



# Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2022

Course Code: MAT101; Course Title: Mathematics-I

Sections & Teachers: All

Time: 2:00 Hrs

Marks: 40

## Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |                 |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|
| 1. | <p>a) <math>u = (x^2 + y^2 + z^2)^{-\frac{1}{2}}</math>, Is it symmetric? Using the rules of partial differentiation, <b>show</b> that <math>\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0</math>.</p> <p>b) <math>u = \tan^{-1}\left(\frac{x^3 - y^3}{x - y}\right)</math>, Is it a Homogeneous function? Using Euler's theorem <b>show</b> that <math>x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u</math></p> | [Marks- 10] | CO-2<br>Level-1 |
| 2. | <p>Solve the following integrals by using the appropriate method.</p> <p>a) <math>\int \frac{dx}{(1+x^2)(9-(\tan^{-1} x)^2)}</math></p> <p>b) <math>\int x^2 \sin x dx</math></p> <p>c) <math>\int \frac{(x+5)dx}{(x^2+3)\sqrt{x^2+6}}</math></p> <p>d) <math>\int_0^2 \frac{dx}{(x+2)\sqrt{1+x}}</math></p> <p>e) <math>\int_0^1 \frac{x^5}{16-x^{12}} dx</math></p> <p>f) <math>\int_0^3 \frac{x^2-1}{(x+1)^2(x-2)} dx</math></p>                                                                            | [Marks-20]  | CO-3<br>Level-3 |
| 3. | <p>Using the proper method, <b>solve</b> the following multiple integrals.</p> <p>a) <math>\int_0^2 \int_1^2 (2x - 5y^2) dx dy</math></p> <p>b) <math>\int_1^3 \int_{-1}^2 \int_0^1 6xy^3 z^2 dz dx dy</math></p>                                                                                                                                                                                                                                                                                              | [Marks-10]  | CO-3<br>Level-3 |