

**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: Mathematics-III (1309)**

**Level: F.A/F.Sc**

**Semester: Autumn, 2013**

**Total Marks: 100**

**Pass Marks: 40**

**ASSIGNMENT No. 1**

**(Units 1–5)**

*Note: Attempt all questions, each question carry equal marks*

- Q.1 a) Find area between the  $x$ -axis and the curve  $y = \cos \frac{x}{2}$  from  $x = -\pi$  to  $\pi$ .
- b) In a culture, bacteria increases at the rate proportional to the bacteria present. If the bacteria are 200 initially and are tripled in 3 hours, find the bacteria present 6 hours later.
- c) A ball is thrown vertically upward with a velocity of 1000 cm/sec. Neglecting air resistance, find.
- i) Velocity of ball at any time  $t$ .
  - ii) Distance traveled in any time  $t$ .
  - iii) Maximum height attained by ball.
- Q.2 a) Maximize  $z = 3x + y$ ; subject to the constraints:  
 $3x + 5y \geq 15$ ;  $x + 6y \geq 9$ ;  $x \geq 0$
- b) Suppose the axes of a  $xy$ -coordinate system are rotated through angle of  $\theta = 45^\circ$  to obtain a  $x'y'$ -coordinate system. Find the equation of the curve  $xy = 1$ . Also identify and sketch the curve.
- Q.3 a) Find approximate increase in the volume of a cube if the length of its each edge is changes from 4 to 4.05.

- b) Show that  $\int \frac{dx}{\sqrt{x^2 - a^2}} = \ln(x + \sqrt{x^2 - a^2}) + c$ .
- c) Evaluate the following integral  $\int \frac{2x^2 - 2}{x^4 + x^2 + 1} dx$
- Q.4 a) Find the area of the triangular region bounded by  $7x - y - 10 = 0$ ,  $10x + y - 41 = 0$  and  $x + 2y + 3 = 0$ .
- (b) Evaluate  $\int \frac{x^2 + 2x + 3}{(x+1)(x^2 + 2)(x^2 + 3x + 5)}$  by partial fraction.
- c) Maximize the function  $f(x, y) = 4x + 6y$  subject to constraints:  $2x + y \leq 8$ ,  $x + 2y \leq 14$ ,  $x \geq 0$ ,  $y \geq 0$ .
- Q.5 a) The points (4, -2), (-2, 4) and (5, 5) are the vertices of a triangle. Find the in-centre of the triangle.
- b) A house was purchased for Rs. 1 million in 1980. It worth Rs. 4 million in 1996. Assuming that the value increased by the same amount each year, find an equation that gives the value of the house after  $t$  years of purchase. What was its value in 1984?

## ASSIGNMENT No. 2

### (Units 6–9)

*Note: Attempt all questions, each question carry equal marks*

- Q.1 a) The moon orbits in an elliptic path with earth at one focus. The major and minor axes of the orbit are 768,806 km and 767,746 km respectively. Find the greatest and least distances of the moon from earth.
- b) Discuss the conic  $5x^2 - \sqrt{72}xy + 11y^2 - 16 = 0$  and find its elements.
- Q.2 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) By rotation of axes, eliminate the  $xy$  - term in each of the following equations. Identify the conic and find its elements  $4x^2 - 4xy + 7y^2 - 8x + 12y - 10 = 0$ .
- c) 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.3 a) Find an equation of the chord of contact of the tangents drawn from  $(4, 5)$  to the circle  
 $2x^2 + 2y^2 - 8x + 12y + 21 = 0$ .
- b) Prove that the perpendicular dropped from a point of a circle on a diameter is a mean proportional between the segments into which it divides the diameter.
- Q.4 a) A force of magnitude 10 units acting, parallel to the vector  $4\mathbf{i} + 3\mathbf{j} + 5\mathbf{k}$ , displaces the point of application from  $(2, 3, 4)$  to  $(6, 4, 8)$ . Find the work done by that force.
- b) Prove that perpendicular bisectors of the sides of a triangle are concurrent.
- c) A force of magnitude 6 units acting parallel to  $2\mathbf{i} - 2\mathbf{j} + \mathbf{k}$  displaces, the point of application from  $(1, 2, 3)$  to  $(5, 3, 7)$ . Find the work done.
- Q.5 a) Find an equation of the parabola formed by the cables of a suspension bridge whose span is  $a$  meters and the vertical height of the supporting towers is  $b$  meters.
- b) Show that tangent at any point  $P$  of a parabola makes equal angles with the line  $PF$  and the line through  $P$  parallel to the axis of the parabola,  $F$  being focus.