International Islamic University Chittagong

Department of Electrical and Electronic Engineering

B. Sc. Engineering in EEE

Final Exam, Autumn 2022

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

Time: 2 hours 30 minutes Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

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

Course Outcomes (Cos) of the Questions	
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.
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.
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

Bloom's Levels of the Questions						
Letter Symbols	**R**	**U**	**Ap**	**An**	**E**	**C**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Part A

[Answer the questions from the followings]

1.	a)	Solve the ODE (i). $(2xy + x^2)\,dy = (3y^2 + 2xy)dx$, (ii). $y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$.	CO2	App	3+3
1.	b)	Solve $\sin x \frac{dy}{dx} + 2y = \tan^3\left(\frac{x}{3}\right)$.	CO2	App	4
2.	a)	Construct the differential equation into Clairaut's form and solve it : $p = \log(px - y)$	CO2	App	4
2.	b)	Solve the following differential equation: $(i)\ (D^2 + 3D + 2)y = cos2x\ \ (ii)(D^2 + 4)y = x^2$	CO2	App,App	3+3

Or,

2.	a)	Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{2x}\cos x$.	**CO2**	**App**	3
2.	b)	Solve (i). $\frac{d^2y}{dx^2} + 4y = \cos x$, (ii). $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{2x}\sin 2x$.	**CO2**	**App**	3.5+3.5

Part B

[Answer the questions from the followings]

3.	a)	Find the solution of Bessel's Equation $x^2\frac{d^2y}{dx^2}\ x\frac{dy}{dx}+(x^2-n^2)y=0.$	CO2	App	5
3.	b)	Find the solution of Legendre's equation $(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+m(n+1)y=0, when\ m=n.$	CO2	App	5
4.	a)	Solve by Charpits' method $px+qy=pq.$	CO3	App	3
4.	b)	(i) Solve the partial differential equation with constant coefficients: $(D^3-3D^2D'+4D'^3)z=e^{x+2y}$ (ii) Solve the partial differential equations by using Lagrange's method : $ptanx+qtany=$ tanz	CO3	App,App	3.5+3.5
5.	a)	According to Newton's law of cooling, the rate at which a substance cools in moving air is proportional to the difference between the temperature of the substance and that of the air .If the temperature of the air is 300K and the substance cools 370 K to 340 K in 15 minutes, determine when the temperature will be 310K.	CO3	An	5
5.	b)	A $12volt$ batteries is connected in series with a 6Ω resistor and an inductor of $\frac{1}{4}$ H. If the switch k is closed at time t=0, obtain a differential equation for the current and determine the current at time t	CO3	An	5

Or,

5.	a)	A generator having emf $100v$ is connected in series with a 10Ω resistor and an inductor of 5 H. If the switch k is closed at time t=0, obtain a differential equation for the current and determine the current at time t.	CO3	An	5
5.	b)	The body of a murder victim was discovered at 11:00 p.m. The doctor took the temperature of the body at 11:30p.m.,which was 94.6^0F.He again took the temperature after one hour when showed 93.4^0F and noticed that the temperature of room was 70^0F.Estimate the time of death.(Normal temperature of human body =98.6^0F)	CO3	An	5