

Question Bank of Unit I and Unit-II

1) Verify LMVT for the function $f(x) = x(x-1)(x-2)$ on $[0, \frac{1}{2}]$

2) Prove that if $0 < a < b$ then

$$\frac{b-a}{1+b^2} < (\tan^{-1} b - \tan^{-1} a) < \frac{b-a}{1+a^2} \quad \text{and hence prove that } \frac{\pi}{4} + \frac{3}{25} < \tan^{-1} \frac{4}{3} < \frac{\pi}{4} + \frac{1}{6}$$

3) Using Taylor's Theorem expand $\log \cos \left(x + \frac{\pi}{4}\right)$ in ascending powers of x .

4) Prove that $\log(1 + \tan x) = x - \frac{x^2}{2} + \frac{2}{3}x^3 - \dots$

5) Using Taylor's theorem Expand $5 + 4(x-2)^2 - 3(x-2)^3 + (x-2)^4$ in ascending power of x .

6) Using Taylor's Theorem expand $2x^3 + 3x^2 - 8x + 7$ in ascending powers of $(x-2)$.

7) Using Taylor's theorem Expand $7 + (x+1) + 3(x+1)^3 + (x+1)^4$ in ascending power of x .

8) Find a and b if $\lim_{x \rightarrow 0} \left[\frac{a \cos x - a + bx^2}{x^4} \right] = \frac{1}{12}$

9) Evaluate $\lim_{x \rightarrow 0} (\cot x)^{\sin x}$

10) Expand $\sqrt{1 + \sin x}$ unto x^6 .

11) Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan 3x}{\tan x}$

12) If $\lim_{x \rightarrow 0} \frac{\sin 2x + p \sin x}{x^3}$ is finite then find the value of p and hence find the value of limit.

13) Obtain Fourier Series of $f(x) = \pi^2 - x^2$ on $[-\pi, \pi]$ with period 2π .

14) Obtain half range Fourier sine series $f(x) = x^2$ on $[0, l]$.

15) Find first three coefficient of Fourier sine Series of y in the interval $[0, 6]$

X	0	1	2	3	4	5
Y	4	8	15	7	6	2

16) Obtain the Fourier Series of $f(x)$, where $f(x) = x^3$ on $[-\pi, \pi]$ with period 2π .

17) Obtain Half Range Fourier Cosine Series of $f(x) = \pi x - x^2$ in the interval $0 < x < \pi$.

18) Find the Fourier Series of the following values of y up to first harmonic in the interval $[0, 6]$

X	0	1	2	3	4	5	6
Y	9	18	24	28	26	20	9

19) Obtain the Fourier Series of $f(x)$, where $f(x) = x^2$ on $[-\pi, \pi]$ and $f(x) = f(x + 2\pi)$

20) Obtain half range Fourier sine series $f(x) = x$ on $[0, l]$

21) Find first three coefficient of Fourier cosine Series of y in the interval $[0, 180^\circ]$

X°	0	30	60	90	120	150
Y	0	9.2	14.4	17.8	17.3	11.7

22) Obtain the Fourier Series of $f(x)$, where $f(x) = x$ on $[-\pi, \pi]$ and $f(x) = f(x + 2\pi)$.

23) Obtain Half Range Fourier Cosine Series of $f(x) = x - x^2$ in the interval $0 < x < 1$.

24) Find the Fourier Series of the following values of y up to first harmonic in the interval $[0, 6]$

X	0	1	2	3	4	5	6
Y	9	18	24	28	26	20	9