Bangladesh Army University of Science and Technology

Department of Computer Science and Engineering

Referred/Improvement/Backlog Examination, Fall 2018 **Level-1** **Term-II**

Course Code: MATH 1243 **Course Title: Math-II(Ordinary and Partial Differential Equations and Co-ordinate geometry)**

Time: 03 (Three) hours **Full Marks: 210**

N.B.: (i) Answer any three questions from each PART (ii) Use separate answer script for each PART
(iii) Marks allotted are indicated in the margin (iv) Symbols have their usual meanings

PART A

1. a) Define differential equation with example. What do you mean by order and degree of a differential equation? 10

   b) Find the solution of the homogeneous differential equation $(x^2 + y^2)\frac{dy}{dx} = xy$. 10

   c) Solve the equation $\frac{dy}{dx} + \frac{y}{x} = x^2$. 15

2. a) Solve the differential equation $\frac{y^2 z}{x}p + xzq = y^2$ with the help of Lagrange's method, where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$. 15

   b) Find the solution the wave equation $\frac{\delta u}{\delta x} = 2\frac{\delta u}{\delta t} + u$. 20

3. a) Solve the equation $\frac{\partial^2 v}{\partial x^2} = \frac{\partial v}{\partial t}$ by separation of variables. 20

   b) Find the solution of the differential equation $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 0$. 15

4. a) Determine the solution of the differential equation $D^3y - 9D^2y + 23Dy - 15y = 0$. 10

   b) Solve the differential equation $(D^2 - 2D + 5)y = e^{2x}\sin x$. 10

   c) Find the solution of $(D^2 - 3D + 2)y = x^2$. 15

PART B

5. a) Find the condition that the general equation of the 2nd degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ may represent a pair of straight lines. Find point of intersection. 25

   b) By transforming to parallel axes through a properly chosen point (h, k). Prove that the equation $12x^2 - 10xy + 2y^2 + 11x - 5y + 2 = 0$ may be reduced to one containing only the term of the 2nd degree. 10

6. a) Find the value of c if the following equations may represent pairs of straight lines 10

$$12x^2 - 10xy + 2y^2 + 11x - 5y + c = 0.$$

   b) Reduce the equation in standard form $x^2 + 12xy - 4y^2 - 6x + 4y + 9 = 0$. Hence identify it. 25

7. a) Prove that the equation $3y^2 - 8xy - 3x^2 - 29x + 3y - 18 = 0$ represent a pair of straight lines. Find angle between this two lines. 20

b) Is the equation $x^2 + 6xy + 9y^2 + 4x + 12y - 5 = 0$ represent a pair of parallel straight lines? If it represent a pair of parallel straight lines then find point of intersection. 15

8. a) Find the equation of the circle which passes through the point $(3, 5)$ and $(5, -3)$ and has its center on the line $2x + y = 27$. 15

b) Find the equations of the planes passing through $(2,3,1)$ and $(4, -5, 3)$ and parallel to the x-axis, y-axis and z-axis respectively. 20