International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination Spring -2019
Course Code: MATH-2303

Time: 2 hours 30 minutes

Program: B.Sc. Engg. (EEE)
Course Title: Differential Equations and Partial Differential Equations
Full Marks: 50

Part A

[Answer any ***two*** questions from the followings; figures in the right margin indicate full marks.]

1. Solve the following differential equation by using series solution method **10**

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+\left(x^2-n^2\right)y=0$$

2. Apply the method of variation of parameters solve the following differential equations (any two): **10**

(i) $\dfrac{d^2y}{dx^2}-3\dfrac{dy}{dx}+2y=\dfrac{e^x}{1+e^x}$

(ii) $\dfrac{d^2y}{dx^2}+y=\tan x$

(iii) $y''-6y'+9y=e^{3x}/x^2$

3(a). Without determining the coefficients, write only the trial solution for the method of undetermined coefficients. **02**

(i) $y''-4y=x^2e^x-x\cos 2x$

(ii) $y''+9y'=xe^{-x}\sin\pi x$

3(b). Solve the following differential equations using the method of undetermined coefficients: **08**

(i) $\left(D^2-1\right)y=e^x\sin 2x$

(ii) $\left(D^2+2D+2\right)y=x^2+\sin x$

Part B

[Answer any ***three*** questions from the followings; figures in the right margin indicate full marks.]

4(a). Formulate a partial differential equation by eliminating the constants a, b and c from the relation $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}+\dfrac{z^2}{c^2}=1$. Also write down the order and degree of the obtained differential equation. **05**

4(b). Find the differential equations by eliminating the arbitrary function from **05**

$$\varphi\left(x+y+z,\ x^2+y^2-z^2\right)=0.$$

5(a). Solve the following linear partial differential equations (any two): **06**

(i) $y^2p-xyq=x(z-2y)$

(ii) $x^2(y-z)p+y^2(z-x)q=z^2(x-y)$

(iii) $(z^2-2yz-y^2)p+(xy+xz)\,q=xy-xz$

5(b). Obtain the integral surface of the linear partial differential equation **04**

$$x(y^2+z)p-y(x^2+z)q=(x^2-y^2)z,$$

which contains the line $x+y=0,\ z=1$.

6. Write down the Charpit's auxiliary equation.Apply the Charpit's method to find the complete integral of the following equations (any two): **10**

(i) $pxy+pq+qy-yz=0$

(ii) $p=(qy+z)^2$

(iii) $px+qy=pq$

7(a). Find the complementary function of the following (any one): **02**

(i) $4(r-s)+t=0$

(ii) $\dfrac{\partial^4 z}{\partial x^4}-\dfrac{\partial^4 z}{\partial y^4}=0$

7(b). Solve the following partial differential equations (any two): **08**

(i) $(D^2-6DD'+9D'^2)\,z=12x^2+36xy$

(ii) $(D^3-4D^2D'+4DD'^2)\,z=4\sin(2x+y)$

(iii) $(D^2-2DD'+D'^2)\,z=e^{x+2y}$