➢ BASIC DEFINITE INTEGRATION PROBLEMS

1. $\int_{-2}^{2}(x^2-4x+3)\,dx$
2. $\int_{0}^{\frac{\pi}{2}}\cos^2 x dx$
3. $\int_{1/2}^{1}\frac{1}{\sqrt{1-x^2}}dx$
4. $\int_{0}^{\frac{\pi}{2}}\sqrt{1+\sin 2x}\,dx$
5. $\int_{0}^{\pi/4}\tan^2 x dx$
6. $\int_{0}^{\pi/2}\sin^3 x dx$
7. $\int_{0}^{\pi/4}\sec^2 x\,dx$
8. $\int_{0}^{\pi/2}\frac{\sin x}{1+\cos x}dx$
9. $\int_{0}^{1}\frac{x^3}{1+x^8}dx$
10. $\int_{0}^{\pi/4}\tan^4 x.\sec^2 x dx$
11. $\int_{0}^{\pi/4}\cos^4 x\,dx$
12. $\int_{0}^{1}\frac{1}{1+x^2}dx$
13. $\int_{1}^{\sqrt{3}}\frac{1}{1+x^2}dx$
14. $\int_{1/2}^{1}\frac{1}{\sqrt{1-x^2}}dx$
15. $\int_{1}^{2}\frac{1}{x\sqrt{x^2-1}}dx$
16. $\int_{0}^{\pi/4}\cos^4 x\,dx$
17. $\int_{0}^{a}\sqrt{a^2-x^2}dx$
18. $\int_{0}^{e}\log x\,dx$
19. $\int_{0}^{1}\frac{1}{e^x+e^{-x}}dx$
20. $\int_{0}^{\pi/2}x\cos x\,dx$

➢ PROPERTY BASED DEFINITE INTEGRATION PROBLEMS

21. $\int_{0}^{\pi/2}\frac{\sin x}{\sin x+\cos x}dx$
22. $\int_{0}^{\pi/2}\frac{\cos x}{\cos x+\sin x}dx$
23. $\int_{0}^{\pi/2}\frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$
24. $\int_{0}^{\pi/2}\frac{\sqrt{\cos x}}{\sqrt{\cos x}+\sqrt{\sin x}}dx$
25. $\int_{0}^{\pi/2}\frac{\cos^2 x}{\cos^2 x+\sin^2 x}dx$
26. $\int_{0}^{\pi/2}\frac{\cos^n x}{\cos^n x+\sin^n x}dx$
27. $\int_{0}^{\pi/2}\frac{\sin^{20} x}{\sin^{20} x+\cos^{20} x}dx$
28. $\int_{0}^{\pi/2}\frac{\sin^n x}{\sin^n x+\cos^n x}dx$
29. $\int_{0}^{\pi/2}\frac{\sqrt{\tan x}}{\sqrt{\tan x}+\sqrt{\cot x}}dx$
30. $\int_{0}^{\pi/2}\frac{\sqrt{\cot x}}{\sqrt{\cot x}+\sqrt{\tan x}}dx$
31. $\int_{0}^{\pi/2}\frac{1}{1+\tan x}dx$
32. $\int_{0}^{\pi/2}\frac{1}{1+\cot x}dx$
33. $\int_{0}^{\frac{\pi}{2}}\log\tan x\,dx$
34. $\int_{0}^{\frac{\pi}{2}}\log\cot x\,dx$
35. $\int_{0}^{\pi/4}\log(1+\tan\theta)\,d\theta=\frac{\pi}{8}(\log 2)$.
36. $\int_{0}^{\frac{\pi}{2}}\frac{a\sin x+b\cos x}{\sin x+\cos x}dx$
37. $\int_{0}^{\pi}\frac{x\sin x}{1+\cos^2 x}dx$
38. $\int_{0}^{\pi}\frac{x.\sin x}{1+\sin x}dx$
39. $\int_{0}^{\pi/4}\log(1+\tan\theta)d\theta$
40. $\int_{0}^{\frac{\pi}{2}}\sin 2x\log\tan x\,dx$
41. $\int_{0}^{\frac{\pi}{2}}\log\left|\frac{2+3\sin x}{2+3\cos x}\right|dx$

➢ QUADRATURE (AREAS)

42. Find the area of the region bounded by the curve $(2y = x^2)$, the x-axis and the ordinates x=1 and x=3.
43. Find the area bounded by the curve $y = \cos x$, x-axis between the limits x=0 to x=2π.
44. Find the area of the region bounded by the curve $(y = x^2)$, the x-axis and the line x=4.
45. Find the area included between the parabola $y^2 = 4ax$ and its latus rectum.
46. Find the area bounded by the parabola $y^2 = 4ax$, the x- axis and the lines x=1 and x=4 in the first quadrant.
47. Find the area bounded by the curve $y^2 = 8x$, the y-axis and the lines y=2 and y=6.
48. Find the area of the region bounded by the curve $y^2 = 4x$ and x=3.
49. Find the area enclosed by the parabola $y = x^2 - 8x + 15$ and the x- axis.
50. Find the area enclosed by the circle $x^2 + y^2 = r^2$.
51. Prove that the area common to the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16a^2}{3}$
52. Find the area enclosed between the parabolas $y^2 = 16x$ and $x^2 = 16y$.
53. Find the area enclosed between the parabolas $y^2 = 9x$ and $x^2 = 9y$.
54. Find the area enclosed between the parabolas $y^2 = 8x$ and $x^2 = 8y$.
55. Find the area enclosed between the parabolas $y^2 = x$ and $x^2 = y$.
56. Find the area enclosed between the parabolas $y^2 = 4x$ and $x^2 = 4y$.
57. Find the area bounded by the curve $(x = 4 - y^2)$ And the y axis.
58. Find the area of the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
59. Find the area enclosed by $9x^2 + 4y^2 = 36$.
60. Find the area enclosed between the curves $x^2 = y$ and the straight line y=3x+4.
61. Find the area of the segment cutoff from the parabola $y^2 = 8x$ by the line 2x-y-8=0.
62. Find the enclosed area between the curve $x^2 = y$ and the straight line y=x+2.
63. Find the area enclosed by the curve $y = x^2$ and the line 2x-y+3=0.
64. Find the area bounded by the parabola $y^2 = x - 1$ and the line y=x-3.
65. Find the area bounded by the parabola $3x^2 = 4y$ and the line 2y=3x+12.
66. Find the area bounded by the parabola $y^2 = 4x$ and the line x+y=3.

➢ VOLUMES OF SOLIDS OF REVOLUTION.

67. Find the volume of the solid generated when the area bounded by the curve $y = x^2 - 1$ and the x- axis.
68. Find the volume of the solid generated by rotating the portion of the parabola $y = x^2$ between x=0 and x=2 about x-axis.
69. Find the volume generated when the area enclosed by $y = \sqrt{x}$, the x-axis and the ordinates x=1 and x=6 revolves about x-axis.
70. Find the volume of the solid generated when the area bounded by $y^2 = x^3$ and x=4 revolve about x- axis.
71. Find the volume of the parabolic generated by revolving the parabola $y^2 = 4ax$ about x- axis from x=0 to x=h.
72. Find the volume of the solid generated when the area bounded by the curve $y = x(1 - x)$ and x- axis.
73. Determine the volume of the solid generated by revolving the area bounded by the parabola $y^2 = 8x$ cut off by its latus rectum given by x=2 about the x- axis.
74. The region of the circle $x^2 + y^2 = 16$ is revolved about a diameter. Find the spheare thus generated.
75. Find the volume generated by revolving about the x- axis an arch of the curve $y = \sin x$.
76. Obtain the volume of the sphere of radius "r" using integration.
77. Find the volume of the solid formed by revolving the area enclosed by the curve $y = x^3$, the y-axis and the line y=0 and y=8 about y- axis.
78. Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about x- axis.
79. Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about y-axis.
80. Find the volume generated by revolution of the ellipse$9x^2 + 25y^2 = 225$. About its x-axis.
81. Find the volume of the solid generated by revolving the area bounded by the ellipse $25x^2 + 16y^2 = 400$ about its major axis.
82. Find the volume of the solid generated by revolving the area bounded by the ellipse $4x^2 + 9y^2 = 36$ about its major axis.
83. Find the volume of the solid generated by revolving the area bounded by the ellipse $25x^2 + 16y^2 = 400$ about its minor axis.
84. Find the volume of the solid generated by revolving the area bounded by the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$, x=0 and y=0 about the x-axis.
85. Find the volume of the solid generated by rotating the area bounded by the curve $\sqrt{x} + \sqrt{y} = 1$ and the first quadrant about the y- axis.
86. Find the volume of the solid generated by revolving the area bounded by $y = x^2 + 3$ about x-axis from x=1 to x=3.

➢ MEAN AND RMS VALUES

87. Find the mean value of $x^2 - 5x + 6$ between the values of 'x' where the expression vanishes.
88. Find the mean value of $x = y^2 - 6y + 5$ between the values of 'x' where the expression vanishes.
89. Find the mean value of $x^2 - 4x + 3$ between the values of 'x' where the expression vanishes.
90. If the mean value of $k\sin 2x + \sin x$ is '0' in the interval $\left[0, \frac{\pi}{2}\right]$, then find "k".
91. Find the mean value of x^2e^x from x=1 to x=3.
92. Find the mean value of x^2e^x from x=1 to x=2.
93. Find the mean value of $f(x) = \log x$ on $[1, e]$.
94. Find the mean value of $\frac{1}{1+x^2}$ in the interval $(0,1)$.
95. Find the mean value of $y^2 = 8x$ from x=0 to x=3.
96. Find RMS value of xe^x as x varies from x=1 to x=3.
97. Find the RMS value of xe^{2x} over the interval $0 \le x \le 1$.
98. Find the RMS value of $\sqrt{\log x}$ over the range x=1 to x=e.
99. Find the RMS value of $\log x$ over the range x=1 to x=e.
100. Find the RMS value of $\sqrt{27 - 4x^2}$ from x=0 to x=3.
101. Find the RMS value of $y = \sqrt{8 - 4x^2}$ from x=0 to x=2.
102. Find the RMS value of $y = \sqrt{x}$ from x=0 to x=1.
103. Find the RMS value of $\sqrt{\log x}$ between the limits x=e and $x=e^2$.
104. Determine the root mean square value of the function $y=xe^x$ in the range between x=0 and x=1.
105. Find the RMS value of the current I=a $\sin x$ over the half wave.
106. Find the RMS value of the current I= $\sin x$ over the full wave.