

**Third Semester FYUGP Degree Examination NOVEMBER
2025**

**KU3DSCMAT217 - MULTIPLE INTEGRALS,
DIFFERENTIAL EQUATIONS AND NUMERICAL
METHODS**

2024 Admission onwards

Time : 2 hours

Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. Sketch the region of integration, $-1 \leq x \leq 2, x - 1 \leq y \leq x^2$.
2. State Fubini's first Theorem.
3. Solve the ODE by integration, $y' = y$.
4. Give a basis for the ODE $y'' + y = 0$.
5. Write the characteristic equation of $3y' - 2y = 0$.
6. Write the general formula for Trapezoidal Rule.
7. Write the general formula for Simpson's $\frac{1}{3}$ -rule.
8. Write the second order Range Kutta formula.

Section B

Answer any 4 questions. Each carry 6 marks.

9. Solve the initial value problem $y' = 3y, y(0) = 5.7$.
10. Verify that $y = ce^{-4x} + 0.35$ is a solution of the ODE $y' + 4y = 1.4$ and, therefore, find the particular solution given the initial condition $y(0) = 2$.
11. Solve $y'' + 25y = 0$.
12. Using bisection method find a real root of equation $f(x) = x^3 - 2x - 5 = 0$ upto two iterations.
13. Using Runge Kutta second order formula, find $y(0.4)$, given $y' = 1 + y^2, y(0) = 0$ and $h = 0.2$.
14. Evaluate $I = \int_0^1 \sqrt{1-x^2} dx$ using Simpson's rule, given $h = 0.5$

Section C

Answer any 2 questions. Each carry 14 marks.

15. Find the volume of region in the first octant bounded by the coordinate planes and planes $x + z = 1$ and $y + 2z = 2$
16. (a) Replace the given polar equation by equivalent Cartesian equation. $r^2 = 4r \sin \theta$.
- (b) Replace the given polar equation by equivalent Cartesian equation. $r^2 = \cot \theta \csc \theta$.
- (c) Replace the Cartesian equation with equivalent polar equations. $x^2 + xy + y^2 = 1$.
- (d) Replace the Cartesian equation with equivalent polar equations. $y^2 = 4x$.
17. (a) Find $\int_0^2 \int_0^1 (4 - x - y) dy dx$.
- (b) Find $\int_1^2 \int_0^4 2xy dy dx$.