ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Mathematics & 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: Mathematic-1 (1309) **Semester: Spring, 2014**
Level: F.A/F.Sc **Total Marks: 100**
Pass Marks: 40

ASSIGNMENT No. 1
(Units 1–5)

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

Q.1 a) Evaluate the integral:

$$\int \frac{2x^2-2}{x^4+x^2+1}dx$$

b) Show that

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

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

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

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

Q.3 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.4 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.5 a) Find the general solution of the equation: $\frac{dy}{dx} - x = xy^2$

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

b) 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?

ASSIGNMENT No. 2

(Units 6–9)

Total Marks: 100 **Pass Marks: 40**

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

Q.1 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) Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and half as long.

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

b) 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.

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

Q.3 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.4 a) Discuss the conic $5x^2 - \sqrt{72}xy + 11y^2 - 16 = 0$ and find its elements.

b) 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.

c) Prove that perpendicular bisectors of the sides of a triangle are concurrent.

Q.5 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 $x^2 + y^2 = 26$