2. DEFINITE INTEGRATION

SYNOPSIS

DEFINITIONS AND FORMULAE:

- Let f(x) be a function defined on [a, b]. If $\int f(x)dx$ =F(x), then F(b)-F(a) is called the definite integral of f(x) over [a, b]. It is denoted by $\int_a^b f(x)dx$. The real number a is called the lower limit and the real number b is called the upper limit.

- $\int f(x)dx$ =F(x)+c => $\int_a^b f(x)dx$ =F(b)-F(a).

- $\int_a^b f(x)dx = \int_a^b f(t)dt = \int_a^b f(y)dy = ...$

- If f(x) is an integrable function on [a, b] and g(x) is derivable on [a, b] then

$$\int_a^b (fog)(x)g^1(x)dx = \int_{g(a)}^{g(b)} f(x)dx$$

- $\int_a^b f(x)dx = -\int_b^a f(x)dx$.

- If a<c<b then $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$.

- $\int_0^a f(x)dx = \int_0^a f(a-x)dx$.

- $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$.

- $\int_{-a}^{a} f(x)dx = \int_0^a [f(x)+f(-x)]dx =$

$$-\int_{-a}^{a} f(x)dx = 2\int_0^a f(x)dx, \ if \ f \ is \ even$$

$$= 0, \ if \ f \ is \ odd$$

- $\int_0^{2a} f(x)dx = \int_0^a [f(x)+f(2a-x)]dx$

$$= 2\int_0^a f(x) \quad if \quad f(2a-x) = f(x)$$
$$= 0 \qquad if \quad f(2a-x) = -f(x)$$

- $\int_0^a f(x)dx = 2\int_0^{a/2} f(x)dx$ if f(a-x)=f(x).

  = 0, if f(a-x)=-f(x).

- If f(x) is a periodic function with period a then

$\int_0^{na} f(x)dx = n\int_0^a f(x)dx$. where $n \in N$

- $\int_0^{\frac{\pi}{2}} \frac{f(\alpha)}{f(\alpha)+f(\beta)}dx = \frac{\pi}{4}$

α = cos x, β=sin x

α = tan x, β=cot x

α = sec x, β=cosec x

WALLI'S FORMULAE

- If $I_n = \int_0^{\pi/2} Sin^n x dx = \int_0^{\pi/2} cos^n x dx$, then $I_n = \frac{n-1}{n} I_{n-2}$.where $n \in Z+$

$$\therefore I_n = \left(\frac{n-1}{n}\right)\left(\frac{n-3}{n-2}\right)\left(\frac{n-5}{n-4}\right)$$

$\ldots\ldots\ldots\ldots\ldots \frac{1}{2}.\frac{\pi}{2}$ in n is positive even integer.

$= \left(\frac{n-1}{n}\right)\left(\frac{n-3}{n-2}\right)\left(\frac{n-5}{n-4}\right)\ldots\ldots\ldots\ldots\left(\frac{2}{3}\right)1$ if n is odd

positive integer.

- If $I_n = \int_0^{\pi/4} \tan^n x dx$ $(n > 1)$ then $I_n + I_{n-2} = \frac{1}{n-1}$

and hence $I_n = \frac{1}{n-1} - \frac{1}{n-3} + \frac{1}{n-5} - \frac{1}{n-7}$

.... I_0 or I_1 according as n is even or odd.

Here $I_0 = \frac{\pi}{4}$, $I_1 = \frac{1}{2}$ log 2.

If $\mathbf{I_n = \int_{\pi/4}^{\pi} \cot^n xdx}$ then $\mathbf{n \in N}$

$$\mathbf{I_n + I_{n-2} = \frac{1}{n-1}}$$

- If $I_n = \int_0^{\pi/4} \sec^n x dx$ $(n \in Z+)$ then

$$I_n = \frac{\left(\sqrt{2}\right)^{n-2}}{n-1} + \frac{n-2}{n-1} I_{n-2}.$$

- $$\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \operatorname{cosec}^n x \, dx$$

$$= \frac{(\sqrt{2})^{n-2}}{n-1} + \frac{n-2}{n-1} \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \operatorname{cosec}^{n-2} x \, dx$$

- If $I_{m,n} = \int_0^{\pi/2} \sin^m x \cos^n x dx$ then $I_{m,n} = \frac{m-1}{m+n}$

$I_{m-2,n}$. $(m, n \in Z+)$

$$\therefore I_{m,n} = \frac{m-1}{m+n}.\frac{m-3}{m+n-2}.\frac{m-5}{m+n-4}.$$

$\ldots\ldots\ldots \frac{1}{n+1}$ if m is odd.

$$\therefore I_{m,n} = \frac{m-1}{m+n}.\frac{m-3}{m+n-2}.\frac{m-5}{m+n-4}$$

$\ldots\ldots\ldots \int_0^{\pi/2} \cos^n x dx$ if m is even.

- $$\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} [\cot^n x + \cot^{n-2} x] dx = \frac{1}{n-1}$$

- $$I_n = \int_0^{\frac{\pi}{2}} x^n \sin x \, dx$$

$$= n\left(\frac{\pi}{2}\right)^{n-1} - n(n-1) I_{n-2}$$

- $$I_n = \int_0^{\frac{\pi}{2}} x^n \cos x \, dx$$

$$= \left(\frac{\pi}{2}\right)^n - n(n-1) I_{n-2}$$

- **INTEGRATION AS SUM OF LIMITS**

$$\int_0^1 f(x)dx = \underset{n\to\infty}{Lt} \frac{1}{n}\sum_{r=1}^{n} f\left(\frac{r-1}{n}\right) = \underset{n\to\infty}{Lt} \frac{1}{n}\sum_{r=0}^{n-1} f\left(\frac{r}{n}\right)$$

- $$\int_0^{\frac{\pi}{2}} \log(\sin x) dx = \int_0^{\frac{\pi}{2}} \log(\cos x) dx = -\frac{\pi}{2}\log 2$$

- $\int_0^{\frac{\pi}{4}} \log(1+\tan\theta)d\theta = \frac{\pi}{8}\log 2$
- $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \log(1+\cot\theta)d\theta = \frac{\pi}{8}\log 2$
- $\int_0^{\frac{\pi}{2}} \frac{1}{\sin x+\cos x}dx = \sqrt{2}\ \log\ (\sqrt{2}+1)$
- $\int_0^{\frac{\pi}{2}} \frac{1}{a^2\sin^2 x+b^2\cos^2 x}dx = \frac{\pi}{2ab}$
- $\int_0^{\pi} \frac{x}{a^2\sin^2 x+b^2\cos^2 x}dx = \frac{\pi^2}{2ab}$
- $\int_0^{\pi/2} \frac{\sin^2 x dx}{a^2\sin^2 x+b^2\cos^2 x} = \frac{\pi}{2a(a+b)}$
- $\int_0^{\pi/2} \frac{\cos^2 dx}{a^2\sin^2 x+b^2\cos^2 x} = \frac{\pi}{2b(a+b)}$
- $\int_0^{\pi} \frac{x\sin x}{\sec x+\cos x}dx = \int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}dx = \frac{\pi^2}{4}$
- $\int_0^{\pi} \frac{x\tan x}{\sec x+\tan x}dx = \int_0^{\pi} \frac{x\sin x}{1+\sin x}dx = \frac{\pi(\pi-2)}{2}$
- $\int_a^b \sqrt{(x-a)(b-x)}\ dx = \frac{\pi}{8}(b-a)^2$
- $\int_a^b \frac{1}{\sqrt{(x-a)(b-x)}}\ dx = \pi$
- $\int_a^b \frac{1}{x\sqrt{(x-a)(b-x)}}\ dx = \frac{\pi}{\sqrt{ab}}$

$$\int_a^b \sqrt{\frac{x-a}{b-x}}\,dx = \int_a^b \sqrt{\frac{b-x}{x-a}}\,dx = \frac{\pi}{2}(b-a)$$

- If a > 0, $\int_0^{\infty} e^{-ax}\cos bx\ dx = \frac{a}{a^2+b^2}$
- If a > 0, $\int_0^{\infty} e^{-ax}\sin bx\ dx = \frac{b}{a^2+b^2}$
- $\int_0^{\infty} \frac{1}{(x+\sqrt{x^2-1})^n}dx$

$$= \int_0^{\pi/2} \frac{\sec^2 x}{(\sec x+\tan x)^n}dx = \frac{n}{n^2-1}$$

$$\frac{d}{dx}\left(\int_{\phi(x)}^{\psi(x)} f(t)dt\right)$$

$$= f\left(\psi(x)\right).\psi^1(x) - f\left(\phi(x)\right).\phi^1(x)$$

LEVEL - I

CLASS WORK

PROBLEMS ON BASIC FORMULAE ,SUB-STITUTION AND BY PARTS

1. $\int_0^1 (1+e^{-x})\ dx =$

1. -1 2. 2 3. $1+e^{-1}$ 4. $2-\frac{1}{e}$

2. $\int_{\pi/4}^{\pi/2} Cotx.dx =$

1. 2log2 2. $\frac{\pi}{2}\log 2$ 3. $\log\sqrt{2}$ 4. log2

3. $\int_0^{\pi/2} \sqrt{1+Sin2x}dx =$

1. 1 2. -2 3. $\sqrt{2}$ 4. 2

4. $\int_{1/\sqrt{3}}^{k} \frac{1}{1+x^2} dx = \frac{\pi}{6}$ **then upper limit k =**

1) $\sqrt{3}$ 2. $\frac{1}{\sqrt{3}}$ 3. 1 4. $2+\sqrt{3}$

5. $\int_0^{\pi} \frac{\sin\theta+\cos\theta}{\sqrt{1+\sin 2\theta}} d\theta =$

1) π 2) $\pi+\lambda$ and $\lambda>0$

3) $\pi/2$ 4) $\pi/3$

6. $\int_0^{\pi/4} Tan^2 x.dx =$

1. $\frac{\pi}{4}$ 2. $1-\frac{\pi}{4}$ 3. $\pi/2$ 4. $1+\frac{\pi}{4}$

7. $\int_0^{\pi/2} \sqrt{1-\text{Cos}2x\ dx} =$

1) $\sqrt{2}$ 2) 2 3) $\frac{1}{\sqrt{2}}$ 4) $\sqrt{2}+1$

8. $\int_0^1 \tanh x dx =$

1) $\log\left(e+\frac{1}{e}\right)$ 2) $\log\left(e-\frac{1}{e}\right)$

3) $\log\left(\frac{e}{2}+\frac{1}{2e}\right)$ 4) 1

9. $\int_{\pi^2/16}^{\pi^2/4} \frac{\text{Sin}\sqrt{x}}{\sqrt{x}} dx =$

1) 2 2) 1 3) $\sqrt{2}$ 4) $2\sqrt{2}$

10. $\int_0^1 \frac{1}{e^x+e^{-x}} dx =$

1) 1 2) $\text{Tan}^{-1}(e)-\frac{\pi}{4}$

3) $\text{Tan}^{-1}(e)+\frac{\pi}{4}$ 4) $\frac{\pi}{4}$

11. $\int_0^{\pi} \frac{\tan x}{\text{Sec}x+\text{Cos}x} dx =$

1) π 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{2}$ 4) 2π

12. $\int_{-1}^{3} \left(\tan^{-1}\frac{x}{x^2+1}+\tan^{-1}\frac{x^2+1}{x}\right) dx =$

1. π 2. 2π 3. 4π 4. 3π

13. $\int_0^{\pi/2} \frac{Cosx}{1+Sinx} dx =$

1) log 2 2) log e 3) $\frac{1}{2}\log 3$ 4) 0

14. $\int_0^{\pi/4} \left(\tan^4 x+\tan^2 x\right) dx =$

1) 2 2) $\frac{1}{2}$ 3) $\frac{1}{3}$ 4) 1

15. $\int_0^1 \frac{\tan^{-1} x}{1+x^2} dx =$

1) $\frac{\pi^2}{4}$ 2) $\frac{\pi^2}{18}$ 3 $\frac{\pi^2}{32}$ 4) $\frac{\pi^2}{8}$

16. $\int_0^1 \frac{x^3}{1+x^8} dx =$

1. $\pi/16$ 2. $\pi/4$ 3. $\pi/2$ 4. $\pi/8$

17. $\int_0^{\pi/4} \frac{e^{\tan x}}{\cos^2 x} dx =$

1. e - 1 2. $e^{-1} - 1$ 3. $e^{-1} + 1$ 4. $e^{-2} - 1$

18. $\int_0^{\pi/4} \frac{\sin^9 x}{\cos^{11} x} dx =$

1. 10 2. 5 3. 1/10 4. 1/5

19. $\int_1^3 \frac{1}{\sqrt{x+1}-\sqrt{x-1}}dx =$

1) $\frac{4}{3}$ 2) $\frac{5}{3}$ 3) $\frac{7}{3}$ 4) $\frac{8}{3}$

20. $\int_0^{\log 5} \frac{e^x\sqrt{e^x-1}}{e^x+3}dx =$

1) $\pi+2$ 2) $\pi-2$ 3) $4-\pi$ 4) $4+\pi$

21. $\int_1^2 \left(\frac{1+x\log x}{x}\right)e^x dx =$

1) $e^2 \log 2$ 2) $e \log 2$

3) $\frac{1}{2}\log 2$ 4) $\frac{e^2}{2}\log 2$

22. $\int_0^1 Tan^{-1}x\,\mathbf{dx} =$

1) $\frac{\pi}{4}-\frac{1}{2}\log 2$ 2) $\frac{\pi}{4}-\frac{1}{4}\log 2$

3) $\frac{\pi}{4}+\frac{1}{2}\log 2$ 4) $\frac{\pi}{4}+\frac{1}{4}\log 2$

23. $\int_0^{\pi/2} \frac{1}{\sin x+\cos x}dx =$

1) $\sqrt{2}\log(\sqrt{2}+1)$ 2) $\sqrt{2}\log(\sqrt{2}-1)$

3) $\frac{1}{\sqrt{2}}\log(\sqrt{2}+1)$ 4) $\frac{-1}{\sqrt{2}}\log(\sqrt{2}+1)$

24. $\int_0^{\infty} x.e^{-x^2}dx =$

1) 1 2) -1/2 3) 1/2 4) 0

25. $\int_0^{\pi/4} \frac{\text{Sinx}+\text{Cosx}}{3+\text{Sin}2x}dx =$

1) $\frac{1}{4}\log 3$ 2) $\frac{1}{2}\log 3$

3) $\log 3$ 4) $2\log 3$

26. $\int_0^{\log 2} \text{Sinh}2x\,dx =$

1) $\frac{9}{8}$ 2) $\frac{17}{16}$

3) 2log2 - 1 4) $e^{2\log 2}-1$

27. $\int_0^1 \frac{1-x}{1+x}dx$

1) 2log 2–1 2) log 2

3) log 2+1 4) 2log2+1

28. $\int_0^a \frac{x-a}{x+a}dx =$

1. a+2alog2 2. a - 2alog2

3. 2alog-a 4. 2alog2

29. $\int_0^1 \frac{dx}{x+\sqrt{x}} =$

1) log 2 2) log2+1 3) 2log2 4) 2log2-1

30. **If** $\int_0^K \frac{1}{2+8x^2}dx = \frac{\pi}{16}$**, then K =**

1) 1 2) 2 3) $\frac{1}{2}$ 4) 4

31. $\int_0^{\pi/3} \frac{Cosx}{3+4Sinx}dx =$

1) $\log\left(\frac{3+2\sqrt{3}}{3}\right)$ 2) $\frac{1}{4}\log\left(\frac{3+2\sqrt{3}}{3}\right)$

3) $2\log\left(\frac{3+2\sqrt{3}}{3}\right)$ 4) $\frac{1}{2}\log\left(\frac{3+2\sqrt{3}}{2}\right)$

32. $\int_0^1 \frac{(\text{Tan}^{-1}x)^3}{1+x^2}dx =$

1. $\frac{\pi^4}{64}$ 2. $\frac{\pi^4}{256}$ 3. $\frac{\pi^4}{1024}$ 4. $\frac{\pi^4}{512}$

33. $\int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx =$

1) $\frac{\pi^3}{24}$ 2) π^2 3) $-\pi^2$ 4) 0

34. $\int_0^1 \frac{4x^3}{\sqrt{1-x^8}} dx =$

1) π 2) $-\pi$ 3) $\pi/2$ 4) $-\pi/2$

35. $\int_0^1 \frac{xdx}{(x^2+1)^2} =$

1) 1/2 2) 1/3 3) 1/4 4) 0

36. $\int_{\sqrt{8}}^{\sqrt{15}} x\sqrt{1+x^2}.dx =$

1. 15/8 2. 37/3 3. 37/6 4. $\frac{37}{9}$

37. $\int_1^e \frac{(\ln x)^3}{x} dx =$

1. $e^4/4$ 2. $1/4$ 3. $\frac{1}{4}(e^4-1)$
4. $e^4 - 1$

38. $\int_1^{e^3} \frac{dx}{x\sqrt{1+\ln x}} =$

1. 2 2. $2\sqrt{2}$ 3. $\sqrt{2}$ 4. -2

39. $\int_{1/\pi}^{2/\pi} \frac{\text{Cos}\left(\frac{1}{x}\right)}{x^2} dx =$

1) 2 2) -1 3) 1 4) $\frac{1}{2}$

40. $\int_0^{\pi/2} e^{\sin^2 x} \sin 2x \, dx =$

1. e 2. e+1 3. e-1 4. 2e +1

PROBLEMS ON PROPERTIES OF DEFINITE INTEGRALS

41. $\int_0^{\pi/2} \frac{f(\sin x)}{f(\sin x)+f(\cos x)} dx =$

1) π 2) 2π 3) $\pi/2$ 4) $\pi/4$

42. $\int_0^{\pi/2} \frac{\cos ec^{2/3} x}{\cos ec^{2/3} x + \sec^{2/3} x} dx =$

1) π 2) $-\pi$ 3) $\pi/4$ 4) 0

43. $\int_0^{\pi/2} \frac{a\cos x + b\sin x}{\cos x + \sin x} dx =$

1) π(a+b) 2) $\frac{\pi}{2}$(a+b) 3) $\frac{\pi}{4}$(a+b) 4) πab

44. $\int_0^{\pi/2} \frac{5\tan x - 3\cot x}{\tan x + \cot x} dx =$

1) π 2) $\pi/3$ 3) $\pi/2$ 4) $\frac{\pi}{6}$

45. $\int_0^a \frac{dx}{x+\sqrt{a^2-x^2}} =$

1) π 2) $\pi/3$ 3) $-\pi$ 4) $\pi/4$

46. $\int_{\pi/6}^{\pi/3} \frac{\cos^3 x}{\sin^3 x + \cos^3 x} dx =$

1) $\frac{\pi}{3}$ 2) $\frac{-\pi}{2}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{12}$

47. $\int_0^{\pi/2n} \frac{dx}{1+\cot^n nx} =$

1. $\frac{\pi}{6}$ 2. $\frac{\pi}{4}$ 3. $\frac{\pi}{8}$ 4. $\frac{\pi}{12}$

48. $\int_0^a [f(a+x)+f(a-x)]dx =$

1. $\int_0^a f(x)dx$ 2. $\int_0^{2a} f(x)dx$

3. $\int_0^a f(x)dx$ 4. $\int_{-a}^a f(x)dx$

49. $\int_0^{\pi/2} \frac{dx}{4\cos^2 x+9\sin^2 x} =$

1) $\frac{\pi}{12}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{9}$ 4) $\frac{\pi}{6}$

50. $\int_a^b \frac{f(x)}{f(x)+f(a+b-x)}dx =$

1) $\frac{a+b}{2}$ 2) $\frac{a-b}{2}$ 3) $\frac{b-a}{2}$ 4) b - a

51. $\int_0^a x(a-x)^n dx =$

1) $\frac{a}{n+1}$ 2) $\frac{a}{n+2}$

3) $\frac{a^{n+1}}{(n+1)(n+2)}$ 4) $\frac{a^{n+2}}{(n+1)(n+2)}$

52. $\int_0^{\infty} e^{-4x}.\text{Cos}3x dx =$

1) $\frac{3}{25}$ 2) $\frac{4}{25}$ 3) $\frac{-1}{25}$ 4) $\frac{7}{25}$

53. $\int_0^{\infty} e^{-2x}.\text{Sin}5x dx =$

1) $\frac{-2}{29}$ 2) $\frac{2}{29}$ 3) $\frac{5}{29}$ 4) $\frac{7}{25}$

54. **If** $\int_{-1}^4 f(x)dx = 4 \; and \int_2^4 (3-f(x))dx = 7$

$then \int_{-1}^2 f(x)dx =$

1. -2 2. 3 3. 5 4. 8

55. $\int_0^{\pi/2} \frac{3Secx+5Co\sec x}{Secx+Co\sec x}dx =$

1) π 2) 2π 3) 3π 4) $\pi/2$

56. $\int_0^{\pi/2} \frac{1}{1+\sqrt[4]{Tanx}}dx =$

1. $\pi/4$ 2. $\pi/2$ 3. 0 4. $\pi/3$

57. $\int_0^{\pi/2} \frac{aSecx+bCo\sec x}{Secx+Co\sec x}dx =$

1. $\pi/2$ 2. $\pi/4$

3. (a+b) $\pi/2$ 4. (a+b) $\pi/4$

58. $\int_0^a \frac{f(x)}{f(x)+f(a-x)}dx =$

1) 2a 2) a 3) $\frac{a}{2}$ 4) $\frac{a}{4}$

59. $\int_2^3 \frac{\sqrt{x}}{\sqrt{5-x}+\sqrt{x}}dx =$

1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) 1 4) 2

60. $\int_1^3 \frac{\sqrt{x}}{\sqrt{4-x}+\sqrt{x}}dx =$

1) 1 2) $\frac{1}{2}$ 3) 1 4) 0

61. $\int_{\pi/6}^{\pi/3} \frac{1}{1+\tan x}dx =$

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{8}$ 3) $\frac{\pi}{12}$ 4) $\frac{\pi}{16}$

62. $\int_0^{\pi/2} \frac{\text{Cosx} - \text{Sinx}}{1 + \text{SinxCosx}} dx =$

1) 1 2) 0 3) $\frac{\pi}{4}$ 4) -1

63. $\int_0^1 x(1-x)^{10} dx =$

1) $\frac{1}{112}$ 2) $\frac{1}{132}$ 3) $\frac{1}{246}$ 4) $\frac{1}{92}$

64. $\int_0^1 x^2(1-x)^5 dx =$

1) $\frac{1}{186}$ 2) $\frac{1}{168}$ 3) $\frac{1}{196}$ 4) $\frac{1}{176}$

65. $\int_0^{2a} \frac{f(x)dx}{f(x)+f(2a-x)} =$

1) a 2) a/2 3) 0 4) 2a

66. **If** $\int_0^a x^m (a-x)^n dx$ **=k then** $\int_0^a x^n (a-x)^m dx =$

1) k 2) -k 3) k/2 4) k/3

67. **If** $\int_0^{\pi/2} \log(\sin x)dx$ **=k then** $\int_0^{\pi/2} \log(\cos x)dx =$

1) k/2 2) 2k 3) -3k 4) k

68. $\int_0^a \sqrt{ax - x^2}\, dx =$

1) $\frac{\pi a^2}{8}$ 2) $\frac{\pi a^2}{4}$ 3) $-\pi a^2$ 4) π

69. $\int_1^3 \frac{dx}{\sqrt{(x-1)(3-x)}} =$

1) π 2) $-\pi$ 3) $\pi/2$ 4) 0

PROBLEMS ON MODULES AND STEP FUNCTIONS

70. $\int_0^2 (|x| + |x-1|)dx =$

1) 1 2) -1 3) 2 4) 3

71. $\int_2^5 \left(|x-2| + |x-5|\right) dx =$

1) 0 2) 3 3) 9/2 4) 9

72. $\int_2^3 |x^2 - 5x + 6| dx =$

1) 1/6 2) 2/3 3) 4/7 4) 3/7

73. **If 0<a<b, then** $\int_a^b \frac{|x|}{x} dx =$

1) a-b 2) a+b 3) 0 4) b-a

74. $\int_{\pi/4}^{3\pi/4} |\cos x|\, dx =$

1) $2-\sqrt{2}$ 2) $2\sqrt{2}$ 3) $\sqrt{2}-1$ 4) $\sqrt{2}+1$

75. $\int_0^{\pi} |\cos x - \sin x|\, dx =$

1) $4\sqrt{2}$ 2) $2\sqrt{2}$ 3) $4\sqrt{3}$ 4) $3\sqrt{2}$

76. $\int_1^{\infty} \left[\frac{1}{1+x^2}\right] dx =$

1) 0 2) 1 3) 2 4) 3

77. $\int_1^4 \log[x] dx =$

1) log 4 2) log 5 3) log 6 4) zero

78. $\int_1^2 x^2 [x] dx =$

1) 7/3 2) 8/3 3) 4/3 4) 5/3

79. $\int_0^4 [2x+3] dx =$

1) 12 2) 24 3) 26 4) 0

PROBLEMS ON EVEN AND ODD FUNCTIONS

80. $\int_{-\pi/2}^{\pi/2} \sin|x| dx =$

1) 1 2) 2 3) -1 4) 1/2

81. $\int_{-2}^{2} (x^{11}\cos x + e^x) dx =$

1) sin h2 2) 2 sin h2

3) $\frac{3}{2}$ sin h2 4) $\frac{\sinh 2}{2}$

82. **If f(x) and g(x) are any two continueous functions $\forall x \in R$ then** $\int_{-a}^{a} \frac{g(x)-g(-x)}{f(x)+f(-x)} dx$

1. 0 2. 4 3. 6 4. 3

83. $\int_{-\frac{1}{3}}^{\frac{1}{3}} \cos x \log\left(\frac{1-x}{1+x}\right) dx =$

1. 0 2. $\frac{1}{3}$ 3. $\frac{2}{3}$ 4. $\frac{2}{5}$

84. $\int_{-\pi/2}^{\pi/2} \frac{\cos x}{1+e^x} dx =$

1) 0 2) -1 3) 1 4) 2π

85. $\int_{-1}^{1} \frac{\cos hx}{1+e^x} dx =$

1) $\frac{e^2}{2}$ 2) $\frac{e^2-1}{2}$ 3) $\frac{e^2-1}{2e}$ 4) $1-e^2$

86. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \log\left(\frac{2-\sin\theta}{2+\sin\theta}\right) d\theta =$

1. 0 2. 1 3. 2 4. -1

87. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^2 x \cos^2 x (\sin x + \cos x) dx =$

1. $\frac{2}{15}$ 2. $\frac{4}{15}$ 3. $\frac{2}{5}$ 4. $\frac{8}{15}$

88. $\int_{-\pi}^{\pi} x \sin x dx =$

1. 2π 2. $\frac{\pi^2}{4}$ 3. $-\pi$ 4. 0

89. $\int_{-1}^{1} \left|1-x^2\right| dx$

1. 4/3 2. 1 3. -1/3 4. -4/3

90. $\int_{-2}^{2} \frac{x}{|x|} dx =$

1. 4 2. 2 3. 0 4. 1

PROBLEMS ON PERIODIC PROPERTY

91. $\int_0^{50} (x-[x]) dx =$

1) 25 2) 20 3) 15 4) 10

92. $\int_0^{1000} e^{x-[x]}dx =$

1) $\frac{e^{1000}-1}{1000}$ 2) $\frac{e^{1000}-1}{e-1}$

3) 1000(e-1) 4) $\frac{e-1}{1000}$

93. $\int_0^{100\pi} \sqrt{1-Cos2x}dx =$

1) $150\sqrt{2}$ 2) $100\sqrt{2}$

3) $200\sqrt{2}$ 4) $50\sqrt{2}$

94. $\int_0^{88\pi} \sqrt{1-\text{Cos}2x}dx =$

1) $176\sqrt{2}$ 2) $88\sqrt{2}$

3) $44\sqrt{2}$ 4) $22\sqrt{2}$

95. $\int_0^{100} Sin(x-[x])\pi dx =$

1) $\frac{100}{\pi}$ 2) $\frac{200}{\pi}$ 3) 100π 4) 200π

PROBLEMS ON REDUCTION FORMULAE

96. $\int_0^{\pi/2} \sin^4 x dx =$

1) $\frac{\pi}{12}$ 2) $\frac{3\pi}{7}$ 3) $\frac{3\pi}{16}$ 4) 0

97. $\int_0^{\pi/4} \sin^7 2x \, dx =$

1) $\frac{16}{15}$ 2) $\frac{16}{35}$ 3) $\frac{4}{35}$ 4) $\frac{8}{35}$

98. $\int_0^{\pi/8} \cos^3 4x dx =$

1) 1/6 2) 1/5 3) -1/3 4) 1/8

99. $\int_0^{\pi/4} \tan^5 x \, dx =$

1) $\frac{1}{2}\log 2+\frac{1}{4}$ 2) $\frac{1}{2}\log 2-\frac{1}{4}$

3) $\frac{1}{4}\log 2-\frac{1}{4}$ 4) $\frac{1}{2}\log 4$

100. $\int_0^{\pi/4} \sec^6 x \, dx =$

1) $\frac{8}{15}$ 2) $\frac{35}{8}$ 3) $\frac{44}{15}$ 4) $\frac{28}{15}$

101. $\int_0^{\pi/2} \sin^4 x.\cos^2 x dx =$

1) $\frac{\pi}{32}$ 2) $\frac{\pi^2}{16}$ 3) $\frac{\pi}{15}$ 4) $\frac{\pi}{64}$

102. $\int_0^1 \frac{x^6 dx}{\sqrt{1-x^2}} =$

1) $\frac{\pi}{32}$ 2) $\frac{2\pi}{5}$ 3) $\frac{5\pi}{32}$ 4) $\frac{7\pi}{32}$

PROBLEMS ON LEIBNITZ RULE

103. $\underset{x\to 0}{\text{Lt}}\left(\frac{x^2}{\int_0^x \tan^{-1} t \, dt}\right) =$

1) 2 2) $\frac{1}{2}$ 3) - 2 4) 4

104. $\underset{x\to 0}{Lt}\dfrac{\int_0^{x^2}\sin\sqrt{t}\,dt}{x^3}=$

1) $\frac{1}{3}$ 2) $\frac{2}{3}$ 3) $\frac{4}{3}$ 4) does not exit

105. $\underset{x\to 0}{Lt}\dfrac{\int_0^{x}\sin^2 t\cos t\,dt}{x^3}$

1) 1 2) $\frac{1}{2}$ 3) $\frac{1}{3}$ 4) $\frac{2}{3}$

106. $\underset{x\to 3}{Lt}\left[\dfrac{1}{x-3}\int_3^x e^t\,dt\right]$

1) e^3 2) 1/e 3) e^2 4) e

107. $\underset{x\to 0}{Lt}\dfrac{\int_0^{x}\cos^3 t\,dt}{x}$

1) 0 2) 1./2 3) 1 4) 2

LEVEL-I
HOME WORK
PROBLEMS ON BASIC FORMULAE, SUBSTITUTION AND BY PARTS

1. $\int_0^2 (3x^2+4x+3)dx=$

1. 20 2. 22 3. 25 4. 30

2. $\int_0^1 e^x dx=$

1. e - 1 2. 1 3. e 4. 2

3. $\int_0^4 x\sqrt{x}dx=$

1. 12.4 2. 8.4 3. 8.8 4. 12.8

4. $\int_0^1 \dfrac{dx}{\sqrt{1-x^2}}=$

1. 0 2. -1 3. $\frac{\pi}{2}$ 4. $-\frac{\pi}{2}$

5. $\int_{1/2}^1 \dfrac{1}{\sqrt{1-x^2}}dx=$

1) π 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/4$

6. $\int_1^2 \dfrac{1}{x\sqrt{x^2-1}}dx=$

1) π 2) $\pi/2$ 3) $\pi/4$ 4) $\pi/3$

7. $\int_0^a \dfrac{1}{a^2+x^2}dx=$

1. $\pi/2$ 2. $\pi/3$ 3. $\pi/4$ 4. $\pi/4a$

8. $\int_{a/2}^a \dfrac{1}{\sqrt{a^2-x^2}}dx=$

1. $\pi/2$ 2. $\pi/2a$ 3. $\pi/2 - 1$ 4. $\pi/3$

9. $\int_0^a \sqrt{a^2-x^2}dx=$

1. $\frac{a^2}{4}$ 2. πa^2 3. $\frac{\pi a^2}{2}$ 4. $\frac{\pi a^2}{4}$

10. $\int_0^1 \sqrt{1-x^2}dx=$

1. $1-\frac{\pi}{4}$ 2. $1-\frac{\pi}{3}$ 3. $\frac{\pi}{3}$ 4. $\frac{\pi}{4}$

11. $\int_{\frac{\sqrt{2}}{3}}^{\frac{\sqrt{3}}{3}} \dfrac{1}{\sqrt{4-9x^2}}dx=$

1) $\frac{\pi}{12}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{9}$ 4) $\frac{\pi}{36}$

26. $\int_0^{\infty} \left(a^{-x} - b^{-x}\right) dx =$ **(a > 1 , b > 1)**

1) $\frac{1}{\log a} - \frac{1}{\log b}$ 2) log a - log b

3) log a + log b 4) $\frac{1}{\log a} + \frac{1}{\log b}$

27. $\int_{-1}^{1} xe^x dx =$

1. e 2. 1/e 3. e^2 4. 2/e

28. $\int_0^{\pi/4} x \sec^2 x.dx =$

1) $\frac{\pi}{4} - \frac{1}{2}\log 2$ 2) $\frac{\pi}{4} - \frac{1}{4}\log 2$

3) $\frac{\pi}{4} + \frac{1}{2}\log 2$ 4) $\frac{\pi}{4} + \frac{1}{4}\log 2$

29. $\int_0^1 Sin^{-1} x dx =$

1) π-2 2) $\frac{\pi - 2}{2}$ 3) $\frac{\pi + 2}{2}$ 4) $\pi + 2$

30. $\int_0^{\pi/2} \frac{1}{4 + 5\cos x} dx =$

1) $\frac{1}{5}\log 2$ 2) $\frac{1}{2}\log 2$

3) $\frac{1}{3}\log 3$ 4) $\frac{1}{3}\log 2$

31. **If** $\int_0^{\infty} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$**, then** $\int_0^{\infty} e^{-ax^2} dx$**, a > 0 is**

1) $\frac{\sqrt{\pi}}{2}$ 2) $\frac{\sqrt{\pi}}{2a}$ 3) $2\frac{\sqrt{\pi}}{a}$ 4) $\frac{1}{2}\sqrt{\frac{\pi}{a}}$

32. *If* $\int_0^{40} \frac{dx}{2x+1} = \log a$ *then a*

1) 3 2) 9 3) 81 4) 40

33. $\int_0^4 \sqrt{16 - x^2} dx =$

1) $\frac{\pi}{4}$ 2) π 3) 16π 4) 4π

34. $\int_0^1 x^2 e^x dx =$

1) e-2 2) e+2 3) e 4) e+3

PROBLEMS ON PROPERTIES OF DEFINITE INTEGRALS

35. $\int_0^{\pi/2} \frac{1}{1 + Cot x} dx =$

1) π 2) $\pi/2$ 3) $\pi/4$ 4) $\frac{\pi}{6}$

36 $\int_0^{\infty} \frac{x}{(1+x)(1+x^2)} dx =$

1. $\pi/8$ 2. $\pi/4$ 3. $\pi/2$ 4. $\pi/6$

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

1) $\pi/4$ 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/8$

38. $\int_0^{\pi/2} \frac{Cos^{3/2} x}{Cos^{3/2} x + Sin^{3/2} x} dx =$

1) $\pi/3$ 2) $\pi/2$ 3) $\pi/4$ 4) $\pi/8$

39. $\int_{\pi/8}^{3\pi/8} \frac{\cos x}{\cos x + \sin x} dx =$

1) $\pi/6$ 2) $\frac{\pi}{8}$ 3) $\frac{\pi}{12}$ 4) $\frac{\pi}{24}$

12. $\int_0^{\pi/2} \sqrt{1+\sin x}dx =$

1) 1 2) 1/2 3) 2 4) 3

13. $\int_{\pi/2}^{3\pi/2} \frac{1}{1+\cos x}dx =$

1. 2 2. -2 3. 1/2 4. -1/2

14. **If** $\int_0^k \frac{\cos x}{1+\sin^2 x}dx = \frac{\pi}{4}$ **then k =**

1. 1 2. $\pi/4$ 3. $\pi/2$ 4. $\pi/6$

15. $\int_0^{\pi/2} \cos^5 x.\sin 2x dx =$

1) 2/7 2) 1/7 3) -1/7 4) 3/7

16. $\int_0^{\pi/2} \frac{Sin^2 x}{(1+Cosx)^2}dx =$

1. $\pi/2$ 2. 2 - $\pi/2$
3. $\pi/2$ - 2 4. 2 + $\pi/2$

17. $\int_0^1 e^x(e^x+1)^3 dx =$

1. $\frac{e^4}{4}-4$ 2. $\frac{(e+1)^4}{4}-4$

3. $\frac{(e+1)^4+16}{4}$ 4. $\frac{(e+1)^4}{4}+4$

18. $\int_0^1 e^x \sinh x dx =$

1) $\frac{e^2-3}{4}$ 2) $\frac{e^2+3}{4}$ 3) 4(e^2+3) 4) $\frac{e^2-5}{4}$

19. $\int_0^{\log 2} \cosh 2x dx =$

1) 15/16 2) -15 3) 16/17 4) 17/18

20. $\int_0^1 \frac{x}{1+\sqrt{x}}dx =$

1) $\frac{5}{3}-\log 4$ 2) $\frac{5}{3}+\log 4$

3) $\frac{5}{3}\log 4$ 4) $\frac{3}{5}-\log 4\frac{3}{5}-\log 4$

21. **If** $\int_{\log 2}^{t} \frac{dx}{\sqrt{e^x-1}} = \frac{\pi}{6}$ **then t =**

1) log 8 2) log 6 3) log 4 4) 1

22. $\int_0^{1/2} e^x\left[\text{Sin}^{-1}x + \frac{1}{\sqrt{1-x^2}}\right]dx =$

1. $\frac{e^4}{4}$ 2. $\frac{\pi\sqrt{e}}{6}$ 3. $\frac{\sqrt{\pi e}}{4}$ 4. $\frac{\pi\sqrt{e}}{2}$

23. $\int_0^{\frac{\pi}{2}} (\cos x - \sin x)e^x dx =$

1. 0 2. 1 3. -1 4.2

24. $\int_1^2 \frac{dx}{\sqrt{1+x^2}} =$

1. $\log_e\left(\frac{2+\sqrt{5}}{\sqrt{2}+1}\right)$ 2. $\log_e\left(\frac{\sqrt{2}+1}{2+\sqrt{5}}\right)$

3. $\log_e\left(\frac{2-\sqrt{5}}{\sqrt{2}-1}\right)$ 4. 0

25. $\int_0^1 \frac{1}{\sqrt{2+3x}}dx =$

1. $\frac{2}{3}(\sqrt{5}-\sqrt{2})$ 2. $\frac{2}{3}(\sqrt{5}+\sqrt{2})$

3. $\frac{3}{5}(\sqrt{5}-\sqrt{2})$ 4. $\frac{2}{3}(\sqrt{3}-\sqrt{2})$

40. $\int_0^{\pi/2} \frac{Secx}{Secx + Co\sec x} dx =$

1) $\pi/3$ 2) $\pi/2$ 3) $\pi/4$ 4) $\pi/8$

41. $\int_{\alpha}^{\frac{\pi}{2}-\alpha} \frac{\text{Cotx}}{\text{Tanx}+\text{Cotx}} dx =$

1) $\frac{\pi}{4}-\alpha$ 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/8$

42. $\int_0^{\pi/2} \frac{\sqrt{Cotx}}{\sqrt{Tanx}+\sqrt{Cotx}} dx =$

1) π 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/4$

43. $\int_0^{\frac{\pi}{2}} \frac{3^{\sec^3 x}}{3^{\sec^3 x}+3^{\cos ec^3 x}} dx =$

1) 0 2) $\pi/2$ 3) $\pi/4$ 4) π

44. $\int_0^{\pi/2} \frac{2Sinx+3Cosx}{Sinx+Cosx} dx =$

1) $\frac{5\pi}{4}$ 2) $\frac{5\pi}{2}$ 3) $\frac{5\pi}{3}$ 4) $\frac{5\pi}{5}$

45. $\int_0^{\pi/2} \frac{\sec^2 x dx}{(\sec x+\tan x)^n} =$ **(n > 2)**

1) $\frac{1}{n^2-1}$ 2) $\frac{n}{n^2-1}$ 3) $\frac{n}{n^2+1}$ 4) $\frac{2}{n^2-1}$

46. $\int_0^{\infty} \frac{dx}{\left(x+\sqrt{x^2+1}\right)^5} =$

1) 1/24 2) 1/5 3) 5/24 4) 5/36

47. $\int_8^9 \sqrt{\frac{x-8}{9-x}} dx =$

1) π 2) $\frac{\pi}{3}$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{6\sqrt{2}}$

48. $\int_0^{\infty} e^{-2x}(\text{Cos}4x+\text{Sin}4x)dx =$

1) 4/25 2) 3/10 3) 1/5 4) 7/25

49. $\int_0^{\pi/2} \log(\tan x)dx =$

1) 0 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/4$

50. $\int_0^{\frac{\pi}{2}} \frac{f(\sec x)-f(\operatorname{cosec} x)}{1+f(\sec x)f(\operatorname{cosec} x)} dx$

1) 0 2) $\pi/2$ 3) $\pi/3$ 4) $\pi/4$

51. $\int_0^{\frac{\pi}{2}} \log\left(\frac{a\cos x+b\sin x}{a\sin x+b\cos x}\right) dx =$

1. 0 2. $\pi/4$ 3. e^{π} 4. $\frac{e^{\pi}}{4}$

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

1. 0 2. 1 3. $\pi/4$ 4. $\frac{4}{e^{\pi}}$

53. $\int_0^{\pi/2} \sin 2x \log(\tan x)dx =$

1) 0 2) -1/2 3) 1/3 4) 1/4

54. $\int_a^b \frac{(20-x)^n}{x^n+(20-x)^n}dx = 6\ then$

1) $a=8, b=12$ 2) $a=10, b=10$

3) $a=4, b=16$ 4) $a=6, b=14$

55. $\int_a^b f(a+b-x)dx = \int_a^b f(x)dx\ is\ true$

1) For all values of a,b

2) For a = 0 only

3) For all values of a only

4) For all values of b only

56. $\int_0^{\pi} \frac{dx}{1+(\tan x)^{2008}} =$

1) 0 2) π 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{2}$

57. $\int_0^6 f(x)dx = \int_0^k f(x)f(6-x)dx\ then\ k=$

1) 1 2) 2 3) 3 4) 4

58. **The value of** $\int_0^{2\pi} \cos^{99} x dx$ **is**

1) 1 2) -1 3) 99 4) 0

59. $\int_0^1 \frac{x}{(1-x)^{\frac{5}{4}}}dx =$

1) 16/3 2) 3/16 3) -3/16 4) -16/3

60. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{f\left(\frac{\pi}{2}-x\right)}{f(x)+f\left(\frac{\pi}{2}-x\right)}dx =$

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{6}$ 3) $\frac{\pi}{12}$ 4) $\frac{\pi}{3}$

61. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \frac{\sec x}{e^x+1}dx =$

1) 0 2) $\frac{\pi}{2}$ 3) $\log\left(\sqrt{2}+1\right)$ 4) π

62. **If** $f(x) = \begin{cases} x^2\ for 0 \le x \le 1 \\ \sqrt{x}\ for 1 \le x \le 2 \end{cases}$ **then** $\int_0^2 f(x)dx =$

1. $(1/3)(4\sqrt{2}+1)$ 2. $(1/3)(4\sqrt{2}-1)$

3. $(1/3)(2\sqrt{2}-1)$ 4. $(1/2)(3\sqrt{2}-1)$

63. $\int_1^4 f(x)dx$ **where f(x)=x²; 1 ≤ x<2 and f(x)=3x-4; 2 ≤ x<4 is**

1. 7/3 2. 10 3. 23/3 4. 37/3

64. $\int_{e^{-1}}^{e^2} \left|\frac{\log x}{x}\right| dx =$

1) 3/2 2) 5/2 3) 3 4) 5

65. **If** $f(x) = \begin{cases} x \text{ for } x<1 \\ x-1 \text{ for } x \ge 1 \end{cases}$

then $\int_0^2 x^2 f(x)dx =$

1) $\frac{5}{3}$ 2) $\frac{3}{5}$ 3) $\frac{-5}{3}$ 4) $\frac{-3}{5}$

PROBLEMS ON MODULES AND STEP FUNCTIONS

66. $\int_0^2 |x-2|\,dx =$

1) 1/2 2) 3 3) 2 4) 3/4

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

1) 3/2 2) 2/3 3) 5/2 4) 0

68. **If a<0<b, then** $\int_a^b \frac{|x|}{x}dx =$

1) b-a 2) a-b 3) a+b 4) 0

69. $\int_{-1}^{1} \frac{|x|}{x}dx =$

1) 0 2) 1/2 3) 1/3 4) -1

70. $\int_0^{\pi} |\cos x|\, dx =$

1. 0 2.2- $\sqrt{2}$ 3. 2+$\sqrt{2}$ 4. 2

71. $\int_0^{\pi} \left(\cos x + |\cos x|\right) dx =$

1) 1 2) 1/2 3) 2 4) -1

72. $\int_0^{2} [x]dx =$

1) 1 2) -1 3) 0 4) 2

73. $\int_{-a}^{a} x|x|\, dx =$

1) $\frac{a}{3}$ 2) $\frac{a^2}{3}$ 3) $\frac{a^2}{2}$ 4) 0

PROBLEMS ON EVEN AND ODD FUNCTIONS

74. $\int_{-\pi/2}^{\pi/2} \sqrt{Cosx - Cos^3 x}dx =$

1) 1 2) 4/3 3) -1/3 4) 0

75. $\int_{-\pi}^{\pi} x^3 \cos x dx =$

1) π 2) $\pi/2$ 3) $-\pi/3$ 4) 0

76. $\int_{-2\pi}^{2\pi} \sin^5 x dx =$

1) $\frac{\pi^2}{2}$ 2) $\pi/15$ 3) $3\pi/17$ 4) 0

77. $\int_{-a}^{a} \{f(x)+f(-x)\}dx =$

1) $2\int_0^a f(x)dx$ 2) 0

3) $2.\int_0^a \{f(x)+f(-x)\}dx$ 4) $\int_0^a f(-x)dx$

78. $\int_{-1}^{1} \left(\sqrt{1-x+x^2} - \sqrt{1+x+x^2}\right)dx =$

1) 1/2 2) -1 3) 0 4) 2

79. $\int_{-3}^{3} \log\left(\sqrt{x^2+1}+x\right)dx =$

1) 0 2) log2 3) –log2 4) 2log2

80. **The value of** $\int_{0.5}^{4.5} [x]dx + \int_{-1}^{1} |x|dx$ **is**

1) 9 2) 8 3) 7 4) 6

81. $\int_{-1}^{1} \left(ax^3 + bx\right) dx = 0$ **for**

1) any values of a and b
2) a > 0; b < 0 only
3) a > 0; b > 0 only
4) a < 0; b < 0 only

82. $\int_{-\pi}^{\pi} \frac{xCosx}{1+Sin^2x} dx =$

1) 1 2) 0 3) -1 4) $\frac{1}{2}$

83. $\int_{-\pi/2}^{\pi/2} \left(x^3 + x\text{Cos}x + \tan^5 x + 1\right) dx =$

1) 0 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{2}$ 4) π

84. $\int_{-\pi}^{\pi} \frac{2x\left(1+\text{Sin}x\right)}{1+\text{Cos}^2 x} dx$

1) π^2 2) $\frac{\pi^2}{2}$ 3) $\frac{\pi^2}{4}$ 4) $2\pi^2$

85. $\int_{-1}^{1} \left(x^{27}\text{Cos}x + e^x\right) dx =$

1) 0 2) 1 3) $e+\frac{1}{e}$ 4) $e-\frac{1}{e}$

86. $\int_{-\pi/2}^{\pi/2} e^{\text{Sin}^2 x}.\text{Sin}^{(2n+1)} x dx =$

1) 2e 2) 0 3) 1 4) $\frac{e}{2}$

87. **If** $f(x) = \begin{vmatrix} x & \cos x & e^{x^2} \\ \sin x & x^2 & \sec x \\ \tan x & x^4 & 2x^2 \end{vmatrix}$ **then**

$\int_{-\pi/2}^{\pi/2} f(x) dx =$

1) 0 2) 1 3) -1 4) 2

PROBLEMS ON REDUCTION FORMULAE

88. $\int_{0}^{\pi/2} \sin^9 x \, dx =$

1) $\frac{\pi}{315}$ 2) $\frac{128\pi}{315}$ 3) $\frac{128}{315}$ 4) $\frac{115}{315}$

89. $\int_{0}^{\pi/2} \cos^5 x dx =$

1) 8/15 2) 7/15 3) 1/15 4) 0

90. $\int_{0}^{\pi/4} \tan^6 x \, dx =$

1) $\frac{\pi}{4}+\frac{3}{15}$ 2) $\frac{\pi}{4}+\frac{2}{3}$

3) $\frac{13}{15}-\frac{\pi}{4}$ 4) $\frac{\pi}{4}-\frac{13}{15}$

91. $\int_{0}^{\pi/2} \sin^8 x \cos^2 x dx =$

1) $\frac{\pi}{512}$ 2) $\frac{3\pi}{512}$ 3) $\frac{7\pi}{512}$ 4) $\frac{5\pi}{512}$

92. $\int_{0}^{\pi/2} \cos^6 x \sin^5 x \, dx =$

1) $\frac{8}{693}$ 2) $\frac{16}{155}$ 3) $\frac{17}{675}$ 4) $\frac{5}{2048}$

93. **The values of** θ $(0 \le \theta \le \pi)$ **satiesfying**

$\int_{0}^{\theta} \cos x \, dx = \sin 2\theta$ are

1. $0, \frac{\pi}{3}$ 2. $\frac{\pi}{4}, \frac{3\pi}{4}$

3. $\frac{\pi}{2}, \pi$ 4. $\frac{\pi}{6}, \frac{5\pi}{6}$

94. $\int_{0}^{2\pi} \sin^m x \cos^n x \, dx = 4\int_{0}^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$

(m,n $\in$ **N), when**

1) m is odd n is even 2) m, n both odd

3) m,n both even 4) m is even n is odd

95. $\int_{-2\pi}^{2\pi} \cos^6 x dx =$

1) $\frac{4\pi}{5}$ 2) $\frac{5\pi}{4}$ 3) 15π 4) $\frac{\pi^2}{4}$

96. $\int_0^a \frac{x^5 dx}{\sqrt{a^2-x^2}} =$

1) $\frac{a^5}{15}$ 2) $\frac{8a^5}{15}$ 3) $\frac{8a}{15}$ 4) $\frac{11a^2}{15}$

97. $\int_0^{2\pi} \cos^4 x dx =$

1) $\frac{3\pi}{4}$ 2) -3π 3) $\frac{4\pi}{3}$ 4) 0

98. $\int_0^{\infty} \frac{x^2 dx}{(1+x^2)^{7/2}} =$

1) 1/15 2) 2/15 3) -1/15 4) $\frac{4}{15}$

99. $\int_0^{\infty} \frac{dx}{(1+x^2)^4} =$

1) $\frac{\pi}{32}$ 2) $\frac{3\pi}{32}$ 3) $\frac{5\pi}{32}$ 4) $\frac{7\pi}{32}$

100. $\int_{-a}^{a} \frac{x^4 dx}{\sqrt{a^2-x^2}} =$

1) $\frac{3\pi a^4}{8}$ 2) $\frac{\pi a^4}{8}$ 3) $\frac{-\pi a^4}{8}$ 4) $\frac{5\pi a^4}{8}$

101. $\int_0^3 (9-x^2)^{3/2} dx =$

1) $\frac{243\pi}{16}$ 2) $\frac{\pi}{16}$

3) $\frac{-243\pi^2}{15}$ 4) $\frac{81\pi}{16}$

KEY

LEVEL - I

01) 4	02) 3	03) 4	04) 1	05) 1
06) 2	07) 1	08) 3	09) 3	10) 2
11) 3	12) 2	13) 1	14) 3	15) 3
16) 1	17) 1	18) 3	19) 4	20) 3
21) 1	22) 1	23) 1	24) 3	25) 1
26) 2	27)1	28)2	29) 3	30)3
31) 2	32) 3	33) 1	34) 3	35) 3
36) 2	37) 2	38) 1	39) 2	40) 3
41) 4	42) 3	43) 3	44) 3	45) 4
46) 4	47) 2	48) 2	49) 1	50) 3
51) 4	52) 2	53) 3	54) 3	55) 2
56) 1	57) 4	58) 3	59) 2	60) 1
61) 3	62) 2	63) 2	64) 2	65) 1
66) 1	67) 4	68) 1	69) 1	70) 4
71) 4	72) 1	73) 4	74) 1	75) 2
76) 1	77) 3	78) 1	79) 3	80) 2
81) 2	82) 1	83) 1	84) 3	85) 3
86) 1	87) 2	88) 1	89) 1	90) 1
91) 1	92) 3	93) 3	94) 1	95) 2
96) 3	97) 4	98) 2	99) 2	100) 4
101) 1	102) 3	103) 1	104) 2	105) 3
106) 1	107) 3			

LEVEL - I

HOME WORK

1) 2	2) 2	3) 4	4) 3	5) 3
6) 4	7) 4	8) 4	9) 4	10) 4
11) 4	12) 3	13) 2	14) 3	15) 1
16) 2	17) 2	18) 1	19) 1	20) 1
21) 3	22) 2	23) 3	24) 1	25) 1
26) 1	27) 4	28) 1	29) 2	30) 4
31) 4	32) 2	33) 4	34) 1	35) 3
36) 2	37) 1	38) 3	39) 2	40) 3
41) 1	42) 4	43) 3	44) 1	45) 2
46) 3	47) 3	48) 2	49) 1	50) 1
51) 1	52) 1	53) 1	54) 3	55) 1
56) 4	57) 3	58) 4	59) 4	60) 3
61) 3	62) 2	63) 4	64) 2	65) 1
66) 3	67) 3	68) 3	69) 1	70) 4
71) 3	72) 1	73) 4	74) 2	75) 4
76) 4	77) 3	78) 3	79) 1	80) 1
81) 1	82) 2	83) 4	84) 1	85) 4
86) 2	87) 1	88)3	89) 2	90) 3
91) 3	92) 1	93) 1	94) 3	95) 2
96) 2	97) 1	98) 3	99) 3	100) 1
101) 1				

LEVEL - II

CLASS WORK

PROBLEMS ON BASIC FORMULAE AND SUBSTITUTIONS.

1. $\int_0^{\pi/2} \frac{1}{1+4\sin^2 x} dx =$

1) $\frac{\pi}{\sqrt{5}}$ 2) $\frac{\pi}{2\sqrt{5}}$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{3\sqrt{5}}$

2. **If 0< a < c, 0 < b < c then** $\int_0^{\infty} \frac{a^x - b^x}{c^x} dx =$

1. $\log\frac{b}{c} - \log\frac{a}{c}$ 2. $\frac{\log a - \log b}{\log c}$

3. $\frac{1}{\log b/c} - \frac{1}{\log a/c}$ 4. $\log\frac{a}{c} - \log\frac{b}{c}$

3. $\int_2^{e} \left[\frac{1}{\log x} - \frac{1}{(\log x)^2}\right] dx =$

1. e - 2 2. e + 2 $\log_2$e

3. e -2 $\log_2$e 4. $\log_2$e

4. **If f(x)=** $\begin{vmatrix} \cos x & 1 & 0 \\ 1 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ **then** $\int_0^{\pi/2} f(x)dx =$

1) 1/4 2) -1/3 3) 1/2 4) 0

5. $\int_0^{\pi/2} \log(\tan x + \cot x)dx =$

1) π log 2 2) -π log 2

3) -$\frac{\pi}{2}$ log 2 4) $\frac{\pi}{2}$ log 2

6. $\int_0^1 \text{Tan}^{-1}\left(\frac{2x-1}{1+x-x^2}\right)dx =$

1) 0 2) 1 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{8}$

7. $\int_0^1 \text{Cot}^{-1}(1-x+x^2)dx =$

1) $\frac{\pi}{2}$ - log 2 2) log 2

3) $\frac{\pi}{2}+\frac{1}{2}\log 2$ 4) $\frac{\pi}{2}$

8. $\int_0^1 \frac{dx}{x^2+2x\cos\alpha+1}\ (0<\alpha<\pi) =$

1) $\sin\alpha$ 2) $\tan^{-1}(\sin\alpha)$

3) $\alpha\sin\alpha$ 4) $\left(\frac{\alpha}{2\sin\alpha}\right)$

9. **If the tangent lines to the curve y = f(x) form angles $\frac{\pi}{3}$ and $\frac{\pi}{4}$ with $\vec{OX}$ at the points x = a, x = b respectively then** $\int_a^b f^{11}(x)\,dx =$

1) $1-\sqrt{3}$ 2) $\sqrt{3}-1$ 3) 1 4) 0

10. $\int_{\pi}^{5\pi/4} \frac{\text{Sin}\,2x.dx}{\text{Cos}^4x+\text{Sin}^4x} =$

1) $\frac{5\pi}{4}$ 2) $\frac{\pi}{2}$ 3) π 4) $\pi/4$

11. $\int_0^1 \frac{\sqrt{x}}{1+x}dx =$

1) $2-\pi/2$ 2) $1-\pi/2$ 3) $\pi/2$ 4) $2+\pi/2$

12. $\int_0^{\frac{1}{\sqrt{2}}} \frac{\sin^{-1}x}{(1-x^2)^{3/2}}dx =$

1) $\frac{\pi}{4}+\frac{1}{2}\log 2$ 2) $\frac{\pi}{4}-\frac{1}{2}\log 2$

3) $\frac{\pi}{3}$ 4) $\frac{\pi}{6}$

13. $\int_0^{\pi} \frac{dx}{3+2\sin x+\cos x} =$

1) $\pi/3$ 2) $\pi/4$ 3) $\pi/6$ 4) $\pi/2$

14. $\int_0^{\pi/4} \frac{\text{Sinx}+\text{Cosx}}{9+16\text{Sin}2\text{x}}\text{dx} =$

1) $\frac{1}{10}\log 3$ 2) 5 log 3

3) $\frac{1}{20}\log 3$ 4) log 3

15. $\int_0^{1/2} \frac{x\sin^{-1}x}{\sqrt{1-x^2}}dx =$

1) $\frac{1}{2}+\frac{\pi\sqrt{3}}{12}$ 2) $\frac{1}{2}-\frac{\pi\sqrt{3}}{12}$

3) $\frac{\pi\sqrt{3}}{12}$ 4) $\frac{-\pi\sqrt{3}}{12}$

16. $\int_0^1 \text{Cos}\left(2\,\text{Cot}^{-1}\sqrt{\frac{1-x}{1+x}}\right)\text{dx} =$

1) -1/2 2) 1/2 3) 0 4) 1

17. $\int_1^2 x^{2x}[1+\log x]dx =$

1. $\frac{9}{2}$ 2. $\frac{11}{2}$ 3. $\frac{13}{2}$ 4. $\frac{15}{2}$

18. $\int_{\pi^2/16}^{\pi^2/4} \frac{\sin\sqrt{x}}{\sqrt{x}}dx =$

1. $\sqrt{2}$ 2. $1/\sqrt{2}$ 3. $2\sqrt{2}$ 4.p/2

19. $\int_0^{\pi/2} \sqrt{\cos x}\sin^5 x\,dx =$

1. $\frac{34}{231}$ 2. $\frac{64}{231}$ 3. $\frac{30}{321}$ 4. $\frac{128}{231}$

20. $\int_0^{\pi/4} \frac{Sin^{\frac{1}{2}}x}{Cos^{\frac{5}{2}}x} dx =$

1. 0 2. $\frac{\pi}{4}$ 3. 1 4. 2/3

21. $\int_{1/3}^{1} \frac{(x-x^3)^{1/3}}{x^4} dx =$

1. 3 2. 0 3. 6 4. 4

22. $\int_0^1 \frac{\log(1+x)}{1+x^2} dx =$ **[A 2011]**

1) $\pi \log 2$ 2) $\frac{\pi}{8} \log 2$

3) $\frac{\pi}{4} \log 2$ 4) $-\pi \log 2$

23. $\int_0^{\infty} \frac{\log(1+x^2)}{1+x^2} dx =$

1) $\pi \log 2$ 2) $-\pi \log 2$

3) $-\frac{\pi}{2} \log 2$ 4) $\frac{\pi}{2} \log 2$

24. $\int_0^1 \log\left(\cos\frac{\pi x}{2}\right) dx =$

1) $-\log 2$ 2) $\frac{1}{2} \log 2$

3) $\log \sqrt{3}$ 4) $\log 8$

25. $\int_0^{\infty} \frac{x.\log x}{\left(1+x^2\right)^2} dx =$

1) 1 2) -1 3) 0 4) $\frac{\pi}{2}$

26. $\int_0^1 \frac{x^3}{\left(1+x^2\right)^3} dx =$

1) $\frac{1}{8}$ 2) $\frac{1}{4}$ 3) $\frac{1}{12}$ 4) $\frac{1}{16}$

27. **If** $\int_0^{\infty} \frac{x^2 dx}{\left(x^2+a^2\right)\left(x^2+b^2\right)\left(x^2+c^2\right)} = \frac{\pi}{2(a+b)(b+c)(c+a)}$ **then**

$\int_0^{\infty} \frac{dx}{\left(x^2+4\right)\left(x^2+9\right)} =$

1) $\frac{\pi}{60}$ 2) $\frac{\pi}{20}$ 3) $\frac{\pi}{40}$ 4) $\frac{\pi}{80}$

PROBLEMS ON PARTIAL FRACTIONS & BYPARTS.

28. $\int_1^2 \frac{dx}{x+x^3} =$

1) $\frac{1}{2}\log\frac{8}{5}$ 2) $\frac{1}{3}\log\frac{8}{5}$

3) $\frac{1}{2}\log\frac{5}{8}$ 4) $\frac{1}{3}\log\left(\frac{5}{8}\right)$

29. $\int_0^{\infty} \frac{dx}{(x^2+a^2)(x^2+b^2)} =$

1) $\frac{\pi ab}{(a+b)}$ 2) $\frac{\pi}{2(a+b)}$

3) $\frac{\pi}{2ab(a+b)}$ 4) $\frac{\pi(a+b)}{ab}$

30. $\int_1^2 x^2 \log x dx =$

1) $\frac{8}{3}\log 2-\frac{7}{9}$ 2) $\frac{8}{3}\log 2+\frac{7}{9}$

3) $\frac{8}{3}\log\frac{1}{3}-\frac{7}{9}$ 4) $\frac{8}{3}\log\frac{1}{3}+\frac{7}{9}$

31. $\int_0^1 (1+x).\log(1+x)dx =$

1) $\log 4 - \frac{3}{4}$ 2) $\log 2 + \frac{3}{4}$

3) $\frac{1}{2}\log 2 - \frac{3}{4}$ 4) $\log 4 + \frac{3}{4}$

32. $\int_0^{\pi/2}\left(2\tan\frac{x}{2} + x\sec^2\frac{x}{2}\right)dx =$

1. π 2. $\pi/2$ 3. $2\pi/3$ 4. $\pi/6$

33. $\int_1^e \frac{\ln x}{x^2}dx =$

1. $1 - \frac{2}{e}$ 2. $\frac{2}{e} - 1$ 3. $\frac{e-1}{e}$ 4. $1+\frac{2}{e}$

34. $I_n = \int_1^e (\log x)^n dx$ and $I_n = A + BI_{n-1}$ then A=........., B =...........

1) e, -n 2) 1/e, n 3) -e, n 4) -e ,-n

PROBLEMS ON MODULES AND STEP FUNCTIONS.

35. $\int_0^{10\pi} |\sin x|$ dx =

1) 20 2) 18 3) 10 4) 8

36. $\int_0^2 \left|\cos\frac{\pi x}{2}\right| dx =$

1) $\frac{1}{\pi}$ 2) $\frac{2}{\pi}$ 3) $\frac{3}{\pi}$ 4) $\frac{4}{\pi}$

37. $\int_{e^{-1}}^{e^2} \left|\frac{\log x}{x}\right| dx =$

1) $\frac{3}{2}$ 2) $\frac{5}{2}$ 3) 3 4) 5

38. $\int_{\pi/2}^{3\pi/2} [2\sin x]\, dx =$

1) $-\pi$ 2) $\frac{-\pi}{2}$ 3) 0 4) $\frac{\pi}{2}$

39. **The value of** $\sum_{n=1}^{1000}\int_{n-1}^{n} e^{x-[x]}\, dx$ **is ([x] is the greatest integer function)**

1) $\frac{e^{1000}-1}{1000}$ 2) $\frac{e^{1000}-1}{e-1}$

3) 1000 (e – 1) 4) $\frac{e-1}{1000}$

40. **If [x] stands for the greatest integer function, the value of**

$\int_4^{10} \frac{[x^2]}{[x^2-28x+196]+[x^2]}\, dx$ **is**

1) 0 2) 1

3) 3 4) none of these

41. **Statement I :** $\int_0^{100\pi} |\sin x|\, dx = 200$

Statement II : $|\sin x|$ **is a periodic function of period** 2π **and** $\int_0^{\pi} |\sin x| dx$ **is 4**

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true

PROBLEMS ON DEFINITE INTEGRALS

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

1) $\sqrt{2}\log(\sqrt{2}+1)$ 2) $\frac{1}{\sqrt{2}}\log(\sqrt{2}+1)$

3) $\log(\sqrt{2}+1)$ 4) $\frac{1}{\sqrt{2}}\log(\sqrt{2}-1)$

43. $\int_0^1 \log\left(\frac{1}{x}-1\right)dx =$

1) 0 2) -1/2 3) 1/3 4) 1/2

44. $\int_0^{2\pi} x.\phi(\text{Sin}^4 x + \text{Tan}^2 x)dx =$

$k\int_0^{\pi/2} \phi(\text{Sin}^4 x + \text{Tan}^2 x)dx$ then the value of k=

1) π 2) 2π 3) 3π 4) 4π

45. $\int_{\pi/6}^{5\pi/6} \sqrt{4-4Sin^2 t}\,dt =$

1. 0 2. 2 3. 1 4. 4

46. $\int_0^a \sqrt{\frac{a+x}{a-x}}dx =$

1. $\frac{a}{2}(\pi+2)$ 2. $\frac{a}{2}(\pi-2)$

3. $\frac{a}{3}(\pi+2)$ 4. $\frac{a}{2}(\pi+3)$

47. $\int_0^{\pi} \frac{x}{1+\text{Sinx}}dx =$

1) $\frac{\pi}{2}$ 2) π 3) 2π 4) 4π

48. $\int_0^{\pi/2} \log\left(\frac{4+3\text{Sinx}}{4+3\text{Cosx}}\right)dx =$

1) 1 2) 0 3) $\frac{\pi}{4}$ 4) -1

49. $\int_0^{\pi} xf(\sin x)dx =$

1) 0 2) $\pi\int_0^{\pi} f(\sin x)dx$

3) $\frac{\pi}{2}\int_0^{\pi} f(\sin x)dx$ 4) $\frac{\pi}{3}\int_0^{\pi} f(\sin x)dx$

50. $\int_0^{2\pi} CosmxSinnx.dx$ **where m, n are integers=**

1. 0 2. π 3. $\pi/2$ 4. 2π

51. $\int_0^{2\pi} e^{ax} Sinbx.dx$ **where a, b $\in$ z =**

1. 0 2. $\frac{2b}{a^2+b^2}e^{2a\pi}$

3. $\frac{2a}{a^2+b^2}e^{2a\pi}$ 4. $\frac{b}{a^2+b^2}(1-e^{2a\pi})$

52. $\int_0^{\pi} \sin 7x \sin 4x dx =$

1) 11π 2) $\frac{11\pi}{2}$ 3) $\frac{3\pi}{2}$ 4) 0

53. $\int_0^{\pi} \cos mx \cos nx\, dx \quad (m \neq n)$ **(m, n $\in$ z) =**

1) $\frac{\pi}{2}$ 2) 0 3) 1 4) π

54. **If f(x) = f(4 – x) then** $\int_1^3 x\, f(x)\, dx =$

1) $\int_1^3 f(x)\, dx$ 2) $2\int_1^3 f(x)\, dx$

3) $-2\int_1^3 f(x)\, dx$ 4) 0

55. **If** $\int_n^{n+1} f(x)\, dx =$ **n² + 1** $\forall n \in Z$ **then** $\int_{-2}^{3} f(x)\, dx =$

1) 10 2) 13 3) 15 4) 18

56. **If f(x)** = $\frac{1}{2}a_0 + \sum_{r=1}^{n} a_r \cos rx + b_r \sin rx$

then $\int_0^{2\pi} f(x)\, dx =$

1) 0 2) a_0 3) πa_0 4) None

57. **If f(x)** = $\int_0^{\sin^2 x} \sin^{-1}\sqrt{t}$ **dt and g(x)** = $\int_0^{\cos^2 x} \cos^{-1}\sqrt{t}$ **dt then the value of f(x) + g(x) is**

1) π 2) $\frac{\pi}{4}$

3) $\frac{\pi}{2}$ 4) $\sin^2x+\sin x + x$

58. $\int_{-\pi}^{\pi} x^2.\sin x dx =$

1) 2π 2) $\frac{\pi^2}{4}$ 3) $-\pi$ 4) 0

59. $\int_{-\pi/2}^{\pi/2} e^{\sin^{-2} x}.\sin^{2n+1} x\, dx =$

1. 0 2. $\pi/2$ 3.1 4. $\pi/4$

60. $\left(\sum_{n=1}^{10} \int_{-2n-1}^{-2n} \sin^{27} x dx\right) + \left(\sum_{n=1}^{10} \int_{2n}^{2n+1} \sin^{27} x dx\right) =$

1) 27^2 2) -54 3) 54 4) 0

PROBLEMS ON STANDARD RESULTS

61. $\int_2^5 \sqrt{\frac{5-x}{x-2}} dx =$

1. π 2. $\pi/2$ 3. $3\pi/2$ 4. $\pi/4$

62. $\int_0^1 \sqrt{x(1-x)}\, dx =$

1. $\pi/2$ 2. $\pi/4$ 3. $\pi/6$ 4. $\pi/8$

63. $\int_1^2 \sqrt{(x-1)(2-x)}\, dx =$

1. $\pi/8$ 2. $\pi/4$ 3. 1/8 4. 1/4

64. $\int_0^{\pi} \frac{x Tan x}{Sec x + Tan x} dx =$

1) $\frac{\pi-2}{2}$ 2) $\frac{\pi(\pi-2)}{2}$

3) $\frac{\pi+2}{2}$ 4) $\frac{\pi(\pi+2)}{2}$

PROBLEMS ON REDUCTION FORMULAE

65. $\int_0^{2\pi} x.\sin^4 x.\cos^6 x.dx =$

1) $\frac{3\pi^2}{128}$ 2) $\frac{15\pi^2}{128}$ 3) $\frac{3\pi^2}{64}$ 4) $\frac{5\pi^2}{128}$

66. $U_n = \int_0^{\pi/4} \tan^n\theta\, d\theta$, then $u_{10}+u_{12}=$

1) $\frac{1}{10}$ 2) $\frac{1}{12}$ 3) $\frac{1}{11}$ 4) $\frac{1}{22}$

67. $\int_0^{\pi} \sqrt{\frac{1+\cos 2x}{2}}\,dx =$

1) -2 2) 2 3) 0 4) -3

68. $\int_0^{\pi} x\sin^6 x\,dx =$

1) $\frac{5\pi^2}{32}$ 2) $\frac{35\pi^2}{1024}$ 3) $\frac{3\pi^2}{128}$ 4) $\frac{\pi^2}{32}$

HOME WORK

PROBLEMS ON BASIC FORMULA E AND SUBSTITUTION

1. $\int_1^2 \frac{dx}{x^2-2x+4} =$

1) 0 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{6\sqrt{3}}$

2. $\int_0^{16} \frac{dx}{\sqrt{x+9}-\sqrt{x}} =$

1) 10 2) 12 3) 14 4) 16

3. The solution of the equation $\int_{\sqrt{2}}^{x} \frac{dx}{x\sqrt{x^2-1}} = \frac{\pi}{12}$ is

1) 1 2) 1/2 3) 2 4) -2

4. If $\int_0^k \frac{dx}{2+8x^2} = \frac{\pi}{16}$ then k =

1. 1 2. ½ 3. $\pi/2$ 4. 2

5. $\int_0^1 \frac{xe^x}{(x+1)^2}dx =$

1. $\frac{e}{2}$ 2. $\frac{e-1}{2}$ 3. $\frac{e}{2}-1$ 4. $\frac{e-3}{2}$

6. $\int_0^{\pi/2} e^x\left(\frac{1+\sin x}{1+\cos x}\right)dx =$

1. $\pi/4$ 2. 0 3. $e^{\pi/2}$ 4. $e^{\pi/2}$ - 1

7. If

$$f(x)=\begin{vmatrix} \sin x+\sin 2x+\sin 3x & \sin 2x & \sin 3x \\ 3+4\sin x & 3 & 4\sin x \\ 1+\sin x & \sin x & 1 \end{vmatrix},$$

then the value of $\int_0^{\pi/2} f(x)dx$ is

1) 3 2) 2/3 3) 1/3 4) 0

8. $\int_0^{\pi} \log(\sin x)dx =$

1) $\pi \log 2$ 2) $-\frac{\pi}{3}\log 2$

3) $-\pi \log 2$ 4) $-\frac{\pi}{2}\log 2$

9. The solution of $\int_{\sqrt{2}}^{x} \frac{dt}{t\sqrt{t^2-1}} = \frac{\pi}{12}$ is

1) 4 2) 2 3) 6 4) $\sqrt{3}$

10. $\int_{1/3}^{3} \frac{1}{x}\sin\left(\frac{1}{x}-x\right)dx =$

1) $\frac{\sqrt{3}}{2}$ 2) $\pi+\frac{\sqrt{3}}{2}$

3) 0 4) π

11. $\int_{\log 2}^{t} \frac{dx}{\sqrt{e^x-1}} = \frac{\pi}{6}$, then t =

1) 4 2) log 8 3) log 4 4) log2

12. $\int_1^4 \frac{x\,dx}{\sqrt{2+4x}} =$

1) $\frac{1}{2}$ 2) $\frac{1}{\sqrt{2}}$ 3) $\frac{3}{2}$ 4) $\frac{3}{\sqrt{2}}$

13. $\int_0^{\pi/2} \frac{1}{2+3\text{Sin}x}dx =$

1) $\frac{1}{\sqrt{5}}\log\left|\frac{\sqrt{5}+1}{\sqrt{5}-1}\right|$ 2) $\log\left(\sqrt{5}+1\right)$

3) $\frac{1}{2}\log\left|\frac{\sqrt{5}+1}{\sqrt{5}-1}\right|$ 4) $\sqrt{5}\log 2$

14. $\int_0^{\pi/2} \frac{1}{4+5\text{Sin}x}dx =$

1) $\frac{1}{2}\log 2$ 2) $\log 2$ 3) $\frac{1}{3}\log 2$ 4) $\frac{1}{4}\log 2$

15. $\int_0^{\pi} \frac{1}{3+2\text{Cos}x}dx =$

1) $\frac{\pi}{5}$ 2) $\frac{\pi}{\sqrt{5}}$ 3) $\frac{2\pi}{5}$ 4 $\frac{2\pi}{\sqrt{5}}$

16. $\int_0^1 \text{Cos}^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx =$

1) $\frac{\pi}{2}$ - log 2 2) $\frac{\pi}{2}$ + log 2

3) $\frac{\pi}{4}$ - log 2 4) $\frac{\pi}{4}$ - log 3

17. $\int_0^1 \text{Tan}^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)dx =$

1) $\frac{3\pi}{2}$ - 3 log 2 2) $\frac{3\pi}{4}$ - $\frac{3}{2}$ log 2

3) $\frac{7\pi}{2}$ + 3 log 2 4) $\frac{3\pi}{4}+\frac{3}{2}\log 2$

18. $\int_0^1 \text{Sin}\left(2\text{Tan}^{-1}\sqrt{\frac{1-x}{1+x}}\right)dx =$

1) π 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{4}$

19. $\int_0^3 x\sqrt{1+x}\,dx =$

1. 9/2 2. 27/4 3. 116/15 4. 112/15

20. $\int_0^1 \frac{dx}{x+\sqrt{x}} =$

1. log2 2. 2 log 2 3. 3 log 3 4. $\frac{1}{2}\log 2$

21. $\int_0^1 \sqrt{\frac{x}{1-x^3}}dx =$

1. $\frac{\pi}{4}$ 2. $\frac{\pi}{3}$ 3. $\frac{\pi}{6}$ 4. $\frac{\pi}{2}$

22. $\int_0^1 Tan^{-1}\left(\frac{2x}{1-x^2}\right)dx =$

1. $\frac{\pi}{2}-\log 2$ 2. $\frac{\pi}{2}+\log 2$

3. $\frac{\pi}{3}-\log 3$ 4. $\frac{\pi}{2}-2\log 2$

23. $\int_0^1 \sin^{-1}\left(\frac{2x}{1+x^2}\right)dx =$

1. $\frac{\pi}{4}$ 2. $\frac{\pi}{4}+\log 2$

3. $\frac{\pi}{2}+\frac{1}{2}\log 2$ 4. $\frac{\pi}{2}-\log 2$

24. $\int_0^{\pi^2/4} \cos\sqrt{x}\,dx =$

1. 2 2. π-2 3. π+2 4. (π/2)-1

25. $\int_0^{\pi/4} \log(1+\tan x)dx =$

1) $\pi \log 2$ 2) $\frac{\pi}{8} \log 2$

3) $\frac{\pi}{4} \log 2$ 4) $-\pi \log 2$

26. $\int_0^1 \frac{\log x}{\sqrt{1-x^2}} dx =$

1) $\pi \log 2$ 2) $-\pi \log 2$

3) $2^{-\log 2}$ 4) $-\frac{\pi}{2} \log 2$

27. $\int_0^1 \log Sin\left(\frac{\pi x}{2}\right)dx =$

1) log 2 2) - log 2

3) $\frac{\pi}{2} \log 2$ 4) $-\frac{\pi}{2} \log 2$

28. $\int_{1/2}^1 \frac{1}{\sqrt{x-x^2}} dx =$

1) π 2) 0 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{2}$

29. $\int_0^{2\pi} e^{x/2} \sin\left(\frac{x}{2}+\frac{\pi}{4}\right)dx =$

1) 1 2) π 3) 0 4) 2

PROBLEMS ON PARTIAL FRACTIONS AND BYPARTS

30. $\int_0^{a/2} \frac{adx}{(x-a)(x-2a)} =$

1) $\log\left(\frac{3}{2}\right)$ 2) $\log\left(\frac{2}{3}\right)$

3) $\left(\frac{12}{7}\right)$ 4) $\frac{13}{7}$

31. **I : If then** $\int_0^\infty \frac{x^2}{(x^2+a^2)(x^2+b^2)(x^2+c^2)}dx$

$= \frac{\pi}{2(a+b)(b+c)(c+a)}$ **then**

$\int_0^\infty \frac{1}{(x^2+a^2)(x^2+b^2)}dx = \frac{\pi}{2ab(a+b)}$

II : If $\int_1^2 (x^2-x^3)dx = k$ **then the area bounded by y = x^3, y = x^2 in [1,2] is –k**

Which of the above statement is true

1. Only I 2. Only II
3. Both I and II 4. Neither I nor II

32. $\int_0^1 xTan^{-1}xdx =$

1) $\frac{\pi-2}{4}$ 2) $\frac{2}{\sqrt{2}}(\sqrt{5}+1)$

3) $\frac{2}{\sqrt{3}}(\sqrt{5}+\sqrt{2})$ 4) $\frac{\pi+2}{4}$

33. $\int_0^{\pi/2} x^2.\sin xdx =$

1) 2π 2) $\pi/2$ 3) $\pi+1$ 4) $\pi-2$

34. $\int_1^2 \log x \, dx =$

1. 2 log 2 -1 2. log 2-1
3. 2 log 2+1 4. 2 log 2 -2

35. $\int_0^\pi e^x \sin xdx =$

1. $\frac{1}{2}e^\pi$ 2. $e^\pi+1$

3. $\frac{1}{2}(e^\pi-1)$ 4. $\frac{1}{2}(e^\pi+1)$

36. If f(x) = f(a-x) and g(x) + g(a-x)=2 then $\int_0^a f(x).g(x)\,dx =$

1) 0 2) a 3) $\int_0^a f(x)\,dx$ 4) a^2

37. $\int_1^e x^n \log x.dx =$

1. $\frac{1}{(n+1)^2}(e^{n+1}+1)$ 2. $\frac{1}{(n+1)^2}(ne^{n+1}+1)$

3. $\frac{1}{(n+1)^2}(ne^{n+1}-1)$ 4. $\frac{1}{(n+1)^2}$

PROBLEMS ON MODULES AND STEP FUNCTIONS.

38. $\int_0^2 x[x]\,dx,$ **where [x] is integral part function=**

1) $\frac{3}{2}$ 2) $\frac{5}{2}$ 3) $\frac{7}{2}$ 4) $\frac{9}{2}$

39. $\int_{-1}^{1} \{x-[x]\}\,dx =$

1) 0 2) $\frac{1}{2}$ 3) 1 4) 2

40. The values of the following definite integrals in the decreasing order is

A) $\int_0^3 [x]dx$ **B)** $\int_{-2}^{2} x^3 dx$

C) $\int_0^3 (x-[x])dx$ **D)** $\int_{-1}^{1} |x|dx$

1. D,A,C,B 2. A,D,C,B

3. A,D,C,B 4. A,C,B,D

PROBLEMS ON PROPERTIES OF DIFINITE INTEGRALS

41. $\int_{-\pi/4}^{\pi/4} \log(\cos x + \sin x)dx =$

1) $\pi \log 2$ 2) $-\pi \log 2$

3) $-\frac{\pi}{4} \log 2$ 4) $\pi^2 \log 2$

42. $\int_0^{\pi/2} \log(\sin 2x)dx =$

1) $\frac{\pi}{2} \log 2$ 2) $-\frac{\pi}{2} \log 2$

3) $\frac{\pi}{3} \log 2$ 4) $\pi \log 2$

43. $\int_0^{2\pi} \frac{1}{1+\operatorname{Tan}^4 x} dx =$

1) $\frac{\pi}{4}$ 2) $\frac{\pi}{2}$ 3) $\frac{3\pi}{4}$ 4) π

44. If $\int_0^{\pi} x.f(\operatorname{Sin}x)dx = k\int_0^{\pi/2} f(\operatorname{Sin}x)dx$ **then the value of k is**

1) $\pi/2$ 2) π 3) $\pi/3$ 4) 0

45. $\int_0^{2\pi} e^{\operatorname{Sin}^2 nx}.\operatorname{Tan}nx.dx =$

1) 2 2) 1 3) π 4) 0

46. $\int_2^3 \frac{2-x}{\sqrt{5x-6-x^2}}dx =$

1. $\pi/2$ 2. $-\pi/2$ 3. $-\pi/3$ 4. π

47. $\int_0^{\pi} x\log(\text{Sin}x)\,dx =$

1) $\frac{\pi}{2}\log 2$ 2) $\frac{-\pi^2}{2}\log 2$

3) $-\frac{\pi}{2}\log 2$ 4) $-2\pi\log 2$

48. $\int_0^{\pi/2} \text{Sin}2x.\log(\tan x)\,dx =$

1) 1 2) -1 3) 0 4) $\frac{\pi}{4}$

49. $\int_0^{2\pi} \log(1+\text{Cos}x)\,dx =$

1) $\pi\log 2$ 2) $-\pi\log 2$

3) $-2\pi\log 2$ 4) $2\pi\log 2$

50. **If f(a+b-x)=f(x) then** $\int_a^b x.f(x)dx =$

1) $\frac{a+b}{2}\int_a^b f(b-x)dx$ 2) $\frac{a+b}{2}\int_a^b f(x)dx$

3) $\frac{b-a}{2}\int_a^b f(x)dx$ 4) $(a+b)\int_a^b f(x)dx$

51. $\int_0^{2\pi} e^{ax}Cosbx.dx$ **; a, b $\in$ z =**

1. $\frac{a}{a^2+b^2}(e^{2a\pi}-1)$ 2. $\frac{b}{a^2+b^2}(e^{2a\pi}-1)$

3. $\frac{a}{a^2+b^2}$ 4. $\frac{b}{a^2+b^2}$

52. $\int_0^{\pi/2} \log\frac{(a+b\sin x)}{a+b\cos x} =$

1. $2\sqrt{2}$ 2. 0 3. 2π 4. $\log\frac{\pi}{2}$

53. **If** $I_1 = \int_1^2 x[\sqrt{x}+\sqrt{3-x}]dx$ **and**

$I_2 = \int_1^2 (\sqrt{x}+\sqrt{3-x})dx$ **then** $\frac{I_1}{I_2} =$

1. ½ 2. 3/2 3. 2 4. 1

54. **Let** $f:(0,\infty)\to R$ **and** $F(x) = \int_0^x f(t)\,dt.$

If $F(x^2) = x^2(1+x)$ **then** $f(4) =$

1) $\frac{5}{4}$ 2) 7 3) 4 4) 2

55. **If f is continuous in [0, 2] then** $\int_0^2 f(x)\,dx =$

1) $2\int_0^1 f(x)\,dx$ 2) $\int_0^1 [f(x)+f(1-x)]\,dx$

3) $\int_0^1 [f(x)+f(1+x)]\,dx$ 4) None

56. **If** $\int_n^{n+1} f(x)\,dx = n^3$ **for all** $\forall n\in N$ **then**

$\int_1^n f(x)\,dx =$

1) $\frac{n^2(n+1)^2}{4}$ 2) $\frac{(n-1)^2 n^2}{4}$

3) n^3 4) $\frac{n(n+1)}{2}$

57. **If f(x) is periodic with period T then**

$\int_{a+T}^{b+T} f(x)\,dx =$

1) $\int_a^b f(x)\,dx$ 2) 0

3) $2\int_a^b f(x)\,dx$ 4) None

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

1) $2I_1 = I_2$ 2) $I_1 = I_2$ 3) $I_1 = 2I_2$ 4) $I_1 + I_2 = 0$

59. **If** $I_7 = \int_0^{\pi/2} x^7 \sin x\,dx$ **then** $I_7 + 42I_5 =$

1) $\left(\frac{\pi}{2}\right)^7$ 2) $\left(\frac{\pi}{2}\right)^6$ 3) $7\left(\frac{\pi}{2}\right)^6$ 4) $7\left(\frac{\pi}{2}\right)^7$

60. $\int_0^{\frac{\pi}{2}} \frac{\sin 3x - 3\sin x}{\sin^3 x + \cos^3 x}\,dx$

1) π 2) $-\pi$ 3) 2π 4) -2π

61. $\int_{-\pi/2}^{\pi/2} (x^5 + x^3 \mathrm{Sec}x + \mathrm{Tan}^{-1}x + 1)\,dx =$

1) 0 2) 2 3) π 4) $\frac{\pi}{2}$

62. $\int_{-1}^{1} \frac{1}{(1+x^2)^2}\,dx =$

1. $\frac{\pi}{4}+\frac{1}{2}$ 2. $\frac{\pi}{4}-\frac{1}{2}$ 3. $\frac{\pi}{8}$ 4. $\frac{\pi}{16}$

63. **If** f**(x) is an even function the** $\int_{-\pi}^{\pi} f(x)$ **sin nx dx =**

1. 0 2. $2\int_0^{\pi} f(x)\sin nx\,dx$

3. $4\int_0^{\pi/2} f(x)\sin nx\,dx$ 4. $\int_0^{\pi} f(x)\sin x\,dx$

64. $\int_{-1}^{1} (ax^3 + bx)$ **dx=0 for**

1) any values of a and b
2) a>0 and b>0 only
3) a>0 and b<0 only
4) a<0 and b<0 only

65. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} (\cos 3x - \sin 3x)^2\,dx =$

1. $\frac{\pi}{4}$ 2. $\frac{\pi}{2}$ 3. 2π 4. -2π

66. $\int_0^{2\pi} x.\sin^2 x\,dx =$

1) π 2) $\pi/2$ 3) π^2 4) 0

67. **I : If** $\int_0^{\pi/2} \sin^4 x\,dx = k$ **then** $\int_{-\pi}^{\pi} \sin^4 x\,dx = 8k$

II : Given $\int_0^1 \frac{x}{\sqrt{1-x^2}}\,dx = 1$ **then**

$$\underset{n\to\infty}{Lt} \sum_{r=1}^{n-1} \sqrt{\frac{n+r}{n^2(n-r)}} = \frac{\pi}{2}+1$$

Which of the above statement is true

1. Only I 2. Only II
3. Both I and II 4. Neither I nor II

68. **Observe the following Lists**

List-I	**List-II**
A) $\int_0^a f(x)\,dx$	1) $\int_0^a f(a+x)\,dx$

B) $\int_{-a}^{a} f(x)\,dx$ 2) $\int_{0}^{a} f(a-x)\,dx$

C) $\int_{0}^{2a} f(x)\,dx$ 3). 0, if f(x) is odd

D) $\int_{0}^{na} f(x)\,dx$ 4). 0, if f (2a-x) = f(x)

5) $n\int_{0}^{a} f(x)\,dx$
If period of f(x) is a

6) (n-1) $\int_{0}^{a} f(x)\,dx$,
if period of f(x) is a

The correct match for List-I from List-II

	A	B	C	D
1.	1	2	4	6
2.	2	3	4	5
3.	2	3	4	6
4.	2	1	4	5

PROBLEMS ON STANDARD RESULTS

69. $\int_0^{\pi} \frac{x\operatorname{Sin} x}{1+\operatorname{Cos}^2 x} dx =$

1) $\frac{\pi^2}{4}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi^2}{2}$ 4) $\frac{\pi}{2}$

70. $\int_0^{\pi/2} \frac{1}{\operatorname{Sinx}+\operatorname{Cosx}} dx =$

1) $\sqrt{2}\log\left(\sqrt{2}+1\right)$ 2) $\frac{1}{\sqrt{2}}\log\left(\sqrt{2}+1\right)$

3) 1 4) $\log\left(\sqrt{2}+1\right)$

71. $\int_{\pi/4}^{\pi/2} \log(1+\operatorname{Cotx})dx =$

1) $\frac{\pi}{4}\log 2$ 2) $\frac{\pi}{8}\log 2$

3) $\pi \log 2$ 4) 0

72. **The value of the integral** $\int_0^1 \frac{x^c-1}{\log x} dx,\ c>0$ **is**

1) log c 2) 2log(c + 1)

3) 3 logc 4) log(c+1)

73. **Observe the following Lists**

List-I	List-II
A) $\int_0^{\pi/2} \log\sin x dx =$	1. 2π
B) $\int_0^{\pi/2} \log\tan x dx =$	2. $\frac{-\pi}{2}\log 2$
C) $\int_0^{\pi} x\log\sin x dx =$	3. $\pi\log 2$
D) $\int_{-\pi}^{\pi}\left(x^3+x\cos x+\tan^5 x+2\right)dx$	4. 0

The correct Match for List-I from List-II is

	A	B	C	D
1.	3	4	1	2
2.	1	4	2	3
3.	4	3	2	1
4.	2	4	1	2

74. Observe the following Lists

List-I	List-II
A: $\int_{-2}^{2}\frac{1}{4+x^2}dx$	1) $\frac{\pi}{3}$
B: $\int_{1}^{2}\frac{1}{x\sqrt{x^2-1}}dx$	2) $-\pi/2$

C: $\int_0^{\pi} \cos 3x.\cos 2xdx$ 3) $\frac{\pi}{4}$

4) $\frac{\pi}{2}$

The correct match for List-I from List-II

	A	B	C
1.	3	1	4
2.	3	1	2
3.	1	3	2
4.	4	1	2

75. **Statement I** :

$$\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} dx = \frac{\pi}{4}$$

Statement II :

$$\int_0^a f(x)dx = \int_0^a f(a-x)dx$$

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true

PROBLEMS ON REDUCTION FORMULAE

76. $\int_0^{\pi/2} \cos^{10} xdx =$

1. $\frac{63\pi}{512}$ 2. $\frac{128}{315}$ 3. $\frac{\pi}{315}$ 4. π

77. $\int_{-\pi/3}^{\pi/3} Cos^2 x.dx =$

1. $\sqrt{3}/4$ 2. $\pi/3$

3. $\frac{\pi}{3} + \frac{\sqrt{3}}{4}$ 4. $\frac{\pi}{3} - \frac{\sqrt{3}}{4}$

78. $\int_0^{2\pi} \sin^4 x.\cos^6 xdx =$

1) $\frac{3\pi}{128}$ 2) $\frac{\pi}{128}$ 3) $\frac{5\pi}{128}$ 4) $\frac{7\pi}{128}$

79. $\int_0^{\pi} x.\sin^3 xdx =$

1) $\frac{\pi}{3}$ 2) $\frac{2\pi}{3}$ 3) $\frac{\pi}{5}$ 4) $\frac{2\pi}{5}$

80. $\int_0^{\pi/4} Tan^4 xdx =$

1) $\frac{\pi}{4} - \frac{2}{3}$ 2) $\frac{\pi}{4} + \frac{2}{3}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi^2}{4} + \frac{3}{2}$

81. $\int_0^{\pi/4} Tan^5 xdx =$

1) $\log 2 - \frac{1}{4}$ 2) $\frac{1}{2}\log 2 - \frac{1}{4}$

3) 0 4) $\log 2 + \frac{1}{4}$

82. $\int_0^{\pi/4} Tan^6 xdx =$

1) $\frac{13}{15} - \frac{\pi}{4}$ 2) $\frac{13}{15} + \frac{\pi}{4}$

3) $\frac{\pi}{4} - \frac{2}{3}$ 4) $\frac{13}{15} - 4\pi$

83. **If** $I_n=\int_{\pi/4}^{\pi/2}(\operatorname{Tan}\theta)^{-n}.d\theta$ **(n>1) then** $I_n+I_{n+2}=$

1) $\frac{1}{n+1}$ 2) $\frac{-1}{n+1}$ 3) $\frac{1}{n-1}$ 4) $\frac{-1}{n-1}$

84. $\int_0^{\pi} x\sin^5 x\cos^6 x dx=$

1) $\frac{5\pi}{16}$ 2) $\frac{35\pi}{128}$ 3) $\frac{5\pi}{8}$ 4) $\frac{8\pi}{693}$

85. $\int_0^{\pi}\sin^6 x dx=$

1) $\frac{5\pi}{16}$ 2) $\frac{35\pi}{128}$ 3) $\frac{5\pi}{8}$ 4) $\frac{5\pi}{18}$

86. $\int_0^{\pi}\cos^8 x dx=$

1) $\frac{5\pi}{16}$ 2) $\frac{35\pi}{128}$ 3) $\frac{5\pi}{8}$ 4) $\frac{5\pi}{18}$

87. $\int_0^{2\pi}\cos^6 x dx=$

1) $\frac{5\pi}{16}$ 2) $\frac{35\pi}{128}$ 3) $\frac{5\pi}{8}$ 4) $\frac{5\pi}{18}$

88. **If** $I_1=\int_0^{\pi/2}\sin^4 x dx$, $I_2=\int_0^{\pi/2}\cos^6 x dx$, $I_3=\int_0^{\pi/2}\sin^8 x dx$, $I_4=\int_0^{\pi/2}\cos^2 x dx$ **then the increasing order of** I_1,I_2,I_3,I_4 **is**

1. I_4,I_2,I_3,I_1 2. I_3,I_2,I_1,I_4
3. I_4,I_3,I_2,I_1 4. I_3,I_2,I_1,I_4

KEY

LEVEL - II

1) 2	2) 3	3) 3	4) 2	5) 1
6) 1	7) 1	8) 4	9) 1	10) 4
11) 1	12) 2	13) 2	14) 3	15) 2
16) 1	17) 4	18) 1	19) 2	20) 4
21) 3	22) 2	23) 1	24) 1	25) 3
26) 4	27) 1	28) 1	29) 3	30) 1
31) 1	32) 1	33) 1	34) 1	35) 1
36) 4	37) 2	38) 2	39) 3	40) 3
41) 2	42) 2	43) 1	44) 4	45) 2
46) 1	47) 2	48) 2	49) 3	50) 1
51) 4	52) 4	53) 2	54) 2	55) 3
56) 3	57) 3	58) 2	59) 1	60) 4
61) 3	62) 4	63)	64) 2	65) 1
66) 3	67) 2	68) 1		

HOME WORK

1) 4	2) 2	3) 3	4) 2	5) 3
6) 3	7) 3	8) 3	9) 2	10) 3
11) 3	12) 4	13) 1	14) 3	15) 2
16) 1	17) 2	18) 4	19) 3	20) 2
21) 2	22) 1	23) 4	24) 2	25) 2
26) 4	27) 2	28) 4	29) 3	30) 1
31) 3	32) 1	33) 4	34) 1	35) 4
36) 3	37) 2	38) 1	39) 3	40) 1
41) 3	42) 2	43) 4	44) 2	45) 4
46) 2	47) 2	48) 3	49) 3	50) 2
51) 1	52) 2	53) 1	54) 3	55) 3
56) 2	57) 1	58) 2	59) 3	60)2
61)3	62) 1	63) 1	64) 1	65) 2
66) 3	67) 2	68) 2	69) 1	70) 1
71) 2	72) 4	73) 3	74) 1	75) 2
76) 1	77) 3	78) 1	79) 2	80) 1
81) 2	82) 1	83) 1	84) 4	85) 1
86) 2	87) 3	88) 3		