ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Mathematics and Statistics)

WARNING

1. **PLAGIARISM OR HIRING OF GHOST WRITER(S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM AWARD OF DEGREE/CERTIFICATE, IF FOUND AT ANY STAGE.**
2. **SUBMITTING ASSIGNMENTS BORROWED OR STOLEN FROM OTHER(S) AS ONE'S OWN WILL BE PENALIZED AS DEFINED IN "AIOU PLAGIARISM POLICY".**

Course: Mathematics-I (1309)

Level: F.A/F.Sc **Semester: Spring, 2013**
Total Marks: 100 **Pass Marks: 40**

ASSIGNMENT No. 1
(Unit: 1–5)

Note: Attempt all questions and each question carries equal marks.

Q.1 (a) Find the approximate increase in the area of a circular disc if its diameter is increased from 44 cm to 44.4 cm.

(b) Evaluate the following indefinite integrals.

(i) $\int \frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}} d\theta \quad (\theta > 0)$ (ii) $\int \frac{e^{2x}+e^x}{e^x} dx$

(c) Evaluate $\int \frac{dx}{\sqrt{7-6x-x^2}}$

Q.2 (a) Evaluate the following definite integrals.

(i) $\int_0^{\frac{\pi}{2}} \frac{\cos\theta+\sin\theta}{\cos 2\theta+1} d\theta$ (ii) $\int_0^{\frac{\pi}{4}} \cos^4 t dt$

(b) Find the area bounded by the curve $y = x^3 - 4x$ and the x-axis.

(c) Solve the following differential equation:

$xdy + y(x-1)dx = 0$

Q.3 (a) Show that

$$\int e^{ax} \sin bx \, dx = \frac{1}{\sqrt{a^2+b^2}} e^{ax} \sin(bx - \tan^{-1}\frac{b}{a}) + c.$$

(b) Evaluate (i) $\int \sqrt{4-5x^2}\, dx$ (ii) $\int x^2 e^{ax} dx$

(c) Evaluate the integral:

$$\int \frac{x+4}{x^3-3x^2+4} dx$$

Q.4 (a) Find the interior angles of the triangle whose vertices are A(2,-5), B(-4,-3), C(-1,5)

(b) Find the area of the region bounded by: $10x^2 - xy - 21y^2 = 0$ and $x + y + 1 = 0$

(c) Evaluate $\int \frac{2x}{x^2 - a^2} dx, \quad (x > a)$

Q.5 (a) Find the point which is equidistant from the points A (5, 3), B (-2, 2) and C (4, 2). What is the radius of the circumcircle of the ΔABC?

(b) Find an equation of the perpendicular bisector of the segment joining the points A (3, 5), B (9, 8).

(c) Find the general solution of the equation: $\frac{dy}{dx} - x = xy^2$

Also find the particular solution if $y = 1$ when $x = 0$

ASSIGNMENT No. 2

(Unit: 5–9)

Note: Attempt all questions and each question carries equal marks.

Q.1 (a) Prove that the midpoint of the hypotenuse of a right triangle is the circumcentre of the triangle.

(b) A parabolic arch has a 100 m base and height 25 m. Find the height of the arch at the point 30 m from the centre of the base.

(c) Prove that the latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $\frac{2b^2}{a}$

Q.2 (a) Maximize the function defined as; $f(x, y) = 2x + 3y$ subject to the constraints:

$2x + y \leq 8; \quad x + 2y \leq 14; \quad x \geq 0, \quad y \geq 0$

(b) Show that the circles

$x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y - 9 = 0$ touch externally

(c) Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$

Q.3 (a) For any point on a hyperbola the difference of its distances from the points (2,2) and (10,2) is 6. Find an equation of the hyperbola.

(b) Find equations of the tangents to the conic $9x^2 - 4y^2 = 36$ parallel to $5x - 2y + 7 = 0$

Q.4 (a) Prove that perpendicular bisectors of the sides of a triangle are concurrent.

(b) If $a + b + c = 0$, then prove that $a \times b = b \times c = c \times a$

(c) A force of magnitude 6 units acting parallel to $2i - 2j + k$ displaces, the point of application from (1, 2, 3) to (5, 3, 7). Find the work done.

Q.5 (a) Show that

(i) $10xy + 8x - 15y - 12 = 0$ and

(ii) $6x^2 + xy - y^2 - 21x - 8y + 9 = 0$

each represent a pair of straight lines and find an equation of each line.

(b) Find the vector from the point A to the origin where $\overrightarrow{AB} = 4i - 2j$ and B is the point (-2,5).

(c) Find α, so that $|\alpha i + (\alpha + 1)j + 2k| = 3$