International Islamic University Chittagong

Department of Electrical and Electronic Engineering

B. Sc. Engineering in EEE

Midterm Examination, Autumn 2023

Course Code: **MATH-1207** Course Title: **Mathematics-II**

Time: 1 hour 30 minutes Full Marks: 30

(i) Answer all the questions. The figures in the right-hand margin indicate full marks.

(ii) Course Outcomes (COs) and Bloom's Levels are mentioned in additional Columns.

Course Outcomes (COs), Program Outcomes (POs) and Bloom's Levels (BL) of the Questions			
CO	**CO Statements**	**PO**	**BL**
CO1	Reflect a basic understanding of change of axes, system of circles, Pair of straight lines and their properties, rectangular co-ordinate System, coplanar lines, equation of planes and sphere, basic idea of finding shortest distance.	**PO1**	**C3, C5**
CO2	Developing ability to apply and identify the ordinary differential equations, linear, nonlinear, solution of non-homogeneous differential equations, auxiliary Equations, complementary function ,particular integral and solve the complete solution of a differential equation with constant coefficients.	**PO1**	**C3**
CO3	Analyze and demonstrate the basic idea of partial differential equation, Bessel's & Legendre's polynomials and their properties, .Recognize and solve the complete solution of a differential equation by the method of variation of parameters, undetermined coefficients & short method Applying the ordinary and partial differential equations to solve the real world problems such asElectrical Circuits problems, Growth and Decay Problems, Temperature Problems, Falling Body Problems and Dilution Problems	**PO1**	**C3**

Bloom's Levels (BL) of the Questions						
Letter Symbols	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

1) a) i). Evaluate the transformed equation by transferring to parallel axes through a properly chosen point (h, k) so that the equation $2x^2 + y^2 - xy - 5x - 4y + 11 = 0$ can be reduced to one in which containing the terms of second degree. CO1 C5 4

ii). Identify the conic $14x^2 - 4xy + 11y^2 - 44x - 58y + 71 = 0$. CO1 C3 2

1) b) Show that the angle between the straight lines represented by the equation $ax^2 + 2hxy + by^2 = 0$ is $\theta = tan^{-1}(\frac{2\sqrt{h^2-ab}}{a+b})$ CO1 C3 4

2) a) What is the condition of orthogonally of two circles? Does the following two circles $x^2 + y^2 - 3x + 8y - 2 = 0$ and $x^2 + y^2 + 4x - 5y - 24 = 0$ cut orthogonally? CO1 C3 1+4

2)	b)	If a,b,c are the direction ratios what are the relation for direction cosines? Find the direction cosines of the line joining the points (4,3,-5) and (-2,1,-8).	CO1	C3	2+3
3)	a)	If P, Q, A & B represent the points (1,2,5) (-2, 1,3), (4,4,2) & (2,1,-4) respectively, find projection of PQ on AB.	CO1	C3	5
3)	b)	Write down the equation of a plane in intercept form. If P be the point (2,6,3) , find the equation to the plane through P at right angle to OP being the origin.	CO1	C3	5

OR

3)	a)	Define shortest distance. Obtain the shortest distance between the two straight lines $\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$ and $\frac{x+3}{-3}=\frac{y+7}{2}=\frac{z-6}{4}$	CO1	C3	5
3)	b)	(i) Determine the condition for the lines $x-az-b=0=y-cz-d$ and $x-a_1z-b_1=0=y-c_1z-d_1$ to be perpendicular. (ii)Evaluate the equation of the two spheres which passes through the circle$x^2+y^2+z^2=1,\ 2x+4y+5z=6$ and touches the $z=0$ plane.	CO1	C3	5