MBBS ASSIGNMENT 19/MH01/235 LEBILE CELINE. M.

2. $\int \cos^4 x \sin^3 x \, dx$

Let $u = \cos x$ $\therefore$ $du/dx = -\sin x$

$dx = -du/\sin x$

$\int u^4 \cdot \sin x \cdot \sin^2 x - du/\sin x$

$\int u^4 \cdot (1-\cos^2 x) - du$

$\int (1-\cos^2 x) - u^4 du$

$\int (1-u^2) - u^4 \, du$

$\int (u^6 - u^4) \, du$

$\left[\frac{u^{6+1}}{6+1} - \frac{u^{4+1}}{4+1} \right] + c$

$= \frac{u^7}{7} - \frac{u^5}{5} + c$

$\frac{\cos^7 x}{7} - \frac{\cos^5 x}{5} + C = \int \cos^4 x \sin^3 x$

3. $\int \cos x \sin^3 \cancel{x} \, dx$

Let $u = \sin x$ $\quad du/dx = \cos x$

$dx = du/\cos x$

$\int \cancel{\cos x} \cdot u^3 \cdot du/\cancel{\cos x}$

$\int u^3 \, du$

$\frac{u^{3+1}}{3+1} = \frac{u^4}{4} + c$

$\frac{\sin^4(x)}{4} + C = \int \cos x \sin^3 x \, dx$

$$\int \sin^6 x\,dx = \int [\sin^2 x]^3\,dx$$

$$= \int \left[\frac{1-\cos 2x}{2}\right]^3 dx$$

$$\int \frac{1}{8}(1-\cos 2x)^3\,dx$$

But $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

$$\therefore \tfrac{1}{8}\int [1 - 3\cos 2x + 3\cos^2 2x - \cos^3 2x]\,dx$$

$$\frac{1}{8}\int 1\,dx - 3\int \cos 2x + 3\int \cos^2 2x - \int \cos^3 2x$$

$$-\int \cos^2 2x \cdot \cos 2x\,dx$$

$$\frac{1}{8}\left[x - \frac{3\sin 2x}{2} + 3\int \frac{1}{2}(1+\cos 2x)^2\right.$$

let $u = \sin 2x$

$$dx = \frac{du}{2\cos 2x}$$

$$\frac{3}{2}\int \left(\frac{1}{2}(1+\cos 4x)\right)$$

$$-\int \cos 2x\,(1-\sin^2 2x)\,\frac{du}{2\cos 2x}$$

$$\frac{3}{2}\left[x + \frac{\sin 4x}{4}\right.$$

$$-\int \frac{1}{2}(1-u^2)\,du$$

$$\frac{3}{2}x + \frac{3\sin 4x}{8}$$

$$-\frac{1}{2}\left[u - \frac{u^3}{3}\right] + c$$

$$-\frac{u}{2} + \frac{u^3}{6} + c$$

$$-\frac{\sin 2x}{2} + \frac{\sin^3 2x}{6} + c$$

$$\therefore \frac{1}{8}\left[x - \frac{3\sin 2x}{2} + \frac{3x}{2} + \frac{3\sin 4x}{8} - \frac{\sin 2x}{2} + \frac{\sin^3 2x}{6} + c\right.$$

$$= \frac{1}{8}x - \frac{3\sin 2x}{16} + \frac{3x}{16} + \frac{3\sin 4x}{64} - \frac{\sin 2x}{16} + \frac{\sin^3 2x}{48} + c$$

$$\frac{1}{8}x + \frac{3x}{16} - \frac{3\sin 2x}{16} - \frac{\sin 2x}{16} + \frac{3\sin 4x}{64} + \frac{\sin^3 2x}{48} + c$$

$$\left(\frac{1}{8} + \frac{3}{16}\right)x - \left(\frac{3}{16} + \frac{1}{16}\right)\sin 2x + 3\frac{\sin 4x}{64} + \frac{\sin^3 2x}{48} + c$$

$$\frac{5x}{16} - \frac{4}{16}\sin 2x + \frac{3}{64}\sin 4x + \frac{\sin^3 2x}{48} + C$$