International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Examination Spring-2018	Program: B.Sc. Engg. (EEE)
Course Code: Math-1101	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)$\int \frac{x}{(x^2+1)(x-1)} dx$ (iii) $\int \frac{dx}{1+\tan x}$ (iv) $\int (\ln x)^2 dx$ (v)$\int \sin^3 x dx$ (vi)$\int \frac{dx}{5+4\sin 2x}$	10
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 $\int_a^b f(x)dx = \int_a^b f(z)dz$ (ii) Show that $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx, when a\langle c\langle b$	04
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: (i) $\int_0^2 \int_0^{2-x} \int_2^{2+x+y} dzdydx$ (ii) $\int_0^1 \int_0^x \int_0^{x-y} xdzdydx$	02
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 $y = x, 0 \leq x \leq 1$ of $\int_c (x - y^2) = \frac{1}{6}$	03
7(a).	Evaluate $\lim_{n\to\infty}\left(\frac{1}{n} + \frac{n^2}{(n+1)^3} + \frac{n^2}{(n+2)^3} \cdots\cdots\cdots + \frac{1}{8n}\right)$	03
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