Yashwantrao Chavan College of Science, Karad

Department of Computer Science Question Bank,2023-2024

Subject: Mathematics

Paper No- IV

GEC-206 Calculus

1. State and prove that Lagrange's Mean value theorem.
2. State and prove that Rolle's theorem.
3. State and prove that Cauchy's Mean value theorem.
4. State and prove that Leibnitz's theorem.
5. State Maclaurin's theorem with Cauchy's remainder form's also find the series expansion cosx
6. State Rolle's theorem and verify Rolle's theorem for the function. $f(x) = x^2 - 8x + 15$

   $x \in [3,5]$
7. State Rolle's theorem and verify Rolle's theorem for the function. $f(x) = 2x^3 - x^2 - 4x - 2$

   $x \in [\sqrt{2}, \sqrt{-2}]$
8. State Rolle's theorem and verify Rolle's theorem for the function. $f(x) = x^2 - 6x + 4$

   $x \in [2,4]$
9. State Rolle's theorem and verify Rolle's theorem for the function. $f(x) = x^2$

   $x \in [-1,1]$
10. State Rolle's theorem and If $f(x) = (x-2)\log x$ show that the equation $x \log x = 2 - x$ is satisfied by at least one value of x lie both 1 and 2.

11. State Rolle's theorem and verify Rolle's theorem for the function. $f(x) = \log\frac{x^{2+6}}{5x}$

$x \in [2,3]$

12. State Lagrange's mean value theorem and verify mean value theorem for function $f(x) = x^2 - 4x - 3$ in the interval $[a, b]$ Where $a = 1, b = 4$

13. State Lagrange's mean value theorem and verify mean value theorem for function $f(x) = e^x$ in the interval $[0,1]$

14. State Lagrange's mean value theorem and verify mean value theorem for function $f(x) = x^2 - 2x$ in the interval $[-1,3]$

15. State Lagrange's mean value theorem and verify mean value theorem for function $f(x) = 2x^3 - 12x^2 + 24x + 24$ in the interval $[-1,3]$

16. State Lagrange's mean value theorem and verify mean value theorem for function $f(x) = x(x+1)(x-1)$ in the interval $[0,2]$

17. State Lagrange's mean value theorem and verify mean value theorem for function $f(x) = (x-1)(x-2)(x-3)$ in the interval $[0,4]$

18. Verify Cauchy's mean value theorem for the function $f(x) = \frac{1}{x^2}$ and $g(x) = \frac{1}{x}$ in $[a, b]$, $a > 0$ show that the point c is harmonic mean of $a < b$

19. If the Cauchy's mean value theorem we write $f(x) = e^x$ and $g(x) = e^{-x}$ show that c is the arithmetic mean between a and b.

20. Verify Cauchy's mean value theorem for the function for $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{\sqrt{x}}$ on (a, b) and find c.

21. Verify Cauchy's mean value theorem for the function for $f(x) = 2x^3$ and $g(x) = x^6$on (a, b) and find c

22. Verify Cauchy's mean value theorem for the function for $e^x + e^{-x}$ on $[a, b]$ and find c.

23. Expansion e^x by Maclaurins theorem.

24. Expansion e^x by Maclaurins theorem.

25. Expansion $\sin x$ by Maclaurins theorem.

26. Expansion $\cos x$ by Maclaurins theorem.

27. Expansion $\log(1 + x)$ by Maclaurins theorem.

28. Evaluate$\lim_{x\to 0} \frac{2\sin x - \sin 2x}{x - \sin x}$

29. Evaluate$\lim_{x\to 0} \frac{\sin x}{\cos x}$

30. Evaluate$\lim_{x\to 0} \log x \tan x tanx^2$

31. Evaluate$\lim_{x\to 0} \log \frac{\sin x}{\cot x}$.

32. Evaluate $\lim_{x\to 0} \frac{a^{x-1}}{b^{x-1}}$

33. Evaluate$\lim_{x\to 0} \log \frac{\sin x - x}{x - \tan x}$

34. Evaluate $\lim_{x\to 0} x \log x$

35. Evaluate$\lim_{x\to 0} \frac{\cot x}{log \tan x}$

36. Find n^{th} derivatives of $e^x \log x$

37. If $y = x^2 \sin x$ find y_n.

38. If $y = x^3 e^x \sin x$ then n^{th} derivatives of y.

39. If $y = x^2 \cos x$ find y_n.

40. If $y = x^2 \tan x$ find y_n.