SHERIFF FATIMA
19/MHS01/398
Medicine and Surgery

(1) $2x^2 \ln x$

$u = \ln x \quad dv = 2x^2 \therefore v = \frac{2x^3}{3}$

$du/dx = 1/x \therefore du = dx/x$

$udv = uv - \int v\,du$

$udv = \ln x \frac{2x^3}{3} - \int \frac{2x^2}{3} \frac{dx}{x}$

$udv = \ln x \frac{2x^3}{3} - \frac{2x^3}{3 \cdot 3} = \ln x \frac{2x^3}{3} - \frac{2x^3}{9}$

$\int 2x^2 \ln x = \frac{2x^3 \ln x}{3} - \frac{2x^3}{9} + C$

(2) $3te^{2t}$

$u = 3t, \frac{du}{dt} = 3 \therefore du = 3dt, v = \frac{1}{2}e^{2t}$

$udv = uv - \int v\,du$

$udv = 3t \frac{1}{2}e^{2t} - \int \frac{1}{2} e^{2t} \cdot 3dt$

$udv = \frac{3te^{2t}}{2} - \frac{3}{2}\int e^{2t}\,dt$

$udv = \frac{3te^{2t}}{2} - \frac{3}{2} \cdot \frac{1}{2} e^{2t}$

$\int 3te^{2t} = \frac{3te^{2t}}{2} - \frac{3}{4} e^{2t} + C$

(3) $x^2 \sin x$

$u = x^2 \quad \frac{du}{dx} = 2x \therefore du = 2x\,dx, \quad v = -\cos x$

$udv = uv - \int v\,du$

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

$udv = -x^2 \cos x + \int \cos x \cdot 2x\,dx$

$udv = -x^2 \cos x + (uv - \int v\,du)$

$udv = -x^2 \cos x + (2x \cdot \sin x - \int \sin x \cdot 2\,dx)$

$= -x^2 \cos x + (2x \cdot \sin x + 2\cos x)$

$-x^2 \cos x + 2x \sin x + 2\cos x + C$

$\int x^2 \sin x = -x^2 \cos x + 2x \sin x + 2\cos x + C$

(4) $\cos 5x \cos 6x$

$\cos A \cos B = \frac{1}{2}\left[\cos 11 - \cos x\right]$

$\cos 5x \cos 6x = \frac{1}{2}\int (\cos 6x + \cos x)$

$= \frac{1}{2}\left[\int \cos 6x\,dx + \int \cos x\,dx\right]$

$= \frac{1}{2}\left[\frac{\sin 6x}{6} + \sin x\right] + C$

$\int \cos 5x \cos 6x = \frac{\sin 6x}{12} + \frac{\sin x}{2} + C$

(5) $\sin 7x \cos x$

$\sin A \cos B = \frac{1}{2}\left[\sin 8x + \sin 6x\right]$

$\int \sin 7x \cos x = \frac{1}{2}\int \left[\sin 8x + \sin 6x\right]$

$= \frac{1}{2}\int \sin 8x + \frac{1}{2}\int \sin 6x$

$= -\frac{\cos 8x}{16} - \frac{\cos 6x}{12} + C$

$\int \sin 7x \cos x = -\frac{\cos 8x}{16} - \frac{\cos 6x}{12} + C$