International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination Autumn-2018 | Program: B.Sc. Engg. (EEE)
Course Code: MATH 1107 | Course Title: Mathematics-I
Time: 2 hours 30 minutes | Full Marks: 50

Part A

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

1(a). If $u = log\frac{x^2+y^2}{x+y}$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 1$ **03**

1(b). State Euler's theorem and Verify Euler's theorem for $u = \frac{x^{1/4}+y^{1/4}}{x^{1/5}+y^{1/5}}$ **04**

1(c). Show that the minimum value of $\frac{x}{logx}$ $is\ e$ **03**

2(a). Evaluate any one of the following: **05**

(i) $\int \frac{dx}{x^2(a^2+x^2)}$ (ii) $\int \sin^{-1}\sqrt{\frac{x}{a+x}}$

2(b). Evaluate any one of the following: **05**

(i) $\int \frac{x^3+1}{x(x^2+1)^2}\,dx$ (ii) $\int \sin^n x\,dx$

3(a). If z is a homogenious function of n^{th} order of x, y variable, then prove that the Euler's equation $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = nz$ **04**

3(b). Evaluate $\int \frac{\sqrt{a+x}}{a-x}\,dx$ **03**

3(c) Evaluate $\int \tan^n x\,dx$ **03**

Part B

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

4(a). Prove that $\int_a^b f(x)\,dx = -\int_b^a f(x)dx$ **02**

4(b). Evaluate any one: **03**

(i) $\int_0^\infty e^{-y\frac{1}{x}}\,dy = \Gamma(n+1)$ (ii) $\int_0^{\frac{\pi}{2}} \sin^2\theta\cos^3\theta\,d\theta$

4(c). Prove that $\int_a^b e^x dx$ by using interation limit sum method **05**

5(a). Evaluate any one : **03**

(i) $\int_0^1\int_0^1 e^{\frac{y}{x}}\,dxdy$ (ii) $\int_0^1\int_0^{\sqrt{1+x^2}} \frac{dydx}{1+x^2+y^2}$

5(b). Evaluate any one: **04**

(i) $\iiint (x+y+z)dxdydz$ over the region $0 \le x \le 1, 1 \le y \le 2, 2 \le z \le 3$

(ii) $\iiint (x-2y+z)dxdydz$ over the region $0 \le x \le 1, 0 \le y \le x^2, 0 \le z \le x+y$

5(c). Determine the area between the parabola $y^2 = 4ax$ and $x^2 = 4ay$ **03**

6(a). Find the volume of the Cardioid $r = a(1 + \cos\theta)$ **05**

6(b). Find the perimeter of the circle $x^2+y^2=36$ **05**

7(a). Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ **04**

7(b). Applying the Jacobian method and using the transformation $x + y = u, y = uv$, then show that $\iint\{xy(1-x-y)^{\frac{1}{2}}dxdy = \frac{2\pi}{105}$ **06**