1. $\int_0^4 (|x-1|+3|x-2|+4|x-3|)\,dx =$

(a) 37 (b) 14 (c) 22 (d) 11

2. $\int_0^{\log_e 5} \frac{e^x\sqrt{e^x-1}}{e^x+3}\,dx =$

(a) $3+2\pi$ (b) $4-\pi$ (c) $2+\pi$ (d) $4+\pi$

3. $\sum_{n=1}^{1000} \int_{n-1}^{n} e^{x-[x]}\,dx =$

(a) $\frac{e^{1000}-1}{1000}$ (b) $\frac{e^{1000}-1}{e-1}$

(c) 1000 (e - 1) (d) $\frac{e-1}{1000}$

4. If $A = \int_1^{\sin\theta} \frac{t\,dt}{1+t^2}$ and $B = \int_1^{\operatorname{cosec}\theta} \frac{dt}{t(1+t^2)}$ then the value of $\begin{vmatrix} A & A^2 & B \\ e^A e^B & B^2 & -1 \\ 1 & A^2+B^2 & -1 \end{vmatrix}$ is

(a) $\sin\theta$ (b) $\operatorname{cosec}\theta$ (c) 0 (d) 1

5. Let [x] stands for the greatest integer function. The value of $\int_0^{21} [x]^3\,dx$ is -

(a) 44001 (b) 44000 (c) 40400 (d) None of these

6. If $\int_1^2 e^{x^2}\,dx = a$, then the value of $\int_e^{e^4} \sqrt{\ell n(x)}\,dx$ is-

(a) $e^4 - e$ (b) $e^4 - a$ (c) $2e^4 - a$ (d) $2e^4 - e - a$

7. Number of solution for x between 3 and 15 if $\int_0^x [t]\,dt = \int_0^{[x]} t\,dt$, where [.] denotes greatest integer function, is -

(a)12 (b) 13 (c) 11 (d) Infinitely many

8. The value of $\int_{-2n}^{2n+1/2} (\sin\pi x)\left\{\frac{x}{2}\right\}dx$ is (where {x} denotes the fractional part of x}-

(a) $\frac{-2n\pi+1}{\pi^2}$ (b) $\frac{n}{\pi}$

(c) $\frac{(n+1)}{\pi}$ (d) $\frac{2n\pi-1}{\pi^2}$

9. Let f be integrable over [0, a] for any real a. If we define

$I_1 = \int_0^{\pi/2} \cos\theta\, f(\sin\theta + \cos^2\theta)\,d\theta$ and

$I_2 = \int_0^{\pi/2} \sin 2\theta\, f(\sin\theta + \cos^2\theta)\,d\theta$, then

(a) $I_1 = I_2$ (b) $I_1 = -I_2$

(c) $I_1 = 2I_2$ (d) $I_1 = -2I_2$

10. If $I_1 = \int_0^{\pi/2} \cos(\sin x)\,dx$; $I_2 = \int_0^{\pi/2} \sin(\cos x)\,dx$ and

$I_3 = \int_0^{\pi/2} \cos x\,dx$, then -

(a) $I_1 > I_3 > I_2$ (b) $I_3 > I_1 > I_2$

(c) $I_1 > I_2 > I_3$ (d) $I_3 > I_2 > I_1$

11. If $I = \int_{1/3}^{3} \frac{1}{x}\sin\left(\frac{1}{x}-x\right)dx$, then I equals :

(a) $\sqrt{3}/2$ (b) $\pi+\sqrt{3}/2$

(c) 0 (d) None of these

12. Value of $I = \int_0^{\pi/2} \frac{\sin^3 x\cos x}{\sin^4 x+\cos^4 x}\,dx$ is equal to

(a) $\pi/8$ (b) $\pi/4$ (c) $\pi/2$ (d) π

13. Let f(x) be a function defined by $f(x) = \int_1^x t(t^2-3t+2)\,dt$, $1 \le x \le 3$. Then the range of f(x) is -

(a) [0, 2] (b) $\left[-\frac{1}{4}, 4\right]$

(c) $\left[-\frac{1}{4}, 2\right]$ (d) None of these

14. If $\int_{\sin x}^{1} t^2 (f(t))\,dt = (1 - \sin x)$, then $f\left(\frac{1}{\sqrt{3}}\right)$ is -

(a) $\frac{1}{3}$ (b) $\frac{1}{\sqrt{3}}$

(c) 3 (d) $\sqrt{3}$

15. Let $f(x) = \int_0^x t\sin\frac{1}{t}\,dt$. Then the number of points of discontinuity of the function $f(x)$ in the open interval $(0, \pi)$ is -

(a) 0 (b) 1 (c) 2 (d) Infinite

16. Evaluate : $\int_{-\pi/2}^{2\pi} \sin^{-1}(\sin x)\,dx$ -

(a) $-\frac{\pi^2}{4}$ (b) $\frac{-\pi^2}{8}$

(c) $\frac{\pi^2}{4}$ (d) None of these

17. Evaluate : $\int_{-2}^{2} \max\{x+|x|, x-[x]\}\,dx$, where [x] denotes the greatest integer $\le x$ -

(a) 4 (b) 3 (c) 5 (d) 1

18. Evaluate : $\int_0^{\pi/4} \frac{(\sin x + \cos x)}{(9+16\sin 2x)} dx$ -

(a) $\frac{1}{20} \ln 2$ (b) $\frac{1}{20} \ln 4$

(c) $\frac{1}{20} \ln 3$ (d) None of these

19. Evaluate : $\int_{\pi/4}^{\pi/3} x \operatorname{cosec}^2 x \, dx$ -

(a) $\frac{\pi}{12\sqrt{3}} (3\sqrt{3} - 4) + \frac{1}{2} \ln \left(\frac{3}{2}\right)$

(b) $\frac{\pi}{12\sqrt{3}} (3\sqrt{3} - 4) + \frac{1}{2} \ln \left(\frac{2}{3}\right)$

(c) $\frac{\pi}{12\sqrt{3}} (3\sqrt{3} - 2) + \frac{1}{2} \ln \left(\frac{3}{2}\right)$

(d) None of these

20. If $f(x) = \int_{x^2}^{x^2+1} e^{-t^2} dt$, find the interval in which $f(x)$ is increasing -

(a) $(0, \infty)$ (b) $(-\infty, 0)$ (c) $(-2, 2)$ (d) No where