

**Type-I**

1. (i)  $\int \frac{dx}{25+4x^2}$  (ii)  $\int \frac{dx}{4x^2+5}$   
 (iii)  $\int \frac{3dx}{x^2-8x+25}$  (iv)  $\int \frac{dx}{x^2+6x+25}$   
 (v)  $\int \frac{dx}{x^2-x+1}$  (vi)  $\int \frac{dx}{4x^2+9}$   
 22 (i)  $\int \frac{x^2 dx}{e^{x^3}+e^{-x^3}}$  (ii)  $\int \frac{\sec^2 x}{4+9\tan^2 x} dx$   
 (iii)  $\int \frac{3\tan^2 x \sec^2 x}{1+\tan^6 x} dx$  (iv)  $\int \frac{dx}{1+\cos^2 x}$   
 3. (i)  $\int \frac{dx}{9-4x^2}$  (ii)  $\int \frac{dx}{25a^2-49x^2}$   
 (iii)  $\int \frac{dx}{16-25x^2}$  (iv)  $\int \frac{dx}{5+4x-x^2}$   
 (v)  $\int \frac{dx}{9x^2-16}$  (vi)  $\int \frac{x^2-1}{x^4+1} dx$   
 (vii)  $\int \frac{a^2-x^2}{(a^2+x^2)^2} dx$  (viii)  $\int \left( \frac{1+x^4}{1+x^2} + \frac{1}{x^2+x+1} \right) dx$

**Type-II**

4. (i)  $\int \frac{dx}{\sqrt{25-x^2}}$  (ii)  $\int \frac{dx}{\sqrt{2-3x^2}}$   
 (iii)  $\int \frac{dx}{\sqrt{9-16x^2}}$  (iv)  $\int \frac{dx}{\sqrt{5-4x^2}}$   
 (v)  $\int \frac{dx}{\sqrt{5-3x^2}}$  (vi)  $\int \frac{dx}{\sqrt{3-2x-x^2}}$  (vii)  $\int \frac{dx}{\sqrt{4x-x^2}}$   
 5. (i)  $\int \frac{x^2 dx}{\sqrt{1-x^6}}$  (ii)  $\int \frac{\sec^2 x}{\sqrt{1-\tan^2 x}} dx$   
 (iii)  $\int \frac{x^3 dx}{\sqrt{a^8-x^8}}$  (iv)  $\int \frac{\cos x}{\sqrt{3+\cos^2 x}} dx$   
 (v)  $\int \sqrt{\frac{1-x}{1+x}} dx$  (vi)  $\int \frac{\cos x}{3+\cos^2 x} dx$   
 6. (i)  $\int \frac{dx}{\sqrt{x^2+4x+13}}$  (ii)  $\int \frac{dx}{\sqrt{2x+x^2}}$   
 (iii)  $\int \frac{e^x}{\sqrt{e^{2x}+1}} dx$   
 7. (i)  $\int \sqrt{1-9x^2} dx$  (ii)  $\int \sqrt{2ax-x^2} dx$

**Type-III**

8. (i)  $\int \frac{3x-2}{\sqrt{3+2x-4x^2}} dx$  (ii)  $\int \frac{dx}{(x+2)\sqrt{x+3}}$   
 (iii)  $\int \frac{dx}{(2x+1)\sqrt{4x+3}}$  (iv)  $\int \frac{dx}{(2x+1)\sqrt{2x+5}}$   
 9. (i)  $\int \frac{dx}{(x^2-4)\sqrt{x+1}}$  (ii)  $\int \frac{dx}{(x^2-16)\sqrt{x+1}}$

**Type-IV**

10. (i)  $\int \frac{\sin x}{\sin(x+a)} dx$  (ii)  $\int \sqrt{\tan x} dx$   
 11. (i)  $\int \frac{dx}{x+x^n} (n \neq 1)$  (ii)  $\int \sqrt{1+\sec x} dx$   
 (iii)  $\int \frac{\sin 2x}{\sin x + \cos x} dx$   
 (iv)  $\int \frac{\cos x dx}{\sqrt{(1+\sin x)(2+\sin x)}}$   
 (v)  $\int \frac{dx}{(a^2+x^2)^{\frac{3}{2}}}$  (vi)  $\int \frac{dx}{3\sin x + 2\cos x + 5}$

বিগত বছরের ইঞ্জিনিয়ারিং ও বিশ্ববিদ্যালয় ভর্তি  
পরীক্ষার লিখিত প্রশ্ন

12.  $\int \frac{dx}{\sqrt{x}+\sqrt{1-x}}$  এর মান বের কর।

13. মান নির্ণয় কর:  $\int (\sqrt{\tan x} + \sqrt{\cot x}) dx$

14. মান নির্ণয় কর:  $\int \frac{dx}{(x^2+9)^2}$

**উত্তরমালা**

1. (i)  $\frac{1}{10} \tan^{-1} \left( \frac{2x}{5} \right) + c$  (ii)  $\frac{1}{2\sqrt{5}} \tan^{-1} \frac{2x}{\sqrt{5}} + c$   
 (iii)  $\tan^{-1} \left( \frac{x-4}{3} \right) + c$  (iv)  $\frac{1}{4} \tan^{-1} \left( \frac{x+3}{4} \right) + c$   
 (v)  $\frac{2}{\sqrt{3}} \tan^{-1} \left( \frac{2x-1}{\sqrt{3}} \right) + c$  (vi)  $\frac{1}{6} \tan^{-1} \left( \frac{2x}{3} \right) + c$   
 2. (i)  $\frac{1}{3} \tan^{-1}(e^{x^3}) + c$  (ii)  $\frac{1}{6} \tan^{-1} \left( \frac{3\tan x}{2} \right) + c$   
 (iii)  $\tan^{-1}(\tan^3 x) + c$  (iv)  $\frac{1}{\sqrt{2}} \tan^{-1} \left( \frac{\tan x}{\sqrt{2}} \right) + c$   
 3. (i)  $\frac{1}{12} \ln \left| \frac{3+2x}{3-2x} \right| + c$  (ii)  $\frac{1}{70a} \ln \left| \frac{5a+7x}{5a-7x} \right| + c$   
 (iii)  $\frac{1}{40} \ln \left| \frac{4+5x}{4-5x} \right| + c$  (v)  $\frac{1}{24} \ln \left| \frac{3x-4}{3x+4} \right| + c$   
 (iv)  $\frac{1}{6} \ln \left| \frac{1+x}{5-x} \right| + c$  (vi)  $\frac{1}{2\sqrt{2}} \ln \left| \frac{x^2+1-\sqrt{2}x}{x^2+1+\sqrt{2}x} \right| + c$   
 (viii)  $\frac{x^3}{3} + 2\tan^{-1} x + \frac{2}{\sqrt{3}} \tan^{-1} \frac{2x+1}{\sqrt{3}} - x + c$   
 (vii)  $\frac{x}{a^2+x^2} + c$   
 4. (i)  $\sin^{-1} \frac{x}{5} + c$  (ii)  $\frac{1}{\sqrt{3}} \sin^{-1} \left( \sqrt{\frac{3}{2}} x \right) + c$   
 (iii)  $\frac{1}{4} \sin^{-1} \frac{4x}{3} + c$  (iv)  $\frac{1}{2} \sin^{-1} \frac{2x}{\sqrt{5}} + c$   
 (v)  $\frac{1}{\sqrt{3}} \sin^{-1} \frac{x\sqrt{3}}{\sqrt{5}} + c$  (vi)  $\sin^{-1} \left( \frac{x+1}{2} \right) + c$   
 (vii)  $\sin^{-1} \left( \frac{x-2}{2} \right) + c$   
 5. (i)  $\frac{1}{3} \sin^{-1}(x^3) + c$  (ii)  $\sin^{-1}(\tan x) + c$   
 (iii)  $\frac{1}{4} \sin^{-1} \frac{x}{a} + c$  (iv)  $\sin^{-1} \left( \frac{1}{2} \right) + c$   
 (v)  $\sin^{-1} x + \sqrt{1-x^2} + c$   
 (vi)  $\frac{1}{4} \ln \left| \frac{2+\sin x}{2-\sin x} \right| + c$   
 6. (i)  $\ln|(x+2) + \sqrt{x^2+4x+13}| + c$   
 (ii)  $\ln|(x+1) + \sqrt{2x+x^2}| + c$   
 (iii)  $\ln|e^x + \sqrt{e^{2x}+1}| + c$   
 7. (i)  $\frac{x\sqrt{1-9x^2}}{2} + \frac{1}{6} \sin^{-1} 3x + c$   
 (ii)  $\frac{(x-a)\sqrt{2ax-x^2}}{2} + \frac{a^2}{2} \sin^{-1} \left( \frac{x-a}{a} \right) + c$

8. (i)  $-\frac{3}{4}\sqrt{3+2x-4x^2} - \frac{5}{8}\sin^{-1}\frac{4x-1}{\sqrt{13}} + c$

(ii)  $\ln\left|\frac{\sqrt{x+3}-1}{\sqrt{x+3}+1}\right| + c$

(iii)  $\frac{1}{2}\ln\left|\frac{\sqrt{4x+3}-1}{\sqrt{4x+3}+1}\right| + c$

(iv)  $\frac{1}{4}\ln\left|\frac{\sqrt{2x+5}-2}{\sqrt{2x+5}+2}\right| + c$

9. (i)  $\frac{1}{4\sqrt{3}}\ln\left|\frac{\sqrt{x+1}-\sqrt{3}}{\sqrt{x+1}+\sqrt{3}}\right| - \frac{1}{2}\tan^{-1}\sqrt{x+1} + c$

(ii)  $\frac{1}{8\sqrt{5}}\ln\left|\frac{\sqrt{x+1}-\sqrt{5}}{\sqrt{x+1}+\sqrt{5}}\right| - \frac{1}{4\sqrt{3}}\tan^{-1}\left(\frac{\sqrt{x+1}}{\sqrt{3}}\right) + c$

10. (i)  $x\cos a - \sin a \ln|\sin(x+a)| + c$

(ii)  $\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{\tan x - 1}{\sqrt{2}\tan x}\right) + \frac{1}{2\sqrt{2}}\ln\left|\frac{\tan x + 1 - \sqrt{2}\tan x}{\tan x + 1 + \sqrt{2}\tan x}\right| + c$

11. (i)  $\frac{1}{1-n}\ln|1+x^{1-n}| + c$

(ii)  $2\sin^{-1}\left(\sqrt{2}\sin\frac{x}{2}\right) + c$

(iii)  $\sin x - \cos x + \frac{1}{\sqrt{2}}\ln\left|\frac{\tan\frac{x}{2}-1-\sqrt{2}}{\tan\frac{x}{2}-1+\sqrt{2}}\right| + c$

(iv)  $2\ln(\sqrt{1+\sin x} + \sqrt{2+\sin x}) + c$

(v)  $\frac{x}{a^2\sqrt{a^2+x^2}} + c$

(vi)  $\frac{1}{\sqrt{3}}\tan^{-1}\left\{\frac{\sqrt{3}}{2}\left(\tan\frac{x}{2}+1\right)\right\} + c$

12.  $\sqrt{x} + \frac{1}{2\sqrt{2}}\ln\left|\frac{\sqrt{2x}-1}{\sqrt{2x}+1}\right| - \sqrt{1-x} -$

$\frac{1}{2\sqrt{2}}\ln\left|\frac{\sqrt{2-2x}-1}{\sqrt{2-2x}+1}\right| + c$

13.  $\sqrt{2}\sin^{-1}(\sin x - \cos x) + c$

14.  $\frac{1}{54}\left(\tan^{-1}\frac{x}{3} + \frac{3x}{x^2+9}\right) + c$

15.  $\frac{1}{a}\sin\tan^{-1}\left(\frac{x}{a}\right) + c$

### গ্রুপ-১

•  $\int f\{g(x)\}g'(x)dx$  আকার

1.  $\int x\sin x^2 dx$  2.  $\int \frac{\sin(\frac{1}{x})}{x^2} dx$

3.  $\int \frac{\sec\sqrt{x}}{\sqrt{x}} dx$  3.  $\int \frac{\cos\sqrt{x}}{\sqrt{x}} dx$

4.  $\int e^x \tan e^x \sec e^x dx$  5.

$\int e^{2x} \tan e^{2x} \sec e^{2x} dx$

6.  $\int \frac{e^x(1+x)dx}{\cos^2(xe^x)}$  7.  $\int \frac{\cos(\ln x)}{x} dx$

8.  $\int \frac{\tan^2(\ln x)}{x} dx$  9.  $\int \frac{\tan(\sin^{-1} x)}{\sqrt{1-x^2}} dx$

### গ্রুপ-২

•  $\int \{f(x)\}^n f'(x) dx$  আকার

10.  $\int (2x+3)\sqrt{x^2+3x} dx$  11.  $\int x^2\sqrt{(1-x^3)} dx$

12.  $\int \frac{e^{-x} dx}{(5+e^{-x})^2}$

13.  $\int \left(e^x + \frac{1}{x}\right)(e^x + \ln x) dx.$

14.  $\int \frac{(\ln x)^2}{x} dx$  15.  $\int \frac{1}{x(\ln x)^2} dx$

16.  $\int \frac{1}{x(1+\ln x)^3} dx$  17.  $\int (1+\cos x)^3 \sin x dx$

18.  $\int \sqrt{1-\sin x} \cos x dx$  19.  $\int \frac{\cos x dx}{(1-\sin x)^2}$

20.  $\int \tan^3 x \sec^2 x dx$  22.  $\int \frac{1+\tan^2 x}{(1+\tan x)^2} dx$

23.  $\int \frac{2x\sin^{-1} x^2}{\sqrt{1-x^4}} dx$  24.  $\int \frac{x^2 \tan^{-1} x^3}{1+x^6} dx$

### গ্রুপ-৩

•  $\int \sin^m x \cos^n x dx, \int \sin^m x dx, \int \cos^m x dx$  আকার

25.  $\int \sin^{11} x \cos x dx$

26.  $\int \sin^2 x \cos x dx$

27.  $\int \sin^2 \frac{x}{2} \cos \frac{x}{2} dx$

28.  $\int \sin^3 x \cos^4 x dx$

29.  $\int \sin^3 x \cos^3 x dx$

30.  $\int \sin^5 x dx$

### গ্রুপ-৪

•  $\int e^{f(x)} f'(x) dx$  আকার

31.  $\int x e^{x^2} dx$

32.  $\int x^2 a^{x^3} dx$

33.  $\int \frac{e^{\sqrt{x}}}{5\sqrt{x}} dx$

34.  $\int \left(1 - \frac{1}{x^2}\right) e^{x+\frac{1}{x}} dx$

35.  $\int \cos x e^{\sin x} dx$

36.  $\int \frac{e^{\sin^{-1} x}}{\sqrt{1-x^2}} dx$

37.  $\int e^{a \sin^{-1} x} \cdot \frac{dx}{\sqrt{1-x^2}}$

38.  $\int e^{\tan^{-1} x} \frac{1}{1+x^2} dx$

### গ্রুপ-৫

•  $\int \frac{f'(x)}{f(x)} dx$  আকার.

39.  $\int \frac{x}{\sqrt{1-x^2}} dx$

40.  $\int \frac{x^3 dx}{\sqrt{(1-2x^4)}}$

41.  $\int \frac{dx}{x\sqrt{1+\ln x}}$

42.  $\int \frac{\cos x}{\sqrt{\sin x}} dx$

43.  $\int \frac{dx}{\cos^2 x \sqrt{\tan x - 1}}$

44.  $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx$

45.  $\int \frac{dx}{\sqrt{(\sin^{-1} x)\sqrt{1-x^2}}}$

46.  $\int \frac{dx}{(1+x^2)\sqrt{\tan^{-1} x + 3}}$

### গ্রুপ-৬

•  $\int \frac{f'(x)}{f(x)} dx$  আকার

47.  $\int \frac{2x}{1+x^2} dx$

48.  $\int \frac{e^{3x}}{e^{3x}-1} dx$

49.  $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx$

50.  $\int \frac{1}{e^x + 1} dx$

51.  $\int \frac{1}{x(1+\ln x)} dx$

52.  $\int \frac{\tan x}{\ln(\cos x)} dx$

53.  $\int \frac{\sin x}{3+4\cos x} dx$

54.  $\int \frac{1+\cos x}{x+\sin x} dx$

59.  $\frac{1}{4} \ln \left| 1 - \frac{1}{x^4} \right|$

55.  $\int \frac{1-\tan x}{1+\tan x} dx$

56.  $\int \frac{\sec^2 x}{3-4\tan x} dx$

61.  $2\ln \left| \sec \frac{x}{2} + \tan \frac{x}{2} \right|$  অথবা  $2\ln \left| \tan \left( \frac{\pi}{4} + \frac{x}{4} \right) \right|$

57.  $\int \frac{\sec x dx}{\ln(\sec x + \tan x)}$

58.  $\int \frac{dx}{(1+x^2)\tan^{-1} x}$

59.  $\int \frac{dx}{x(x^4-1)}$

60.  $\int \operatorname{cosec} \frac{x}{2} dx$

61.  $\int \sec \frac{x}{2} dx$

[দ্রষ্টব্য : যোগজীকরণের ধ্রুবক (c) সবক্ষেত্রে বাদ দিয়ে লেখা হয়েছে।]

1.  $-\frac{1}{2} \cos x^2$

2.  $\cos \left( \frac{1}{x} \right)$

3.  $2\ln |\sec \sqrt{x} + \tan \sqrt{x}|$

4.  $2\sin \sqrt{x}$

5.  $\sec e^x$

6.  $\frac{1}{2} \sec e^{2x}$

7.  $\tan(xe^x)$

8.  $\sin(\ln x)$

9.  $\tan(\ln x) - \ln x$

10.  $\ln |\sec(\sin^{-1} x)|$

11.  $\frac{2}{3} (x^2 + 3x)^{-\frac{3}{2}}$

12.  $-\frac{2}{9} (1 - x^3)^{\frac{3}{2}}$

13.  $\frac{1}{5+e^{-x}}$

14.  $\frac{1}{2} (e^x + \ln x)^2$

15.  $\frac{1}{3} (\ln x)^3$

16.  $-\frac{1}{\ln x}$

17.  $-\frac{1}{2(1+\ln x)^2}$

18.  $-\frac{1}{4} (1 + \cos x)^4$

19.  $-\frac{2}{3} (1 - \sin x)^{\frac{3}{2}}$

20.  $\frac{1}{1-\sin x}$

21.  $\frac{1}{4} \tan^4 x$

22.  $-\frac{1}{1+\tan x}$

23.  $\frac{1}{2} (\sin^{-1} x^2)^2$

24.  $\frac{1}{6} (\tan^{-1} x^3)^2$

25.  $\frac{1}{12} (\sin x)^{12} + c$

26.  $\frac{1}{3} \sin^3 x$

27.  $\frac{2}{3} \sin^3 \frac{x}{2}$

28.  $\frac{1}{7} \cos^7 x - \frac{1}{5} \cos^5 x$

29.  $\frac{1}{4} \sin^4 x - \frac{1}{6} \sin^6 x$

30.  $-\cos x + \frac{2}{3} \cos^3 x - \frac{1}{5} \cos^5 x$

31.  $\frac{1}{2} e^{x^2}$

32.  $\frac{1}{3\ln a} a^{x^3}$

33.  $\frac{2}{5} e^{\sqrt{x}}$

34.  $e^{x+\frac{1}{x}}$

35.  $e^{\sin x}$

36.  $e^{\sin^{-1} x}$

37.  $\frac{1}{a} e^{a \sin^{-1} x}$

38.  $e^{\tan^{-1} x}$

39.  $-\sqrt{1-x^2}$

40.  $-\frac{1}{4} \sqrt{1-2x^4}$

41.  $2\sqrt{1+\ln x}$

42.  $2\sqrt{\sin x}$

45.  $2\sqrt{\sin^{-1} x}$

46.  $2\sqrt{\tan^{-1} x + 3}$

49.  $\ln |e^x + e^{-x}|$

50.  $-\ln |1 + e^{-x}|$

53.  $-\frac{1}{4} \ln |3 + 4\cos x|$

54.  $\ln |x + \sin x|$

57.  $\ln |\ln(\sec x + \tan x)|$

60.  $2\ln \left| \operatorname{cosec} \frac{x}{2} - \cot \frac{x}{2} \right|$  অথবা  $2\ln \left| \tan \frac{x}{4} \right|$