Paper: Maths-II

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Question NO1 :-

Answer NO1 :-

Part (a) $\int (x^2 e^x)\,dx$

Solution let $u = x^2$, $\frac{dv}{dx} = e^x$

$\frac{du}{dx} = 2x$, $v = e^x$

$$\int x^2 e^x dx = x^2 e^x - 2\int x e^x dx \rightarrow (A)$$

$$\int x e^x dx$$

Let $u = x$ $\frac{dv}{dx} = e^x$

$\frac{du}{dx} = 1$ $v = e^x$

$$\int x e^x dx = x e^x - \int e^x dx$$

$$= x e^x - e^x \rightarrow (1)$$

Put (1) in (A)

$$= x^2 e^x - 2(x e^x - e^x) + C$$

$$= \boxed{x^2 e^x - 2x e^x - 2e^x + C}$$

QNO1

Part(b):- $\int (1+3t) \cdot t^3 dt$

Solution:-

$$\int (1+3t) \cdot t^3 dt$$

$$= \int (t^3 + 3t^4) dt$$

$$= \int t^3 dt + 3\int t^4 dt$$

$$= \frac{t^4}{4} + \frac{3t^5}{5} + c$$

$$= \boxed{\frac{1}{4}t^4 + \frac{3}{5}t^5 + c}$$ Ans.

Question NO1 :-

Part(C) :- $\int (e^x - e^3)\, dx$

Solution :-

$$\int (e^x - e^3)\, dx$$

$$= \int e^x dx - \int e^3 dx$$

$$= e^x - e^3 \int dx$$

$$= \boxed{e^x - e^3 x + C}$$ Ans.

Pg#4

Question NO2 :-

Answer NO2 :-

Taylor's Series

n	$f^n(n)$	$\frac{f^n(-4)}{n!}$	
0	e^{-6x}	$\frac{(-6)^0 e^{-6(-4)}}{0!}$	$\frac{(-6)^0 e^{24}}{0!}$
1	$-6e^{-6x}$	$\frac{(-6)^1 e^{-6(-4)}}{1!}$	$\frac{(-6)^1 e^{24}}{1!}$
2	$(-6)^2 e^{-6x}$	$\frac{(-6)^2 e^{-6(-4)}}{2!}$	$\frac{(-6)^2 e^{24}}{2!}$
3	$(-6)^3 e^{-6x}$	$\frac{(-6)^3 e^{-6(-4)}}{3!}$	$\frac{(-6)^3 e^{24}}{3!}$
4	$(-6)^4 e^{-6x}$	$\frac{(-6)^4 e^{-6(-4)}}{4!}$	$\frac{(-6)^4 e^{24}}{4!}$

e^{-6x} at $x=-4$

$$e^{-6x} = e^{24} + \frac{(-6)e^{24}}{1!}(x+4) + \frac{(-6)^2 e^{24}}{2!}(x+4)^2 + \frac{(-6)^3 e^{24}}{3!}(x+4)^3$$

$$- \frac{(-6)^4 e^{24}}{4!}(x+4)^4 + \cdots$$

$$= \sum_{n=0}^{\infty} (-1)^n \frac{6^n e^{24}}{n!}(x+4)^n \qquad R = \infty$$

Ans

QNO3 :-

Answer Part (a) :-

$$f(y) = X \cdot \sin x$$

differentiate w.r.t x

$$f(y) = \frac{d}{dx}(x \cdot \sin x)$$

$$f(y) = x\frac{d}{dx}(\sin x) + \sin x \frac{d}{dx}(x)$$

$$f(y) = x\cos x + \sin x\,(1)$$

$$f(y) = x\cos x + \sin x \quad \text{Ans.}$$

Answer Part (b) :-

$$f(y) = x^2 \cos x$$

differentiate w.r.t x

$$f(y) = \frac{d}{dx}(x^2 \cos x)$$

$$f(y) = x^2\frac{d}{dx}(x^2\cos x) = x^2\frac{d}{dx}(\cos x) + \cos x$$

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

$$f(y) = -x^2 \sin x + 2x\cos x \quad \text{Ans.}$$

QNO3:-

Part(C):- $f(t) = z(2z-2)^2$

differentiate w.r.t z

$$f(t) = \frac{d}{dz}(z(2z-2)^2)$$

$$f(t) = z\frac{d}{dz}(2z-2)^2 + (2z-2)^2\frac{d}{dz}(z)$$

$$f(t) = z2(2z-2)^{2-1}\frac{d}{dz}(2z-2) + (2z-2)^2$$

$$f(t) = z2(2z-2)(2) + (2z-2)^2$$

$$f(t) = 4z(2z-2) + (2z-2)^2 \text{ Ans.}$$