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Sec	C
Quiz	1st
Subject	Applied Calculus
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Exam Type	Improvement for CGPA (Summer 2020)
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IMU Peshawar

Q: 1 (i)

Given data:-

$$\int_0^1 \frac{4t^3 - 2t^2 + 3t - 1}{2t^2 + 1}\, dt$$

Required :-

To find the Solution

Solution:-

$$\int_0^1 \frac{4t^3 - 2t^2 + 3t - 1}{2t^2 + 1}\, dt$$

$$\begin{array}{r|l} & 2t - 1 \\ \hline 2t^2 + 1 & 4t^3 - 2t^2 + 3t - 1 \\ & \pm 4t^3 \quad \pm 2t \\ \hline & -2t^2 + t - 1 \\ & \mp 2t^2 \quad \mp 1 \\ \hline & t \end{array}$$

$$\frac{4t^3 - 2t^2 + 3t - 1}{2t^2 + 1} = (2t - 1) + \frac{t}{2t^2 + 1}$$

Taking Integral on both Sides

(2)

$$\int_0^1 \frac{4t^3-2t^2+3t-1}{2t^2+1}\,dt = \int_0^1 (2t-1)\,dt + \int_0^1 \frac{t}{2t^2+1}\,dt$$

$$= \int_0^1 2t\,dt - \int_0^1 dt + \frac{1}{4}\int_0^1 \frac{4t}{2t^2+1}\,dt$$

$$= \frac{2t^2}{2}\Big|_0^1 - t\Big|_0^1 + \frac{1}{4}\ln(2t^2+1)\Big|_0^1$$

$$= \{(1)^2-(0)^2\} - \{1-0\} + \frac{1}{4}\{\ln|2(1)^2+1| - \ln|2(0)^2+1|\}$$

$$= (1)-(1)+\frac{1}{4}\{\ln 3 - \ln 1\}$$

$$= 1-1+\frac{1}{4}\{\ln 3 - 0\}$$

$$= \frac{1}{4}\ln 3$$

$$= 0.2746 \text{ Ans}$$

(ii) $\int_2^3 t \sin t^2 \, dt$

Solution:

$$\int_2^3 t \sin t^2 \, dt$$

$$= \int_2^3 \sin t^2 \cdot t \, dt$$

Let $t^2 = x$

$$\frac{d}{dt}(t^2) = \frac{dx}{dt}$$

$$2t = \frac{dx}{dt}$$

$$2t\,dt = dx$$

$$t\,dt = \frac{dx}{2}$$

$$= \int_2^3 \sin x \, \frac{dx}{2}$$

$$= \frac{1}{2} \int_2^3 \sin x \, dx$$

$$= \frac{1}{2}(-\cos x)\Big|_2^3$$

$$= -\frac{1}{2}\cos x\Big|_2^3$$

Putting the value of x.

$$= -\frac{1}{2}\cos t^2\Big|_2^3$$

$$= -\frac{1}{2}\left\{\cos(3)^2 - \cos(2)^2\right\}$$

$$= -\frac{1}{2}\left\{\cos 9 - \cos 4\right\}$$

$$= -\frac{1}{2}(-0.25748)$$

$$= 0.12874 \quad \text{Ans:}$$