



# Daffodil International University

Department of Computer Science & Engineering

Faculty of Science & Information Technology

Final Examination, Semester: Summer'2019

Course Title: Mathematics-III (Ordinary and Partial Differential Equation)

Course Code: MAT131

Section: All

Level/Term: L1T3

Course Teachers: All

Time: 2.0 hours

Full Marks: 40

Answer any five (5) from the following six (6) questions

(5 \* 8) = 40

1. (a) The population of bacteria in a culture grows at a rate that is proportional to the number present. Initially, there are 600 bacteria, and after 3 hr there are 10,000 bacteria. [6]
  - i) What is the number of bacteria after t hr?
  - ii) What is the number of bacteria after 5 hr?
  - iii) When will the number of bacteria reach 24,000?
- (b) Solve the Homogeneous differential (Cauchy Euler) equation: [2]
$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - 4y = 0$$
2. Check whether the differential equations are exact or not? Hence solve: [3+5]
  - i)  $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$
  - ii)  $(y^4 + 2y)dx + (xy^3 + 2y^3 - 4x)dy = 0$
3. Solve: [2+3+3]
  - i)  $D^2 y - 7Dy + 12y = 0$
  - ii)  $(D^4 + D^2)y = 0$
  - iii)  $(D^3 + 6D^2 + 11D + 6)y = 0$
4. Determine the general solution of the higher order linear differential equations: [4+4]
  - i)  $(D^4 + D^2)y = e^{3x} + \sin 2x$
  - ii)  $(D^2 - 5D + 6)y = e^{4x+5}$
5. (a) Solve the first order linear differential equation :  $x \left( \frac{dy}{dx} \right) + 2y = x^4$  [4]
- (b) Solve the Bernoulli's equation:  $\frac{dy}{dx} + \frac{2}{x}y = \frac{y^3}{x^3}$  [4]
6. Solve the first order linear partial differential equation: [3+5]
  - i)  $(y^2 z)p + (zx^2)q = xy^2$
  - ii)  $(z^2 - 2yz - y^2)p + (xy + zx)q = (xy - zx)$