International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination Spring-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). Prove that the Euler's theorem for the homogenous function of degree n in x and y. **04**

1(b). Show that the minimum value of $\phi(x,y,z) = x^2 + y^2 + z^2$, when $ax + by + cz = p$ is $\frac{p^2}{a^2+b^2+c^2}$ **04**

1(c). If $z^2 = x^2 + y^2 + 1$, then prove that $\frac{\delta^2}{\delta x \delta y} = \frac{\delta^2}{\delta y \delta x}$ **02**

2. Evaluate any four of the following: (i)$\int \frac{dx}{1-sinx}$ (ii)$\int \frac{x}{(x^2+1)(x-1)} dx$ **10**

(iii) $\int \frac{dx}{1+\tan x}$ (iv) $\int (\ln x)^2 dx$ (v)$\int \sin^3 x dx$ (vi)$\int \frac{dx}{5+4\sin 2x}$

3(a). If $u = \frac{1}{\sqrt{x^2+y^2+z^2}}$, then show that $\frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 u}{\delta y^2} + \frac{\delta^2 u}{\delta z^2} = 0$ **05**

3(b). Investigate the maximum and minimum value of $f(x) = (x-5)^5(x-6)^4$ by using first time derivative. **03**

3(c). Obtain the integral value of $\int \sqrt{a^2 - x^2}\, dx$ **02**

Part B

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

4(a). Define Gamma and Beta function. Show that ß(m,n)=ß(n,m) **03**

4(b). (i)Show that $\int_a^b f(x)dx = \int_a^b f(z)dz$ **04**

(ii) Show that $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx, when a\langle c\langle b$

4(c). Establish a reduction formulae for $\int \sin^n x dx$ and hence find the value of I_4 **03**

5(a). Evaluate $\iint \frac{e^{y-x}}{e^{y+x}} dxdy$ taken over the triangle with vertices (0,0), (0,1), (1,0) **05**

5(b). Prove that $\int_1^3 \int_{x^2}^{x^2+1} xy\, dxdy = 22$ **03**

5(c). Evaluate any one: **02**

(i) $\int_0^2 \int_0^{2-x} \int_2^{2+x+y} dzdydx$ (ii) $\int_0^1 \int_0^x \int_0^{x-y} xdzdydx$

6(a). Find the volume bounded by $z = 2, z = 2 + x + y, x = 0, y = 0, x + y = 2$ **03**

6(b). Find the volume bounded by the surface $4z = 16 - 4x^2 - y^2$ & $z = 0$ **04**

6(c). By using line integral, Show that the length of the segment $y = x, 0 \le x \le 1$ **03**

of $\int_c (x - y^2) = \frac{1}{6}$

7(a). Evaluate **03**

$$\lim_{n\to\infty}\left(\frac{1}{n} + \frac{n^2}{(n+1)^3} + \frac{n^2}{(n+2)^3} \ldots\ldots\ldots\ldots + \frac{1}{8n}\right)$$

7(b). Evaluate $\int_a^b x dx$ as the limit of a sum. **03**

7(c). For the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, show that the length of the entire curve is 6a **04**