Date Planned : __ / __ / __	Daily Tutorial Sheet - 18	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level – 3	Exact Duration :________

210. (i) Given that f satisfies $|f(u) - f(v)| \le |u - v|$ for u and v in $[a, b]$. Then $\left|\int_a^b f(x)\,dx - (b-a)\,f(a)\right| \le$

(A) $\frac{(b-a)}{2}$ **(B)** $\frac{(b-a)^2}{2}$ **(C)** $(b-a)^2$ **(D)** None of these

(ii) The area bounded by the curves $x\sqrt{3} + y = 2\log_e(x - y\sqrt{3}) - 2\log_e 2$, $y = \sqrt{3}x$, $y = -\frac{1}{\sqrt{3}}x + 2$ is:

(A) $2\log_e 2$ sq. units **(B)** $2\log_e 2 + 1$ sq. units

(C) $2\log_e 2 - 1$ sq. units **(D)** $4\log_e 2 - 1$ sq. units

211. (i) Consider $f(x) = \begin{cases} \cos x & 0 \le x < \frac{\pi}{2} \\ \left(\frac{\pi}{2} - x\right)^2 & \frac{\pi}{2} \le x < \pi \end{cases}$ such that f is periodic with periodic with period π.

Then which of the following is not true?

(A) The range of f is $\left[0, \frac{\pi^2}{4}\right)$

(B) f is discontinuous for infinite values of x

(C) The area bounded by $y = f(x)$ and the X-axis from $x = 0$ to $x = n\pi$ is $n\left(1 + \frac{\pi^3}{24}\right)$ for a given $n \in N$

(D) None of these

(ii) If $f(x) = \begin{cases} \sqrt{\{x\}} & \text{for } x \notin Z \\ 1 & \text{for } x \in Z \end{cases}$ and $g(x) = \{x\}^2$ where $\{.\}$ denotes fractional part of x then area bounded by $f(x)$ and $g(x)$ for $x \in (0, 6)$ is:

(A) $\frac{2}{3}$ **(B)** 2 **(C)** $\frac{10}{3}$ **(D)** 6

212. (i) Let S is the region of points which satisfies $y^2 < 16x$, $x < 4$ and $\frac{xy(x^2 - 3x + 2)}{x^2 - 7x + 12} > 0$, Its area is:

(A) $\frac{8}{3}$ **(B)** $\frac{64}{3}$ **(C)** $\frac{32}{3}$ **(D)** None of these

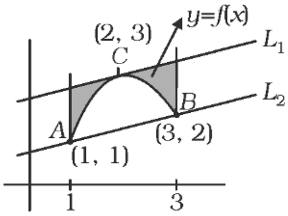
(ii) Given a function $f : [0, 4] \to R$ is differentiable. Then for some $\alpha, \beta \in (0, 2)$, $\int_0^4 f(t)dt$ is equal to:

(A) $f(\alpha^2) + f(\beta^2)$ **(B)** $2\alpha f(\alpha^2) + 2\beta f(\beta^2)$

(C) $\alpha f(\beta^2) + \beta f(\alpha^2)$ **(D)** $f(\alpha) f(\beta)[f(\alpha) + f(\beta)]$

213. (i) Let $f(x)$ be a derivable function satisfying $f(x)=\int_0^x e^t \sin(x-t)dt$ and $g(x)=f''(x)-f(x)$ then the possible integers in the range of g(x) is:

(ii) The following figure shows the graph of a continuous function $y=f(x)$ on the interval [1, 3]. The points A, B, C have coordinates (1, 1), (3, 2), (2, 3), respectively, and the lines L_1 and L_2 are parallel, with L_1 being tangent to the curve at C. If the area under the graph of $y=f(x)$ from $x=1$ to $x=3$ is 4 square units, then the area of the shaded region is :

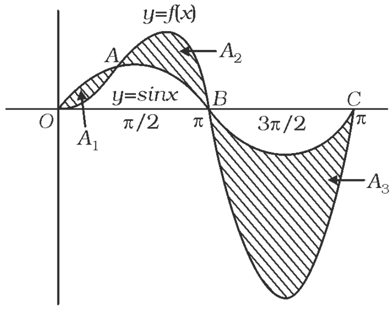


(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

Paragraph for Question 214 (i)

In the following figure, the graphs of two functions $y=f(x)$ and $y=\sin x$ are given. They intersect at origin, $A(a, f(a))$, $B(\pi, 0)$ and $C(2\pi, 0)$. $A_i (i=1, 2, 3)$ is the area bounded by the curves as shown in the figure, respectively, for $x\in(0, a)$, $x\in(a, \pi)$, $x\in(\pi, 2\pi)$.

If $A_1 = 1+(a-1)\cos a - \sin a$, then:



(a) The function $f(x)$ is:

(A) $x^2 \sin x$ **(B)** $x \sin x$ **(C)** $2x \sin x$ **(D)** $x^3 \sin x$

(b) The value of A_2 is:

(A) $(\pi-1)$ units^2 **(B)** $(\pi/2-1)$ units^2

(C) $(\pi-\sin 1-1)$ units^2 **(D)** $\pi/2$ units^2

(ii) If $\int_0^\infty x^{2n+1}.e^{-x^2 dx}=360$, then the value of n is ________

215. (i) The value of $2^{2010}\dfrac{\int_0^1 x^{1004}(1-x)^{1004}dx}{\int_0^1 x^{1004}(1-x^{2010})^{1004}dx}$ is__________

(ii) Let $J=\int_{-5}^{-4}(3-x^2)\tan(3-x^2)dx$ and $K=\int_{-2}^{-1}(6-6x+x^2)\tan(6x-x^2-6)dx$. Then $(J+K)$ equals ______