| Reg.No.: | | | | | | | | | | | | |
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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

**Question Paper Code: 20015**

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. / FEB. 2026
First Semester
Computer Science and Engineering
U19MA101 – CALCULUS
(Regulation 2019)

Time : Three Hours | Maximum : 100 Marks

Answer ALL the questions

| Knowledge Levels (KL) | K1 – Remembering | K3 – Applying | K5 - Evaluating |
|---|---|---|---|
| | K2 – Understanding | K4 – Analyzing | K6 - Creating |

PART – A

(10 x 2 = 20 Marks)

| Q.No. | Questions | Marks | KL | CO |
|---|---|---|---|---|
| 1. | If f(x) = $xe^x$ then find the expression for $f''(x)$. | 2 | K2 | CO1 |
| 2. | Given that $\lim_{x\to 2} f(x) = 4$ and $\lim_{x\to 2} g(x) = -2$. Find the limit that exists for $\lim_{x\to 2}\left[\frac{4f(x)}{g(x)}\right]$. | 2 | K2 | CO1 |
| 3. | If x = rcos $\theta$, y = rsin $\theta$ then find $\frac{\partial r}{\partial x}$. | 2 | K2 | CO2 |
| 4. | Prove $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$ if f = $x^3 + y^3 + z^3 + 3xyz$. | 2 | K2 | CO2 |
| 5. | Evaluate $\int \frac{1}{\sqrt{a^2-x^2}} dx$ by using trigonometric substitution. | 2 | K2 | CO3 |
| 6. | Evaluate $\int_0^{\frac{\pi}{2}} sin^6 x\, dx$. | 2 | K2 | CO3 |
| 7. | Evaluate $\int_1^2 \int_0^{x^2} x\, dydx$. | 2 | K2 | CO4 |
| 8. | Evaluate $\int_0^{\pi} \int_0^{sin\theta} r dr d\theta$. | 2 | K2 | CO4 |
| 9. | Find the particular integral of $(D^2 - 9)y = e^{-3x}$. | 2 | K2 | CO5 |
| 10. | Reduce the equation $(x^2 D^2 + xD + 1)y = \log x$ into an equation with constant coefficients. | 2 | K2 | CO5 |

## PART – B

(5 x 16 = 80 Marks)

| Q.No. | | | Questions | Marks | KL | CO |
|---|---|---|---|---|---|---|
| 11. | a) | | Find the values of a and b that makes f(x) continuous on $(-\infty, \infty)$ $$f(x) = \begin{cases} \frac{x^3 - 8}{x - 2} & if\ x < 2 \\ ax^2 - bx + 3 & if\ 2 \le x < 3 \\ 2x - a + b & if\ x \ge 3 \end{cases}$$ | 16 | K3 | CO1 |
| | | | (OR) | | | |
| | b) | i. | Find the absolute maximum and absolute minimum values of the function $f(x) = 3x^4 - 4x^3 - 12x^2 + 1$ on the interval [-2,3]. | 8 | K3 | CO1 |
| | | ii. | Find the local maximum and minimum values of $f(x) = \sqrt{x} - \sqrt[4]{x}$ using both the first and second derivative test. | 8 | K3 | CO1 |
| 12. | a) | i. | Find the dimension of the rectangular box without a top of maximum capacity, whose surface area is 108 sq.cm. | 8 | K3 | CO2 |
| | | ii. | Examine f(x,y) = $x^3 + 3xy^2 - 15x^2 - 15y^2$+72x. | 8 | K3 | CO2 |
| | | | (OR) | | | |
| | b) | i. | Find the Taylor series expansion of f(x,y)=$x^2y^2 + 2x^2y + 3xy^2$ in powers of (x + 2) and (y - 1) up to the second degree terms. | 8 | K4 | CO2 |
| | | ii. | Solve If u=log (tanx + tany + tanz) then find the value of sin2x$\frac{\partial u}{\partial x}$+ sin2y$\frac{\partial u}{\partial y}$+ sin2z$\frac{\partial u}{\partial z}$. | 8 | K4 | CO2 |
| 13. | a) | i. | Use Partial fraction technique , Evaluate $\int \frac{3x+1}{(x-1)^2(x+3)} dx$ | 8 | K3 | CO3 |
| | | ii. | Evaluate $\int e^{ax}\ cosbx\ dx$ using integration by parts. | 8 | K3 | CO3 |
| | | | (OR) | | | |
| | b) | | Establish a reduction formula for $I_n = \int sin^n x\ dx$. Hence find $\int_0^{\pi/2} sin^n x dx$. | 16 | K4 | CO3 |
| 14. | a) | | Evaluate $\iiint dxdydz$ where V is the finite region of space (tetrahedron) bounded by the planes x = 0, y = 0, z = 0 and 2x + 3y + 4z=12. | 16 | K4 | CO4 |
| | | | (OR) | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | b) | i. | Find the area bounded by the parabolas $y^2 = 4 - x$ and $y^2 = x$. | 8 | K4 | CO4 |
| | | ii. | Change the order of integration $\int_0^a \int_{\frac{x}{a}}^{\sqrt{\frac{x}{a}}} (x^2 + y^2) dydx$ and evaluate the same. | 8 | K4 | CO4 |
| 15. | a) | i. | Solve $(x^2D^2 + 3xD + 5)y = xcos(logx)$. | 8 | K3 | CO5 |
| | | ii. | Solve $(D^2 - 3D + 2)y = 2e^x + 2\cos(2x + 3)$. | 8 | K3 | CO5 |
| | | | (OR) | | | |
| | b) | i. | Solve $(D^2 + 4)y = \tan 2x$ by the method of variation of parameters. | 8 | K3 | CO5 |
| | | ii. | Solve $(D^2 + 2D + 2)y = e^{-2x} + \cos 2x$. | 8 | K3 | CO5 |