac{\sqrt{3}}{2} + \frac{1}{2}$ (c) $\frac{1}{2} - \frac{\sqrt{3}}{2}$ (d) None

107. $\int_a^a f(x) =$
(a) 0 ✓ (b) $\int_b^a f(x)dx$ (c) $\int_b^a f(x)dx$ (d) $\int_a^a f(x)dx$

108. $\int_0^2 2x dx$ is equal to
(a) 9 (b) 7 (c) 4 ✓ (d) 0

109. To determine the area under the curve by the use of integration, the idea was given by
(a) Newton (b) Archimedes ✓ (c) Leibnitz (d) Taylor

110. The order of the differential equation : $x\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2 = 0$
(a) 0 (b) 1 (c) 2 ✓ (d) more than 2

111. The equation $y = x^2 - 2x + c$ represents (c being a parameter)
(a) One parabola (b) family of parabolas ✓ (c) family of line (d) two parabolas

112. Solution of the differential equation: $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$
(a) $y = \sin^{-1} x + c$ ✓ (b) $y = \cos^{-1} x + c$ (c) $y = \tan^{-1} x + c$ (d) None

113. The general solution of differential equation $\frac{dy}{dx} = -\frac{y}{x}$ is
(a) $\frac{x}{y} = c$ (b) $\frac{y}{x} = c$ (c) $xy = c$ ✓ (d) $x^2y^2 = c$

114. Solution of differential equation $\frac{dv}{dt} = 2t - 7$ is :
(a) $v = t^2 - 7t^3 + c$ (b) $v = t^2 + 7t + c$ (c) $v = t - \frac{7t^2}{2} + c$ (d) $v = t^2 - 7t + c$ ✓

115. The solution of differential equation $\frac{dy}{dx} = \sec^2 x$ is
(a) $y = \cos x + c$ (b) $y = \tan x + c$ ✓ (c) $y = \sin x + c$ (d) $y = \cot x + c$

116. If $x < 0, y < 0$ then the point $P(x,y)$ lies in the quadrant
(a) I (b) II (c) III ✓ (d) IV

117. The point P in the plane that corresponds to the ordered pair (x,y) is called:
(a) graph of (x,y) ✓ (b) mid-point of x, y (c) abscissa of x, y (d) ordinate of x, y

118. The straight line which passes through one vertex and perpendicular to opposite side is called:
(a) Median (b) altitude ✓ (c) perpendicular bisector (d) normal

119. The point where the medians of a triangle intersect is called________ of the triangle.
(a) Centroid ✓ (b) centre (c) orthocenter (d) circumference

120. The point where the altitudes of a triangle intersect is called________ of the triangle.
(a) Centroid (b) centre (c) orthocenter ✓ (d) circumference

121. The centroid of a triangle divides each median in the ration of
(a) 2:1 ✓ (b) 1:2 (c) 1:1 (d) None of these

122. The point where the angle bisectors of a triangle intersect is called________ of the triangle.
(a) Centroid (b) in centre ✓ (c) orthocenter (d) circumference

123. The two intercepts form of the equation of the straight line is
(a) $y = mx + c$ (b) $y - y_1 = m(x - x_1)$ (c) $\frac{x}{a} + \frac{y}{b} = 1$ ✓ (d) $x\cos\alpha + y\cos\alpha = p$

124. The Normal form of the equation of the straight line is
(a) $y = mx + c$ (b) $y - y_1 = m(x - x_1)$ (c) $\frac{x}{a} + \frac{y}{b} = 1$ (d) $x\cos\alpha + y\cos\alpha = p$ ✓

125. In the normal form $x\cos\alpha + y\cos\alpha = p$ the value of p is
(a) Positive ✓ (b) Negative (c) positive or negative (d) Zero

126. If α is the inclination of the line l then $\frac{x-x_1}{\cos\alpha} = \frac{y-y_1}{\sin\alpha} = r$ (say)
(a) Point-slope form (b) normal form (c) symmetric form ✓ (d) none of these

127. The slope of the line $ax + by + c = 0$ is
(a) $\frac{a}{b}$ (b) $-\frac{a}{b}$ ✓ (c) $\frac{b}{a}$ (d) $-\frac{b}{a}$

128. The slope of the line perpendicular to $ax + by + c = 0$
(a) $\frac{a}{b}$ (b) $-\frac{a}{b}$ (c) $\frac{b}{a}$ ✓ (d) $-\frac{b}{a}$

129. The general equation of the straight line in two variables x and y is
(a) $ax + by + c = 0$ ✓ (b) $ax^2 + by + c = 0$ (c) $ax + by^2 + c = 0$ (d) $ax^2 + by^2 + c = 0$

130. The x − intercept $4x + 6y = 12$ is
(a) 4 (b) 6 (c) 3✓ (d) 2

131. The lines $2x + y + 2 = 0$ and $6x + 3y - 8 = 0$ are
(a) Parallel ✓ (b) perpendicular (c) neither (d) non coplanar

132. If φ be an angle between two lines l_1 and l_2 when slopes m_1 and m_2, then angle from l_1 to l_2
(a) $\tan\varphi = \frac{m_1-m_2}{1+m_1 m_2}$ (b) $\tan\varphi = \frac{m_2-m_1}{1+m_2 m_1}$ ✓ (c) $\tan\varphi = \frac{m_1+m_2}{1+m_1 m_2}$ (d) $\tan\varphi = \frac{m_2+m_1}{1+m_1 m_2}$

133. If φ be an acute angle between two lines l_1 and l_2 when slopes m_1 and m_2, then acute angle from l_1 to l_2
(a) $|\tan\varphi = \frac{m_1-m_2}{1+m_1 m_2}|$ (b) $|\tan\varphi = \frac{m_2-m_1}{1+m_2 m_1}|$ ✓ (c) $|\tan\varphi = \frac{m_1+m_2}{1+m_1 m_2}|$ (d) $|\tan\varphi = \frac{m_2+m_1}{1+m_1 m_2}|$

134. Two lines l_1 and l_2 with slopes m_1 and m_2 are parallel if
(a) $m_1 - m_2 = 0$✓ (b) $m_1 + m_2 = 0$ (c) $m_1 m_2 = 0$ (d) $m_1 m_2 = -1$

135. Two lines l_1 and l_2 with slopes m_1 and m_2 are perpendicular if
(a) $m_1 - m_2 = 0$ (b) $m_1 + m_2 = 0$ (c) $m_1 m_2 = 0$ (d) $m_1 m_2 = -1$ ✓

136. The lines represented by $ax^2 + 2hxy + by^2 = 0$ are orthogonal if
(a) $a - b = 0$ (b) $a + b = 0$ ✓ (c) $a + b > 0$ (d) $a - b < 0$

137. The lines lying in the same plane are called
(a) Collinear (b) coplanar ✓ (c) non-collinear (d) non-coplanar

138. The distance of the point (3,7) from the x − axis is
(a) 7 ✓ (b) -7 (c) 3 (d) -3

139. Two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel if
(a) $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ ✓ (b) $\frac{a_1}{b_1} = -\frac{a_2}{b_2}$ (c) $\frac{a_1}{c_1} = \frac{a_2}{c_2}$ (d) $\frac{b_1}{c_1} = \frac{b_2}{c_2}$

140. The equation $y^2 - 16 = 0$ represents two lines.
(a) Parallel to x − axis ✓ (b) Parallel y − axis (c) not || to x − axis (d) not || to y − axis

141. The perpendicular distance of the line $3x + 4y + 10 = 0$ from the origin is
(a) 0 (b) 1 (c) 2 ✓ (d) 3

142. The lines represented by $ax^2 + 2hxy + by^2 = 0$ are orthogonal if
(a) $a - b = 0$ (b) $a + b = 0$✓ (c) $a + b > 0$ (d) $a - b < 0$

143. Every homogenous equation of second degree $ax^2 + bxy + by^2 = 0$ represents two straight lines
(a) Through the origin✓ (b) not through the origin (c) two || line (d) two ⊥ar lines

144. The equation $10x^2 - 23xy - 5y^2 = 0$ is homogeneous of degree
(a) 1 (b) 2 ✓ (c) 3 (d) more than 2

145. The equation $y^2 - 16 = 0$ represents two lines.
(a) Parallel to x − axis ✓ (b) Parallel y − axis (c) not || to x − axis (d) not || to y − axis

146. (0,0) is satisfied by
(a) $x - y < 10$ (b) $2x + 5y > 10$ (c) $x - y \geq 13$✓ (d) None

147. The point where two boundary lines of a shaded region intersect is called ____ point.
(a) Boundary (b) corner ✓ (c) stationary (d) feasible

148. If $x > b$ then
(a) $-x > -b$ (b) $-x < b$ (c) $x < b$ (d) $-x < -b$ ✓

149. The symbols used for inequality are
(a) 1 (b) 2 (c) 3 (d) 4 ✓

150. An inequality with one or two variables has _______ solutions.
(a) One (b) two (c) three (d) infinitely many ✓

151. $ax + by < c$ is not a linear inequality if
(a) $a = 0, b = 0$ ✓ (b) $a \neq 0, b \neq 0$ (c) $a = 0, b \neq 0$ (d) $a \neq 0, b = 0, c = 0$

152. The graph of corresponding linear equation of the linear inequality is a line called_______
(a) Boundary line ✓ (b) horizontal line (c) vertical line (d) inclined line

153. The graph of a linear equation of the form $ax + by = c$ is a line which divides the whole plane into _____ disjoints parts.
(a) Two ✓ (b) four (c) more than four (d) infinitely many

154. The graph of the inequality $x \leq b$ is
(a) Upper half plane (b) lower half plane (c) left half plane ✓ (d) right half plane

155. The graph of the inequality $y \leq b$ is
(b) Upper half plane (b) lower half plane ✓ (c) left half plane (d) right half plane

156. The feasible solution which maximizes or minimizes the objective function is called
(a) Exact solution (b) optimal solution ✓ (c) final solution (d) objective function

157. Solution space consisting of all feasible solutions of system of linear in inequalities is called
(a) Feasible solution (b) Optimal solution (c) Feasible region ✓ (d) General solution

158. Corner point is also called
(a) Origin (b) Focus (c) Vertex ✓ (d) Test point

159. For feasible region:
(a) $x \geq 0, y \geq 0$ ✓ (b) $x \geq 0, y \leq 0$ (c) $x \leq 0, y \geq 0$ (d) $x \leq 0, y \leq 0$

160. $x = 0$ is in the solution of the inequality
(a) $x < 0$ (b) $x + 4 < 0$ (c) $2x + 3 > 0$ ✓ (d) $2x + 3 < 0$

161. Linear inequality $2x - 7y > 3$ is satisfied by the point
(a) (5,1) (b) (-5,-1) (c) (0,0) (d) (1,-1) ✓

162. The non-negative constraints are also called
(a) Decision variable ✓ (b) Convex variable (c) Decision constraints (d) concave variable

163. If the line segment obtained by joining any two points of a region lies entirely within the region, then the region is called
(a) Feasible region (b) Convex region ✓ (c) Solution region (d) Concave region

164. A function which is to be maximized or minimized is called:
(a) Linear function (b) Objective function ✓ (c) Feasible function (d) None of these

165. For optimal solution we evaluate the objective function at
(a) Origen (b) Vertex (c) Corner Points ✓ (d) Convex points

166. We find corner points at
(a) Origen (b) Vertex (c) Feasible region ✓ (d) Convex region

167. The set of points which are equal distance from a fixed point is called:
(a) Circle ✓ (b) Parabola (c) Ellipse (d) Hyperbola

168. The circle whose radius is zero is called:
(a) Unit circle (b) point circle ✓ (c) circumcircle (d) in-circle

169. The circle whose radius is 1 is called:
(a) Unit circle ✓ (b) point circle (c) circumcircle (d) in-circle

170. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents the circle with centre
(a) (g, f) (b) $(-g, -f)$ ✓ (c) $(-f, -g)$ (d) $(g, -f)$

171. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents the circle with centre
(a) $\sqrt{g^2 + f^2 - c}$ ✓ (b) $\sqrt{g^2 + f^2 + c}$ (c) $\sqrt{g^2 + c^2 - f}$ (d) $\sqrt{g + f - c}$

172. The ratio of the distance of a point from the focus to distance from the directrix is denoted by
(a) r ✓ (b) R (c) E (d) e

173. Standard equation of Parabola is:
(a) $y^2 = 4a$ (b) $x^2 + y^2 = a^2$ (c) $y^2 = 4ax$ ✓ (d) $S = vt$

174. The focal chord is a chord which is passing through
(a) Vertex ✓ (b) Focus (c) Origin (d) None of these

175. The curve $y^2 = 4ax$ is symmetric about
(a) $y-$axis ✓ (b) $x-$axis (c) Both (a) and (b) (d) None of these

176. Latusrectum of $x^2 = -4ay$ is
(a) $x = a$ (b) $x = -a$ (c) $y = a$ (d) $y = -a$ ✓

177. Eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is
(a) $\frac{a}{c}$ (b) ac (c) $\frac{c}{a}$ ✓ (d) None of these

178. Focus of $y^2 = -4ax$ is
(a) $(0, a)$ (b) $(-a, 0)$ ✓ (c) $(a, 0)$ (d) $(0, -a)$

179. A type of the conic that has eccentricity greater than 1 is
(a) An ellipse (b) A parabola (c) A hyperbola ✓ (d) A circle

180. $x^2 + y^2 = -5$ represents the
(a) Real circle (b) Imaginary circle ✓ (c) Point circle (d) None of these

181. Which one is related to circle
(a) $e = 1$ (b) $e > 1$ (c) $e < 1$ (d) $e = 0$ ✓

182. Circle is the special case of:
(a) Parabola (b) Hyperbola (c) Ellipse ✓ (d) None of these

183. Equation of the directrix of $x^2 = -4ay$ is:
(a) $x + a = 0$ (b) $x - a = 0$ (c) $y + a = 0$ (d) $y - a = 0$ ✓

184. The midpoint of the foci of the ellipse is its
(a) Vertex (b) Centre ✓ (c) Directrix (d) None of these

185. Focus of the ellipse always lies on the
(a) Minor axis (b) Major axis ✓ (c) Directrix (d) None of these

186. Length of the major axis of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b$ is
(a) 2a ✓ (b) 2b (c) $\frac{2b^2}{a}$ (d) None of these

187. In the cases of ellipse, it is always true that:
(a) $a^2 > b^2$ ✓ (b) $a^2 < b^2$ (c) $a^2 = b^2$ (d) $a < 0, b < 0$

188. Two conics always intersect each other in _____ points
(a) No (b) one (c) two (d) four ✓

189. The eccentricity of ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is
(a) $\frac{\sqrt{7}}{4}$ ✓ (b) $\frac{7}{4}$ (c) 16 (d) 9

190. The foci of an ellipse are (4,1) and (0,1) then its centre is:
(a) (4,2) (b) (2,1) ✓ (c) (2,0) (d) (1,2

191. The foci of hyperbola always lie on:
(a) $x-$axis (b) Transverse axis ✓ (c) $y-$axis (d) Conjugate axis

192. Length of transverse axis of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is
(a) 2a ✓ (b) 2b (c) a (d) b

193. $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is symmetric about the:
(a) $y-$axis (b) $x-$axis (c) Both (a) and (b) ✓ (d) None of these

192. Two vectors are said to be negative of each other if they have the same magnitude and _________direction.
(a) Same (b) opposite ✓ (c) negative (d) parallel

193. Parallelogram law of vector addition to describe the combined action of two forces, was used by
(a) Cauchy (b) Aristotle ✓ (c) Alkhwarzmi (d) Leibnitz

194. The vector whose initial point is at the origin and terminal point is P , is called

(a) Null vector (b) unit vector (c) position vector ✓ (d) normal vector

195. If R be the set of real numbers, then the Cartesian plane is defined as
(a) $R^2 = \{(x^2, y^2): x, y \in R\}$ (b) $R^2 = \{(x, y): x, y \in R\}$ ✓
(c) $R^2 = \{(x, y): x, y \in R, x = -y\}$ (d) $R^2 = \{(x, y): x, y \in R, x = y\}$

196. The element $(x, y) \in R^2$ represents a
(a) Space (b) point ✓ (c) vector (d) line

197. If $\underline{u} = [x, y]$ in R^2, then $|\underline{u}| = ?$
(a) $x^2 + y^2$ (b) $\sqrt{x^2 + y^2}$ ✓ (c) $\pm\sqrt{x^2 + y^2}$ (d) $x^2 - y^2$

198. If $|\underline{u}| = \sqrt{x^2 + y^2} = 0$, then it must be true that
(a) $x \geq 0, y \geq 0$ (b) $x \leq 0, y \leq 0$ (c) $x \geq 0, y \leq 0$ (d) $x = 0, y = 0$ ✓

199. Each vector $[x, y]$ in R^2 can be uniquely represented as
(a) $x\underline{i} - y\underline{j}$ (b) $x\underline{i} + y\underline{j}$ ✓ (c) $x + y$ (d) $\sqrt{x^2 + y^2}$

200. The lines joining the mid-points of any two sides of a triangle is always ____to the third side.
(a) Equal (b) Parallel ✓ (c) perpendicular (d) base

201. If $\underline{u} = 3\underline{i} - \underline{j} + 2\underline{k}$ then [3,-1,2] are called ___________ of $\underline{u}$.
(a) Direction cosines (b) direction ratios ✓ (c) direction angles (d) elements

202. Which of the following can be the direction angles of some vector
(a) $45°, 45°, 60°$ (b) $30°, 45°, 60°$ (c) $45°, 60°, 60°$ ✓ (d) obtuse

203. Measure of angle θ between two vectors is always.
(a) $0 < \theta < \pi$ (b) $0 \leq \theta \leq \frac{\pi}{2}$ (c) $0 \leq \theta \leq \pi$ ✓ (d) obtuse

204. If the dot product of two vectors is zero, then the vectors must be
(a) Parallel (b) orthogonal ✓ (c) reciprocal (d) equal

205. If the cross product of two vectors is zero, then the vectors must be
(a) Parallel ✓ (b) orthogonal (c) reciprocal (d) Non coplanar

206. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then $\cos\theta =$
(a) $\frac{a \times b}{|a||b|}$ (b) $\frac{a.b}{|a||b|}$ ✓ (c) $\frac{a.b}{|a|}$ (d) $\frac{a.b}{|b|}$

207. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then projection of $\underline{b}$ along $\underline{a}$ is
(a) $\frac{a \times b}{|a||b|}$ (b) $\frac{a.b}{|a||b|}$ (c) $\frac{a.b}{|a|}$ ✓ (d) $\frac{a.b}{|b|}$

208. If θ be the angle between two vectors $\underline{a}$ and $\underline{b}$, then projection of $\underline{a}$ along $\underline{b}$ is
(a) $\frac{a \times b}{|a||b|}$ (b) $\frac{a.b}{|a||b|}$ (c) $\frac{a.b}{|a|}$ (d) $\frac{a.b}{|b|}$ ✓

209. Let $\underline{u} = a\underline{i} + b\underline{j} + c\underline{k}$ then projection of $\underline{u}$ along $\underline{i}$ is
(a) a ✓ (b) b (c) c (d) u

210. In any ΔABC, the law of cosine is
(a) $a^2 = b^2 + c^2 - 2bcCosA$ ✓ (b) $a = bCosC + cCosB$ (c) $a.b = 0$ (d) $a - b = 0$

211. In any ΔABC, the law of projection is
(a) $a^2 = b^2 + c^2 - 2bcCosA$ (b) $a = bCosC + cCosB$ ✓ (c) $a.b = 0$ (d) $a - b = 0$

212. If $\underline{u}$ is a vector such that $\underline{u}.\underline{i} = 0, \underline{u}.\underline{j} = 0, \underline{u}.\underline{k} = 0$ then $\underline{u}$ is called
(a) Unit vector (b) null vector ✓ (c) $[\underline{i}, \underline{j}, \underline{k}]$ (d) none of these

213. Cross product or vector product is defined
(a) In plane only (b) in space only ✓ (c) everywhere (d) in vector field

214. If $\underline{u}$ and $\underline{v}$ are two vectors, then $\underline{u} \times \underline{v}$ is a vector
(a) Parallel to $\underline{u}$ and $\underline{v}$ (b) parallel to $\underline{u}$ (c) perpendicular to $\underline{u}$ and $\underline{v}$ ✓ (d) orthogonal to $\underline{u}$

215. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of ||gram then the area of ||gram is
(a) $\underline{u} \times \underline{v}$ (b) $|\underline{u} \times \underline{v}|$ ✓ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) $\frac{1}{2}|\underline{u} \times \underline{v}|$

216. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of triangle then the area of triangle is
(a) $\underline{u} \times \underline{v}$ (b) $|\underline{u} \times \underline{v}|$ (c) $\frac{1}{2}(\underline{u} \times \underline{v})$ (d) $\frac{1}{2}|\underline{u} \times \underline{v}|$ ✓

217. The scalar triple product of $\underline{a}$, $\underline{b}$ and $\underline{c}$ is denoted by

(a) $\underline{a}.\underline{b}.\underline{c}$ (b) $\underline{a}.\underline{b}\times\underline{c}$ ✓ (c) $\underline{a}\times\underline{b}\times\underline{c}$ (d) $(\underline{a}+\underline{b})\times\underline{c}$

218. Cross product or vector product is defined
(a) In plane only (b) in space only ✓ (c) everywhere (d) in vector field

219. If $\underline{u}$ and $\underline{v}$ are two vectors , then $\underline{u}\times\underline{v}$ is a vector
(a) Parallel to $\underline{u}$ and $\underline{v}$ (b) parallel to $\underline{u}$ (c) perpendicular to $\underline{u}$ and $\underline{v}$ ✓ (d) orthogonal to $\underline{u}$

220. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of ||gram then the area of ||gram is
(a) $\underline{u}\times\underline{v}$ (b) $|\underline{u}\times\underline{v}|$ ✓ (c) $\frac{1}{2}(\underline{u}\times\underline{v})$ (d) $\frac{1}{2}|\underline{u}\times\underline{v}|$

221. If $\underline{u}$ and $\underline{v}$ be any two vectors, along the adjacent sides of triangle then the area of triangle is
(a) $\underline{u}\times\underline{v}$ (b) $|\underline{u}\times\underline{v}|$ (c) $\frac{1}{2}(\underline{u}\times\underline{v})$ (d) $\frac{1}{2}|\underline{u}\times\underline{v}|$ ✓

222. Two non-zero vectors are perpendicular iff
(a) $\underline{u}.\underline{v}=1$ (b) $\underline{u}.\underline{v}\neq 1$ (c) $\underline{u}.\underline{v}\neq 0$ (d) $\underline{u}.\underline{v}=0$ ✓

223. The scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by
(b) $\underline{a}.\underline{b}.\underline{c}$ (b) $\underline{a}.\underline{b}\times\underline{c}$ ✓ (c) $\underline{a}\times\underline{b}\times\underline{c}$ (d) $(\underline{a}+\underline{b})\times\underline{c}$

224. The vector triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is denoted by
(a) $\underline{a}.\underline{b}.\underline{c}$ (b) $\underline{a}.\underline{b}\times\underline{c}$ (c) $\underline{a}\times\underline{b}\times\underline{c}$ ✓ (d) $(\underline{a}+\underline{b})\times\underline{c}$

225. Notation for scalar triple product of $\underline{a}$,$\underline{b}$ and $\underline{c}$ is
(a) $\underline{a}.\underline{b}\times\underline{c}$ (b) $\underline{a}\times\underline{b}.\underline{c}$ (c) $[\underline{a}.\underline{b}.\underline{c}]$ (d) all of these ✓

226. If the scalar product of three vectors is zero, then vectors are
(a) Collinear (b) coplanar ✓ (c) non coplanar (d) non-collinear

227. If any two vectors of scalar triple product are equal, then its value is equal to
(a) 1 (b) 0 ✓ (c) -1 (d) 2

228. Moment of a force $\underline{F}$ about a point is given by:
(a) Dot product (b) cross product ✓ (c) both (a) and (b) (d) None of these

Question No.2: Short Questions

1. $x=at^2, y=2at$ represent the equation of parabola $y^2=4ax$
2. Express the perimeter P of square as a function of its area A.
3. Show that $x=a\cos\theta, y=b\sin\theta$ represent the equation of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$
4. Show that: $\sinh 2x = 2\sinh x\cosh x$
   Express the volume V of a cube as a function of the area A of its base.
5. Find $\frac{f(a+h)-f(a)}{h}$ and simplify $f(x)=\cos x$
6. $f(x)=\frac{1}{\sqrt{x-1}}, x\neq 1$; $g(x)=(x^2+1)^2$
7. (a) $f^{-1}(x)$ (b) $f^{-1}(-1)$ and verify $f(f^{-1}(x))=f^{-1}f(x))=xf(x)=\frac{2x+1}{x-1}, x>1$
8. Show that $\lim_{x\to 0}\frac{a^x-1}{x}=\log_e a$
9. Evaluate $\lim_{x\to 0}\frac{\mathrm{Sin}7x}{x}$
10. Evaluate $\lim_{n\to+\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}}$
11. $\mathrm{Lim}_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}$
12. $\mathrm{Lim}_{x\to 0}(1+2x^2)^{\frac{1}{x^2}}$
13. Evaluate $\lim_{\theta\to 0}\frac{1-\cos\theta}{\theta}$
14. Evaluate $\lim_{x\to 0}\frac{x^n-a^n}{x^m-a^m}$
15. $\mathrm{Lim}_{x\to 0}\frac{e^{1/x}-1}{e^{1/x}+1}, x>0$

16. (i) $\lim_{x\to 0} \frac{\sin x^0}{x}$ (ii) $\lim_{\theta\to 0} \frac{1-\cos\theta}{\sin\theta}$ (iii) $\lim_{x\to 0} \frac{\sin ax}{\sin bx}$
17. Discuss the continuity of the function at $x = 3$ $g(x) = \frac{x^2-9}{x-3}$ if $x \neq 3$
18. Discuss the continuity of f(x) at x = c: $f(x) = \begin{cases} 2x+5 \text{ if } x \leq 2 \\ 4x+1 \text{ if } x > 2 \end{cases}, c = 2$
19. Discuss the continuity of f(x) at 3, when $f(x) = \begin{cases} x-1, \text{ if } x \leq 3 \\ 2x+1 \text{ if } 3 \leq x \end{cases}$
20. Find the derivative of the given function by definition $f(x) = x^2$
21. Find the derivative of the given function by definition $f(x) = \frac{1}{\sqrt{x}}$
22. Find the derivative of $y = (2\sqrt{x}+2)(x-\sqrt{x})$ w.r.t 'x'
23. Differentiate $\frac{2x^3-3x^2+5}{x^2+1}$ w.r.t 'x'
24. If $x^4 + 2x^2 + 2$, Prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$
25. Differentiate $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$ w.r.t 'x'.
26. Differentiate $(x-5)(3-x)$
27. Find $\frac{dy}{dx}$ if $x = \theta + \frac{1}{\theta}, y = \theta + 1$
28. Find $\frac{dy}{dx}$ by making some suitable substitution if $y = \sqrt{x+\sqrt{x}}$
29. Differentiate $x^2 + \frac{1}{x^2}$ w.r.t $x - \frac{1}{x}$
30. Find $\frac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$
31. Find $\frac{dy}{dx}$ if $x^2 + y^2 = 4$
32. Find $\frac{dy}{dx}$ if $y = x^n$ where $n = \frac{p}{q}, q \neq 0$
33. If $y = (ax+b)^n$ where n is negative integer, find $\frac{dy}{dx}$ using quotient theorem.
34. Find $\frac{dy}{dx}$ if $xy + y^2 = 2$
35. Differentiate $(1+x^2)$ w.r.t x^2
36. Find $\frac{dy}{dx}$ if $3x + 4y + 7 = 0$
37. Find $\frac{dy}{dx}$ if $y = x\cos y$
38. Differentiate $\sin^2 x$ w.r.t $\cos^2 x$
39. Find $f'(x)$ if $f(x) = \ln(e^x + e^{-x})$
40. Find $f'(x)$ if $f(x) = e^x(1 + \ln x)$
41. Differentiate $(\ln x)^x$ w.r.t 'x'
42. Find $\frac{dy}{dx}$ if $y = a^{\sqrt{x}}$
43. Find $\frac{dy}{dx}$ if $y = 5e^{3x-4}$
44. Find $\frac{dy}{dx}$ if $y = (x+1)^x$
45. Find $\frac{dy}{dx}$ if $y = xe^{\sin x}$
46. Find $\frac{dy}{dx}$ if $y = (\ln \tanh x)$
47. Find $\frac{dy}{dx}$ if $y = \sinh^{-1}(\frac{x}{2})$
48. Find $\frac{dy}{dx}$ if $y = \tanh^{-1}(\sin x)$ $, -\frac{\pi}{2} < x < \frac{\pi}{2}$
49. If $y = \sin^{-1}\frac{x}{a}$, then show that $y_2 = x(a^2 - x^2)^{-\frac{3}{2}}$
50. Find y_2 if $y = x^2 . e^{-x}$
51. Find y_2 if $x = a\cos\theta, y = \sin\theta$
52. Find y_2 if $x^3 - y^3 = a^3$

53. Find the first four derivatives of $\cos(ax+b)$
54. Apply Maclaurin's Series expansion to prove that $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \cdots$
55. Apply Maclaurin's Series expansion to prove that $e^x = 1 + x + \frac{x^2}{2!} + \cdots$
56. State Taylor's series expansion.
57. Expand cosx by Maclaurin's series expansion.
58. Define Increasing and decreasing functions.
59. Determine the interval in which $f(x) = x^2 + 3x + 2; x \in [-4,1]$
60. Determine the interval in which $f(x) = \text{Cos}x ; x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
61. Find the extreme values of the function $f(x) = 3x^2 - 4x + 5$
62. Find the extreme values of the function $f(x) = 1 + x^3$
63. Find δy and dy if $y = x^2 + 2x$ when x changes from 2 to 1.8
64. Use differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ in the following equations.
65. $xy + x = 4$ (b) $xy - \ln x = c$
66. Find the approximate increase in the volume of a cube if the length of its each edge changes from 5 to 5.02
67. Find the approximate increase in the area of a circular disc if its diameter is increased form 44cm to 44.4cm.

Question No.3: Short Questions

1. Find dy in $y = x^2 + 2x$ when x changes from 2 to 1.8 .
2. If $xy + x = 4$, find $\frac{dx}{dy}$ by using differentials.
3. Using differentials find $\frac{dx}{dy}$ $xy - \ln x = c$.
4. Use differential to approximate the value of $\cos 29°$
5. Evaluate $\tan^2 \int xdx$.
6. Find $\int a^{x^2} xdx$
7. Evaluate $\int \cos 3x \sin 2x dx$.
8. Evaluate $\int \frac{ax+b}{ax^2+2bx+c} dx$
9. Evaluate $\int \sqrt{1 - \cos 2x} dx$, $(1 - \cos 2x) > 0$.
10. Evaluate $\int \frac{\sec^2 x}{\sqrt{\tan x}} dx$
11. Evaluate $\int \frac{e^{2x} + e^x}{e^x} dx$
12. Integrate by substitution $\int \frac{-2x}{\sqrt{4-x^2}} dx$.
13. Find the integral $\int \frac{\cos x}{\sin x \ln(\sin x)} dx$
14. Evaluate $\int \frac{1}{x \ln x} dx$.
15. Evaluate $\int \frac{2x}{1 - \sin x} dx$
16. Evaluate $\int \frac{e^x(1+x)}{(2+x)^2} dx$
17. Evaluate $\int x \ln x dx$
18. Evaluate $\int \frac{3-x}{1-x+6x^2} dx$
19. Evaluate $\int_{-1}^{3} (x^3 + 3x^2) dx$.
20. $\int_0^{\frac{\pi}{6}} x \cos x dx$
21. Solve the differential equations $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$.

22. Write two properties of definite integral.
23. Find the area between the x-axis and curve $y = 4x - x^2$
24. Solve the differential equation $\frac{x^2+1}{y+1} = \frac{x}{y}\frac{dy}{dx}$
25. Evaluate $\int \frac{1}{\sqrt{x+1}-\sqrt{x}}dx$
26. Evaluate $\int \frac{dx}{x(\ln 2x)^3} x > 0$
27. Evaluate $\int x^5 \ln x dx$
28. Evaluate $\int \frac{2a}{a^2-x^2}dx, x < a$
29. Evaluate $\int_{-1}^{2}[x + |x|]dx$
30. Evaluate $\int_0^3 \frac{dx}{x^2+9}$
31. Evaluate $\int \tan^{-1} x dx$
32. Evaluate $\int_2^{\sqrt{5}} x\sqrt{x^2 - 1}dx$
33. Evaluate $\int \frac{e^{\tan^{-1} x}}{1+x^2}dx$
34. Evaluate $\int x^2 \ln x dx$
35. Evaluate integral $\int x \cdot \sin x dx$
36. Find indefinite integral $\int e^{ax}\left[a\sec^{-1} x + \frac{1}{x\sqrt{x^2-1}}\right]dx$
37. Evaluate $\int \frac{5x+8}{(x+3)(2x-1)}dx$ by using partial fraction
38. Solve $x^2(2y + 1)\frac{dy}{dx} - 1 = 0$.
39. Show that $y = \tan(e^x + c)$ is solution of $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$
40. Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos t dt$.
41. What is differential coefficient?
42. Define Definite integral.
43. Define integral
44. Calculate the integral $\int_0^{\frac{\pi}{4}} \sec x(\sec x + \tan x)dx$.
45. If $\int_{-2}^{1} f(x)dx = 5, \int_{-2}^{1} g(x)dx = 4$ then Evaluate $\int_{-2}^{1}[3f(x) - 2g(x)]dx$
46. Show that the points $A(3,1), B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.
47. Find the mid-point of the line segment joining the vertices $A(-8,3), B(2,-1)$.
48. Show that the vertices $(-1,2)$, $B(7,5), C(2,-6)$ are vertices of a right triangle.
49. Find the points trisecting the join of $A(-1,-4)$ and $B(6,2)$.
50. Find h such that $(-1,h)$, $B(3,2)$, and $C(7,3)$ are collinear.
51. Describe the location in the plane of point $P(x,y)$ for whcih $x = y$.
52. The point $C(-5,3)$ is the centre of a circle and $P(7,-2)$ lies on the circle. What is the radius of the circle?
53. Find the point three-fifth of the way along the line segment from $A(-5,8)$ to $B(5,3)$.
54. The two points P and O' are given in xy −coordinate system. Find the XY-coordinates of P referred to the translated axes $O'X$ and $O'Y$ if $P(-2,6)$ and $O'(-3,2)$.
55. The xy-coordinate axes are translated through point O' whose coordinates are given in xy −coodinate system. The coordinates of P are given in the XY −coodinate system. Find the coordinates of P in xy-coordiante system if $(-5,-3)$, $O'(-2,3)$.
56. What are translated axes.
57. Show that the points $A(-3,6), B(3,2)$ and $C(6,0)$ are collinear.
58. Find an equation of the straight line if its slope is 2 and $y -$ axis is 5.

59. Find the slope and inclination of the line joining the points $(-2,4)$; $(5,11)$
60. Find k so that the line joining $A(7,3)$; $B(k,-6)$ and the line joining $C(-4,5)$; $D(-6,4)$ are perpendicular.
61. Find an equation of the line bisecting the I and III quadrants.
62. Find an equation of the line for $x -$ intercept: -3 and $y -$ intercept: 4
63. Find the distance from the point $P(6,-1)$ to the line $6x - 4y + 9 = 0$
64. Find whether the given point $(5,8)$ lies above or below the line $2x - 3y + 6 = 0$
65. Check whether the lines are concurrent or not.
    $3x - 4y - 3 = 0; 5x + 12y + 1 = 0\,; 32x + 4y - 17 = 0$
66. Transform the eqution $5x - 12y + 39 = 0$ to "Two-intercept form".
67. Find the point of intersection of the lines $x - 2y + 1 = 0$ and $2x - y + 2 = 0$
68. Find an equation of the line through the point $(2,-9)$ and the intersection of the lines $2x + 5y - 8 = 0$ and $3x - 4y - 6 = 0$.
69. Determine the value of p such that the lines $2x - 3y - 1 = 0, 3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.
70. Find the angle measured from the line l_1 to the line l_2 where l_1: Joining $(2,7)$ and $(7,10)$ l_2: Joining $(1,1)$ and $(-5,5)$
71. Express the given system of equations in matrix form $2x + 3y + 4 = 0; x - 2y - 3 = 0; 3x + y - 8 = 0$
72. Find the angle from the line with slope $-\frac{7}{3}$ to the line with slope $\frac{5}{2}$.
73. Find an equation of each of the lines represented by $20x^2 + 17xy - 24y^2 = 0$
74. Define Homogenous equation.
75. Write down the joint equation.

Question No.4: Short Questions

1. Find a joint equation of the straight lines through the origin perpendicular to the lines represented by $x^2 + xy - 6y^2 = 0$.
2. Find measure of angle between the lines represented by $x^2 - xy - 6y^2 = 0$.
3. Define "Corner Point" or "Vertex".
4. Graph the solution set of linear inequality $3x + 7y \geq 21$.
5. Indicate the solution set of $3x + 7y \geq 21\,; x - y \leq 2$
6. What is "Corresponding equation".
7. Graph the inequality $x + 2y < 6$.
8. Graph the feasible region of $x + y \leq 5\,;\ -2x + y \leq 0 \quad x \geq 0; y \geq 0$
9. Graph the feasible region of $5x + 7y \leq 35; x - 2y \leq 4 \quad x \geq 0; y \geq 0$
10. Define "Feasible region".
11. Graph the feasible region of $2x - 3y \leq 6; 2x + y \geq 2 \quad x \geq 0; y \geq 0$
12. $\underline{a} = 3\underline{i} - 2\underline{j} + \underline{k}, \underline{b} = \underline{i} + \text{j}$, find $\text{b} \times \text{a}$
13. A force $\underline{F} = 7\underline{i} + 4\underline{j} - 3\underline{k}$ is applied at $P(1,-2,3)$. Find its moment about the point $Q(2,1,1)$.
14. By means of slope, show the points lie on the same line $A(-1,-3), B(1,5), C(2,9)$
15. Calculate the projection of $\underline{a}$ along $\underline{b}$ when $\underline{a} = \underline{i} + \underline{k}, \underline{b} = \underline{j} + \underline{k}$
16. Check the position of the point $(5,6)$ with respect to the circle $2x^2 + 2y^2 + 12x - 8y + 1 = 0$.
17. Check whether $(-2,4)$ lies above or below $4x + 5y - 3 = 0$
18. Check whether the point $(-2,4)$ lies above or below the line $4x + 5y - 3 = 0$.
19. Check whether the point $(-4,7)$ is above or below of the line $6x - 7y + 70 = 0$.
20. Convert $2x - 4y + 11 = 0$ into slope intercept form.

21. Convert the equation $4x + 7y - 2 = 0$ into two intercept form.
22. Convert the equation into two intercept form $4x + 7y - 2 = 0$.
23. Define direction angles and direction cosines of a vector
24. Define focal chord of parabola.
25. Define parabola.
26. Define trapezium.
27. Define unit vector.
28. Find a scalar " α " so that the vectors $2\underline{i} + \alpha\underline{j} + 5\underline{k}$ and $3\underline{i} + \underline{j} + \alpha\underline{k}$ are perpendicular.
29. Find a vector of length 5 , in the direction of opposite that of $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$.
30. Find a vector perpendicular to each of the vector $\underline{a} = 2\underline{i} - \underline{j} - \underline{k}$ and $\underline{b} = 4\underline{i} + 2\underline{j} - \underline{k}$.
31. Find a vector perpendicular to each of the vectors $= 2\hat{i} + \hat{j} + \hat{k}$ and $= 4\hat{i} + 2\hat{j} - k$.
32. Find a vector whose magnitude is ' 4 ' and is parallel to $2\underline{i} - 3\underline{j} + 6k$.
33. Find an equation of a line bisecting 2^{nd} and 4^{th} quadrants.
34. Find an equation of a line through the points $(-2,1)$ and $(6,-4)$.
35. Find an equation of a line with x-intercept: -9 and slope: -4 .
36. Find an equation of hyperbola if its foci $(0, \pm 9)$ and directrices $y = \pm 4$.
37. Find an equation of the line through $(-4,-6)$ and perpendicular to the line having slope $\frac{-3}{2}$
38. Find the angle from the line with slope $\frac{-7}{3}$ to the line with slope $\frac{5}{2}$
39. Find an equation of the line through $(5,-8)$ and perpendicular to the join of A $(-15,-8)$, $B(10,-7)$
40. Find an equation of the line with x-intercept: -3 and y-intercept: 4
41. Find an equation of the perpendicular bisector of the segment joining the points A (3,5) and B(9,8).
42. Find an equation of the vertical line through $(-5,3)$.
43. Find an unit vector in the direction of the vector $v = \frac{1}{2}\frac{i}{2} + \frac{\sqrt{3}}{2}j$.
44. Find centre and radius of circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$.
45. Find centre and vertices of ellipse $\frac{(x-1)^2}{4} + \frac{(y-1)^2}{9} = 1$.
46. Find condition that the lines $y = m_1x + c_1, y = m_2x + c_2, y = m_3x + c_3$ are concurrent.
47. Find direction cosine of $\underline{v} = 3\underline{i} - \underline{j} + 2\underline{k}$.
48. Find eccentricity of the ellipse $x^2 + 4y^2 = 16$.
49. Find equation of hyperbola with foci $(\pm 5,0)$ and vertex of $(3,0)$.
50. Find equation of latus rectum of parabola $y^2 = -8(x-3)$
51. Find focus and vertex of the parabola $y = 6x^2 - 1$
52. Find h such that $A(-1,h), B(3,2)$ and $C(7,3)$ are collinear.
53. Find length of tangent segment from $(-5,4)$ to $5x^2 + 5y^2 - 10x + 15y - 131 = 0$
54. Find measure of the angle between the lines represented by $x^2 - xy - 6y^2 = 0$
55. Find point which divide $A(-6,3)$ ad $B[(5,-2)$ internally in $2:3$
56. Find position vector of a point which divide the join of E with position vector 5i and F with position vector $4\underline{i} + \underline{j}$ in ratio $2:5$.
57. Find slope and inclination of the line joining points $(4,6), (4,8)$
58. Find the angle between the vectors $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{v} = -\underline{i} + \underline{j}$.
59. Find the area of the triangle with vertices $A(1,-1,1), B(2,1,-1)$ and $C(-1,1,2)$
60. Find the centre and radius of the circle $x^2 + y^2 + 12x - 10y = 0$

61. Find the coordinate of the points of the points of intersection of the line $x + 2y = 6$ with the circle $x^2 + y^2 - 2x - 2y - 39 = 0$.
62. Find the coordinates of the points of intersection of the line $2x + y = 5$ and $x^2 + y^2 + 2x - 9 = 0$.
63. Find the direction cosines for $\overrightarrow{PQ}$, where $P(2,1,5), Q(1,3,1)$.
64. Find the direction cosines of the vector $6\underline{i} - 2\underline{j} + \underline{k}$.
65. Find the distance from the point $P(6, -1)$ tto the line $6x - 4y + 9 = 0.16$
66. Find the equation of ellipse when foci $(\pm 3,0)$ and minor axis of length 10
67. Find the equation of the line through $A(-6,5)$ having slope 7.
68. Find the focus and directrix of the parabola $y = 6x^2 - 1$.
69. Find the focus and vertex of parabola $(x-1)^2 = 8(y+2)$.
70. Find the lines represented by $20x^2 + 17xy - 24y^2 = 0$.
71. Find the lines represented by $x^2 - xy - 6y^2 = 0$, also find the angle between them.
72. Find the measure of angle between the lines represented by $x^2 - xy - 6y^2 = 0$.
73. Find the mid-point of the line joining the two points $A(-8,3), B[2,1)$.
74. Find the point three-fifth of the way along line segment from $A(-5,8)$ to $B\ (5,3)$ ·
75. Find the projection of vector $\underline{a}$ along vector $\underline{b}$ and projection of vector $\underline{b}$ along when $\underline{a} = \hat{\imath} - \hat{k}, \underline{b} = \hat{\jmath} + \hat{k}$
76. Find the value of $3j.\underline{k} \times \underline{a}$.
77. Find the value of $2\underline{i} \times 2\underline{j} - \underline{k}$.
78. Find unit vector perpendicular to the plane of $\underline{a}$ and $\underline{b}$ if $\underline{a} = -i - j - \underline{k}, \underline{b} = 2\underline{i} - 3\underline{j} + 4\underline{k}$.
79. Find vertices and equation of directrices of hyperbola $x^2 - y^2 = 9.17$Grp11,
80. Find α so that $\underline{u} = \alpha\underline{i} + 2a\underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular.
81. Find a, so that $|a\underline{i} + (a+1)\underline{j} + 2\underline{k}| = 3$.
82. Fine the value $3\underline{j} \cdot \underline{k} \times \underline{i}$.
83. If $\overrightarrow{AB} = \overrightarrow{CD}$, find coordinates of points A. If B, C, D are $(1,2), (-2,5), (4,11)$
84. If $\underline{a} = 2\underline{i} + \underline{j} - \underline{k}$ and $\underline{b} = \underline{i} - j + \underline{k}$ find the cross product $\underline{a} \times \underline{b}$
85. If $\underline{u} = 3\underline{i} + \underline{j} - \underline{k}$ and $\underline{v} = 2\underline{i} - \underline{j} + \underline{k}$, find the cosines of the angle θ between $\underline{u}$ and $\underline{v}$
86. If O is the origin and $\overrightarrow{OP} = \overline{AB}$, find the point P when A and B are $(-3,7)$ and $(1,0)$ respectivel
87. Prove that if $\underline{a} + \underline{b} + \underline{c} = 0$ then $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$
88. Prove that $\underline{a} \times (\underline{b} + \underline{c}) + \underline{b} \times (\underline{c} + \underline{a}) + c \times (\underline{a} + \underline{b}) = 0$.
89. Prove that if the lines are perpendicular, then product of their slopes $= -1$
90. Show that the points $A(3,1), B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.
91. Show that the points $A(-1,2), B(7,5)$ and $C(2,-6)$ are vertices of a right triangle.
92. Show that the triangle with vertices $A(1,1), B(4,5)$ and $C(12,-5)$ is right triangle.
93. Show that vectors $3\underline{i} - 2\underline{j} + \underline{k}, \underline{i} - 3\underline{j} + 5\underline{k}$ and $2\underline{i} + \underline{j} - 4\underline{k}$ from a right triangle.
94. Transform $5x - 12y + 39 = 0$ into two intercept form. 15 Grp II,
95. Two lines l_1 and l_2 with respective slopes m_1 and m_2 are parallel if $m_1 = m_2$.
96. Write and equation of parabola with focus $(-1,0)$, vertex $(-1,2)$.
97. Write direction cosine of $\overrightarrow{PQ}$, if $P(2,1,5), Q(1,3,1)$.
98. Write down the equation of straight line with x-intercept $(2,0)$ and y-intercept $(0,-4)$
99. Find the mid-point of line segment joining the points $A\left(-\sqrt{5}, -\frac{1}{3}\right)$ and $(-3\sqrt{5}, 5)$.
100. Find the slope and inclination of the line joining the points $(-2,4)$ and $(5,11)$.
101. Find equation of tangent to the circle $x^2 + y^2 = 25$ at $(4,3)$.

102. Find the vertex and directrix of parabola $x^2 = 4(y-1)$.
103. Find the centre and vertices of the ellipse $9x^2 + y^3 = 18$.
104. Find the sum of vectors $\overrightarrow{AB}$ and $\overrightarrow{CD}$, given the four points A(1, −1), B(2,0), C (−1,3) and D(−2,2).
105. Find a vector perpendicular to each of the vectors $\underline{a} = 2\underline{i} + \underline{j} + \underline{k}$ and $\underline{b} = 4\underline{i} + 2\underline{j} - \underline{k}$.
106. Prove that the vectors $\underline{i} - 2\underline{j} + 3\underline{k} - 2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are co-planar.
107. Find equation of a line through (−4 , 7) and parallel to the line $2x - 7y + 4 = 0$.
108. Find equation of a line through (−6 , 5) having slope = 7
109. Find distance from the point P (6 , −1) to the line $6x - 14y + 9 = 0$
110. Find area of triangular region whose vertices are A (5 , 3), B (−2 , 2), C (4 , 2).
111. Find the equation of tangent to the circle $x2 + y3 = 25$ at (4 , 3). 14 Grp I,
112. Find the equation of parabola whose focus is (2 , 5) and directrix is $y = 1$
113. Find foci and eccentricity of ellipse
114. Find vector from A to origin whose $AB = 4i - 2j$ and B (−2 , 5) .
115. Find a vector whose magnitude is 2 and is parallel to $i + j + k$.
116. Find α so that the vectors $2i + \alpha j + 5k$ and $3i + j + \alpha k$ are perpendicular.
117. Find α so that $\alpha i + j$, $i + j + 3k$, $2i + j - 2k$ are co-planar.

Long Questions

Chapter No.1: Functions and Limits

1. Evaluate $\lim_{x\to 0} \frac{1-\cos x}{\sin^2 x}$
2. Evaluate $\lim_{x\to 0} \frac{\sin x}{x} = 1$
3. Evaluate $\lim_{\theta\to 0} \left(\frac{1-\cos p\theta}{1-\cos q\theta}\right)$
4. Evaluate $\lim_{\theta\to 0} \frac{\tan \theta - \sin \theta}{\sin^3 \theta}$
5. Find the values of m and n, so that given function f is continuous at x = 3.
6. If $f(x) = \begin{cases} mx & \text{if } x < 3 \\ n & \text{if } x = 3 \\ -2x+9 & \text{if } x > 3 \end{cases}$
7. Discuss the continuity of f(x) at x = 2 and x = −2.
8. If $f(x) = \begin{cases} 3x & \text{if } x \le -2 \\ x^2 & \text{if } -2 < x < 2 \\ 3 & \text{if } x \ge 2 \end{cases}$
9. If $f(x) = \begin{cases} \frac{\sqrt{2x+5}-\sqrt{x+7}}{x-2}, & x \ne 2 \\ k & x = 2 \end{cases}$
10. Find the value of k so that f is continuous at x = 2.
11. Let $f(x) = \frac{2x+1}{x-1}$; $x \ne 1$, find $f^{-1}(x)$ and verify $fof^{-1}(x) = x$
12. Prove $\lim_{x\to\infty} \left(1 + \frac{1}{n}\right)^n = e$14 Grp II, 10. Prove that $\lim_{x\to 0} \left(\frac{a^x-1}{x}\right) = \log_e a$
13. Prove that $\lim_{x\to 0} \frac{\sin x}{x} = 1$

Chapter No.2: Differentiation

1. Differentiate $\frac{x^2+1}{x^2-1}$ w.r.t. $\frac{x-1}{x+1}$

2. Differentiate $x^2+\frac{1}{x^2}$ w.r.t. $x-\frac{1}{x}$
3. Differentiate $\cos\sqrt{x}$ from the first principle.
4. Differentiate $\sin\sqrt{\frac{1+2x}{1+x}}$ w.r.t x
5. Find $\frac{dy}{dx}$ if $x=a(\cos t+\sin t), y=a(\sin t-t\cos t)$
6. Find two positive integers whose sum is 9 and the product of one with the square of the other will be maximum.
7. If $x=\sin\theta, y=\sin m\theta$, Show that $(1-x^2)y_2-xy_1+m^2y=0$
8. If $y=(\cos^{-1}x)^2$, prove that $(1-x^2)y_2-xy_1-2=0$
9. If $y=e^x\cdot\sin x$, then prove that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$
10. Prove that $y\frac{dy}{dx}+x=0$ if $x=\frac{1-t^2}{1+t^2}, y=\frac{2t}{1+t^2}$.
11. Show that $\cos(x+h)=\cos x-h\sin x-\frac{h^2}{\underline{|2}}\cos x+\frac{h^3}{\underline{|3}}\sin x+\cdots$ And evaluate $\cos 61°$
12. Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\mathrm{Tan}^{-1}\frac{y}{x}$
13. Show that $y=\frac{\ln x}{x}$ has maximum value at $x=e$.
14. Show that $y=x^x$ has a maximum value at $=\frac{1}{e}$

Chapter No.3: Integration

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1. Evaluate $\int\left(\frac{1-\sin x}{1-\cos x}\right)e^x dx$
2. Evaluate $\int\left(\frac{1-\sin x}{1-\cos x}\right)e^x dx$
3. Evaluate $\int\frac{\sqrt{2}}{\sin x+\cos x}dx$
4. Evaluate $\int\frac{e^x(1+\sin x)}{(1+\cos x)}dx$
5. Evaluate $\int\frac{1}{x(x^3-1)}dx$
6. Evaluate $\int\cos^3 x\sqrt{\sin x}dx, (\sin x>0)$
7. Evaluate $\int\mathrm{cosec}^3 x dx$
8. Evaluate $\int\frac{\cos x}{\sin x\ln\sin x}dx$
9. Evaluate $\int\frac{dx}{\frac{1}{2}\sin x+\frac{\sqrt{3}}{2}\cos x}$
10. Evaluate $\int e^{2x}\cos 3x dx$
11. Evaluate $\int\tan^3 x\sec x dx$
12. Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}}\frac{\cos x}{\sin x(2+\sin x)}dx$
13. Evaluate $\int_0^{\frac{\pi}{4}}\cos^4 t dt$
14. Evaluate $\int_0^{\frac{\pi}{6}}\cos^3\theta d\theta$
15. Evaluate $\int_0^{\pi/4}\frac{\sin x-1}{\cos^2 x}dx$
16. Evaluate $\int_0^{\pi/4}\frac{\sec\theta}{\sec\theta+\cos\theta}d\theta$
17. Evaluate $\int_{-1}^{2}(x+|x|)dx$
18. Evaluate $\int_2^3\frac{3x^2-2x+1}{(x-1)(x^2+1)}dx$
19. 19. Evaluate $\int_2^3\left(x-\frac{1}{x}\right)^2 dx$
20. Evaluate the indefinite integral $\int\sqrt{a^2-x^2}dx$

21. Find the area between the x-axis and the curve $y = \sqrt{2ax - x^2}; a > 0$
22. Find the area bounded by the curve $y = x^3 - 4x$ and x-axis
23. Show that $\int \frac{dx}{\sqrt{x^2-a^2}} = \ln\left(x + \sqrt{x^2 - a^2}\right) + c$
24. Solve the differential equation $(x^2 - yx^2)\frac{dy}{dx} + y^2 + xy^2 = 0$
25. Solve the following differential equation $(x^2 - yx^2)\frac{dy}{dx} + y^2 + xy^2 = 0$
26. Solve the following differential equation $1 + \cos\ x\tan\ y\frac{dy}{dx} = 0$
27. Solve the following differential equation $xdy + y(x - 1)dx$
28. Use differentials to approximate the values of $(31)^{1/5}$
29. $y = \sqrt{2ax - x^2}$ when $a > 0$.

Chapter No.4: Introduction to Analytic Geometry

1. Find a joint equation of the straight lines through the origin perpendicular to the lines represented by $x^2 + xy - 6y^2 = 0$
2. Find an equation of the perpendicular bisector joining the points A(3,5) and B (9,8)
3. Find an equation of the perpendicular bisector of the segment joining the points A (3,5) and B (9,8)
4. Find equations of the sides, altitudes and medians of the triangle whose vertices are A $(-3,2)$, B$(5,4)$ and C $(3,-8)$.
5. Find equations of two parallel lines perpendicular to $2x - y + 3 = 0$ such that the product of the x-intercept and y-intercept of each is 3.
6. Find h such that the points A $(\sqrt{3},-1)$, B$(0,2)$, C$(h,-2)$ are the vertices of a right triangle with right angle at the vertex A.
7. Find interior angles of a triangle whose vertices are A$(6,1)$, B$(2,7)$ and C $(-6,7)$.
8. Find the condition that the line $y = mx + c$ touches the circle $x^2 + y^2 = a^2$ at a single point.
9. Find the condition that the lines $y = m_1x + c_1; m_2x + c_2; y = m_3x + c_3$ are concurrent.
10. Find the distance between the given parallel lines. Also find equation of parallel lying midway between them. $3x - 4y + 3 = 0$ and $3x - 4y + 7 = 0$
11. Find the equations of altitudes of $\triangle$ ABC whose vertices are A$(-3,2)$, B$(5,4)$ and C $(3,-8)$
12. Find the interior angles of a triangle whose vertices are A$(6,1)$, B$(2,7)$, C $(-6,-7)$.
13. Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$.
14. 14. Find the lines represented by each of the following and also find measure of the angle between them $x^2 + 2xy\sec\ \alpha + y^2 = 0$
15. Prove that the line segment joining the midpoints of two sides of a triangle is parallel to the third side and half as long.
16. Prove that the line segments joining the mid-points of sides of quadrilateral taken in order form a parallelogram.
17. Prove that the midpoint of the hypotenuse of a right triangle is the circumcenter of the triangle. 11 Grp II,
18. The points A$(-1,2)$, B$(6,3)$ and C$(2,-4)$ are vertices of a triangle. Show the line joining the midpoint D of AB and the midpoing E of AC is parallel to BC and DE $= \frac{1}{2}$
19. The three points A$(7,-1)$, B$(-2,2)$ and C$(1,4)$ are consecutive vertices of a parallelogram, find the fourth vertex.
20. The vertices of a triangle are A$(-2,3)$, B$(-4,1)$ and C$(3,5)$. Find the circumcircle of the triangle.

Chapter No.5: Linear Inequalities and Linear Programming

1. Graph the feasible region of system of linear inequalities and find the corner points.
2. $2x + 3y \leq 18$, $x + 4y \leq 12$, $3x + y \leq 12$ $x \geq 0, y \geq 0$
3. Graph the feasible region of system of linear inequalities and find the corner points.
4. $3x + 7y \leq 21$, $2x - y \leq -3$, $y \geq 0$
5. Shade the feasible region and also find the corner points of: $2x - 3y \leq 6$, $2x + 3y \leq 12$, $x \geq 0, y \geq 0$
6. Minimize $z = 2x + y$ subject to the constraints. $x + y \geq 3$; $7x + 5y \leq 35$; $x \geq 0$; $y \geq 0$
7. Graph the feasible region of system of linear inequalities and find the corner points.
8. $x + y \leq 5$; $-2x + y \leq 2$; $y \geq 0$
9. Graph the feasible region of system of linear inequalities and find the corner points.
10. $2x - 3y \leq 6$; $2x + y \geq 2$; $y \geq 0, y \geq 0$
11. Minimize $f(x, y) = x + 3y$ subject to constraint.
12. $2x + 5y \leq 30$; $5x + 4y \leq 20$; $x \geq 0, y \geq 0$
13. Minimize $f(x, y) = 2x + 3y$ subject to constraint.
14. $2x + y \leq 8$; $x + 2y \leq 14$; $x \geq 0, y \geq 0$
15. Find the minimum value of $\phi(x, y) = 4x + 6y$ under the constrains: $2x - 3y \leq 6$, $2x + y \geq 2$, $2x + 3y \leq 12$ $x \geq 0, y \geq 0$
16. Minimize the function $z = 3x + y$ subject to the constrains: $3x + 5y \geq 6$, $x + 6y \geq 9$, $x \geq 0, y \geq 0$

Chapter No.6: Conic Sections

1. Find an equation of parabola having its focus at the origin and directrix parallel to y-axis.
2. Find the centre, foci, eccentricity, vertices and equation of directives of $\frac{y^2}{4} - x^2 = 1$.
3. Find x so that points $A(1, -1, 0)$, $B(-2, 2, 1)$ and $C(0, 2, x)$ from triangle with right angle at C.
4. Find the coordinates of the points of intersection of the line $2x + y + 5 = 0$ and the circle $x^2 + y^2 + 2x - 9 = 0$. Also find the length of intercepted chord.
5. Find equation of parabola with elements directrix: $x = -2$, focus $(2, 2)$.
6. Find an equation of parabola whose focus is $F(-3, 4)$, directrix line is $3x - 44y + 5 = 0$.
7. Find the focus, vertex and the directrix of the parabola $x^2 - 4x - 8y + 4 = 0$.
8. Write an equation of the parabola with axis $y = 0$ and passing through $(2, 1)$ and $(11, -2)$.
9. Show that the line $3x - 2y = 0$ and $2x + 3y - 13 = 0$ are tangents to the circle $x^2 + y^2 + 6x - 4y = 0.17$
10. Show that the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$ represent an ellipse. Find its elements (foci, vertices and directrices)
11. Show that the equation $x^2 + 16x + 4y^2 - 16y + 76 = 0$ represent an ellipse. Find its foci eccentricity, vertices and directrices.
12. Write equations of tangent lines to the circle $x^2 + y^2 + 4x + 2y = 0$ down from the point $P(-1, 2)$. Also find the tangential distance.
13. Prove that in any triangle ABC by vector method $a^2 = b^2 + c^2 - 2bc\cos A$
14. Find equation of ellipse having vertices $(0, \pm 5)$ and eccentricity $\frac{3}{5}$.
15. Find an equation of the circle passing through the point $(-2, -5)$ and touching the line $3x + 4y - 24 = 0$ at the point $(4, 3)$
16. Find the foci, vertex and directrix of the parabola $y = 6x^2 - 1$.,
17. Find equations of the tangents to the circle $x^2 + y^2 = 2$
18. Find an equation of an ellipse with Foci $(-3\sqrt{3}, 0)$ and vertices $(\pm 6, 0)$

19. Find equation of the circle passing through A(a, 0), B(0, b) and C(0,0)
20. Find an equation of the parabola with focus (1,2) and vertex (3,2),
21. Write an equation of the circle that passes through the point A(a, 0), B(0, b), C (0,0),
22. Write an equation of the circle that passes through the points A(4,5), B(−4, −3), and C(8, −3).

Chapter No.7: Vectors

1. Find the value of α, in the coplanar vectors $\alpha \underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$, and $2\underline{i} + \underline{j} - 2\underline{k}$.
2. If $\underline{a} = 3\underline{i} - \underline{j} - 4\underline{k}$; $\underline{b} = -2\underline{i} - 4\underline{j} - 3\underline{k}$ and $\underline{c} = \underline{i} + 2\underline{j} - \underline{k}$, then find a unit vector parallel to $-3\underline{a} - 2\underline{b} + 4\underline{c}$, 16
3. (Example) Find the volume of the tetrahedron whose vertices are A(2,1,8), B (3,2,9), C(2,1,4) and D (3,3,10).
4. Prove that $\sin(\alpha - \beta) = \sin a \cdot \cos \beta - \cos \alpha \sin \beta$ by method of vectors.
5. Find the volume of the tetrahedron with the vertices of A(0,1,2), B(3,2,1), C (1,2,1) and D (5,5,6)
6. Find the constant a such that the vectors are coplanar $\underline{i} - \underline{j} + \underline{k}$, $\underline{i} - 2\underline{j} - 3\underline{k}$, and $3\underline{i} - a\underline{j} + 5\underline{k}$
7. The position vectors of the points A, B, C and D are $2\underline{i} - \underline{j} + \underline{k}$, $3\underline{i} + \underline{j}$, $2\underline{i} + 4\underline{j} - 2\underline{k}$ and $-\underline{i} + 2\underline{j} + \underline{k}$ respecetively. Show that AB is parallel to CD.
8. A force of magnitude 6 units acting parallel to $2\underline{i} - 2\underline{j} + \underline{k}$ displaces the point of application from (1,2,3) to (5,3,7). Find the work done.
9. Prove by using vectors that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and half as long.
10. If $\underline{a} + \underline{b} + \underline{c} = 0$ then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$
11. A force $\underline{F} = 4\underline{i} - 3\underline{k}$ passes through the point A(2, −2, 5). Find the moment of the force about the point B(1, −3,1)
12. Find a unit vector perpendicular to both vectors $\underline{a}$ and $\underline{b}$ where $\underline{a} = -\underline{i} - j - k$ and $\underline{b} = 2\underline{i} - 3\underline{j} + 4\underline{k}$.
13. If $\underline{a} = 3\underline{i} - j - 4\underline{k}$, $\underline{b} = -2\underline{i} - 4\underline{j} - 3\underline{k}$ and $\underline{c} = \underline{i} + 2\underline{j} - \underline{k}$ find a unit vector parallel to $3\underline{a} - 2\underline{b} + 4\underline{c}$.
14. Find equation of the circle of radius 2 and tangent to the line $x - y - 4 = 0$ at A (1, −3)