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

Course: Mathematics for Computing (3403)

Level: B.S Computer Science   **Semester: Spring, 2014**

Total Marks: 100   **Pass Marks: 50**

ASSIGNMENT No. 1
(Units 1-3)

Note: Attempt all questions.

Q.1   a)   Draw the graph of the following conic and label its Foci, Vertices, Centre and Axes

$$\frac{(x-2)^2}{9} + \frac{(y+3)^2}{4} = 1$$

     b)   Consider the conic whose equation is $x^2 + xy + 2y^2 - x + 3y + 1 = 0$;

        i.   Use the discriminant to identify the conic.

        ii.   Graph the equation.

Q.2   a)   Determine whether the sequence: $\left\{(1-\frac{2}{n})^2\right\}_{n=1}^{\infty}$ converges or diverges if converges then find the limit.

     b)   Apply ratio test to check the convergence or divergence of the series: $\sum_{k=1}^{\infty} \frac{4^k}{k^2}$ converges or diverges.

Q.3   a)   A ball is dropped from a height of 10m. Each time the ball strikes the ground it bounces vertically to a height that is $\frac{3}{4}$ of the preceding height. Find the total distance the ball will travel if it is allowed to bounce indefinitely.

     b)   The Fibonacci sequence is defined as follows:

        $a_{n+2} = a_n + a_{n+1}$ *for* $n \geq 1$, *where* $a_1 = a_2 = 1$.

        i.   List the first eight terms of the sequence.

        ii.   Find $Lim(a_n + 1/a_n)$ assuming that it exists.

Q.4 a) Evaluate $\int_0^\infty x^{-p}\,dx$.

b) Determine all values of p for which the integral is improper $\int_1^2 \frac{1}{x-p}\,dx$.

Q.5 a) Verify that in $\underset{k\to+\infty}{Lim}\ \dfrac{x(2+Sinx)}{x+1}$ L'Hopital's rule is of no help in finding the limit. Then find the limit by some other method.

b) Find the Limit: $lim_{x\to 0}\dfrac{e^x-1}{sin\,x}$

ASSIGNMENT No. 2
(Units 4-7)

Total Marks: 100   **Pass Marks: 50**

Q.1 a) Sketch the curve: $r = -3 - 4Sin\theta$.

b) Find the arc length of the curve: $r = Sin^2\left(\frac{\theta}{2}\right)$ $from\ \theta = 0\ to\ \theta = \pi$.

Q.2 a) Find the slope of the tangent line to the polar curve: $r = 1 + Sin\theta\ at\ \theta = \frac{\pi}{4}$

b) Find the values of t at which the parametric curve:
$$x = 2Cost,\ \ y = 4Sint\ \ where\ 0 \le t \le 2\pi$$
   i) Has a vertical tangent line.
   ii) Has a horizontal tangent line.

Q.3 a) Find the area of the region outside the cardioid $r = 2 - 2Cos\theta$ and inside the circle $r = 4$.

b) Express the parametric equations: $x = 2 - t,\ y = -3 + 5t,\ z = t$ of line in vector form using bracket and i, j, k notation.

Q.4 a) For $f(x,y) = 3x^3y^2$ find $f_x(x,y),\ f_y(x,y)\ and\ f_{xy}(x,y)$.

b) Find the domain of $r(t) = \sqrt{3t+1}\,i + t^2\,j$ and also find the value of $r(1)$.

Q.5 a) Define the arc-length formulae in for parametric and polar curves and using these formulae find the arc-length of one parametric curve and one polar curve.

b) The temperature at a point (x, y) on a metal plate in xy-plane is T(x,y) = x^3+2y^2+x degree. Find the rate at which temperature changes with distance if we start at the point (1, 2) and move (i) to the right and parallel to x-axis and (ii) upward and parallel to the y-axis.

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