

**Mid-Term Examination (19-01-2022)**  
**Class: M.E. (chemical)-Env. Engg. 1<sup>st</sup> Semester**

**Subject: Mathematical Methods in Chemical Engineering**

**Max. Marks: 25**

**Time allowed: 1hr**

**Note:** Attempt all questions

(1) Use Runge-Kutta method of fourth order. Solve

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2} \text{ with } y(0) = 1 \text{ at } x = 0.2 \quad (5)$$

(2) Solve the equation  $y'' = x + y$  with the boundary conditions  $y(0) = y(1) = 0$  (5)

(3) Evaluate  $\int_0^{\infty} x^6 e^{-2x} dx$  (5)

(4) Solve the Poisson equation  $u_{xx} + u_{yy} = -81xy$ ,  $0 < x < 1$ ,  $0 < y < 1$  given that  $u(0, y) = 0$ ,

$$u(x, 0) = 0, \quad u(1, y) = 100, \quad u(x, 1) = 100 \text{ and } h = \frac{1}{3}. \quad (10)$$