

Reg.No.:



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.



Question Paper Code: 2001

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – DECEMBER 2019

First Semester

Computer Science and Engineering

U15MA101 – CALCULUS

(Common to Electrical and Electronics Engineering, Electronics and Communication Engineering, Information Technology & Biotechnology)

(Regulation 2015)

Time : Three Hours

Maximum : 100 Marks

Answer ALL the questions

PART – A

(10 x 2 = 20 Marks)

1. Use the mean value theorem (MVT) to establish the following inequality.
 $e^x \geq 1 + x$ for $x \in R$.
2. Show that the function $f(x) = x^3 - 5x^2 + 3x + 6$ has at least two real zeros between $x = 1$ and $x = 4$.
3. Verify that $f(x, y) = x^2 + y^2$ has a minimum at $(0, 0)$.
4. Find the Jacobian of the transformation T given by $x = uv$ and $y = \frac{u}{v}$.
5. Evaluate the Reimann sum for $f(x) = x^3 - 6x$ taking the sample points to be right endpoints and $a = 0, b = 3$, and $n = 6$.
6. Show that $\int_0^{\infty} e^{-x^2} dx$ is convergent.
7. Estimate the volume of the solid that lies above the square $R = [0, 2] \times [0, 2]$ and below the elliptic paraboloid $z = 16 - x^2 - 2y^2$. Divide R into four equal squares and choose the sample point to be the upper right corner of each square R_{ij} .
8. Sketch the region of integration for the integral $\int_0^2 \int_0^x f(x, y) dy dx$.
9. What do you mean by linear differential equation?
10. Transform the variable coefficient differential equation
 $(x^2 D^2 - 4xD + 4)y = \sin(\log x)$ into a constant coefficient differential equation.

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PART - B

(5 x 16 = 80 Marks)

11. a) Show that the equation $2x - 1 - \sin(x) = 0$ has exactly one real root.
(OR)
- b) If a and b are positive numbers, find the maximum value of
 $f(x) = x^a(1-x)^b, 0 \leq x \leq 1.$
12. a) Find the maximum and minimum values of $f(x, y) = 81x^2 + y^2$ subject to the constraint $4x^2 + y^2 = 9.$
(OR)
- b) State and prove Taylor's theorem for a function of two variables.
13. a) State and prove the Fundamental theorem of Calculus.
(OR)
- b) Use Fundamental theorem of Calculus to find the derivative of the function
 $g(x) = \int_1^x \frac{1}{t^3+1} dt.$
14. a) Find the area of a region enclosed by the curves $y = x$ and $y = x^2$ by double integration.
(OR)
- b) Find the volume of the solid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ by triple integral.
15. a) Find a general solution to the following differential equation:
 $2y'' + 18y = 6\tan(3t).$
(OR)
- b) Solve the following initial value problem
 $2x^2y'' + 3xy' - 15y = 0, y(1) = 0, y'(1) = 1.$