04861

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

December, 2011

CS-60 : FOUNDATION COURSE IN MATHEMATICS IN COMPUTING

Time : 3 hours *Maximum Marks : 75*

Note : *Question No. 1 is **compulsory**. Attempt **any three** more questions from questions **No. 2 to 6**. Use of calculator is permitted.*

1. (a) Simplify $\dfrac{\sqrt{3} - 1}{\sqrt{3} + 1}$. 15x3=45

   (b) Find the slope and the y - intercept of the line whose equation is $5x + 6y = 7$.

   (c) Does the equation $x^2 + y^2 - 12x + 6y + 45 = 0$ represent a circle ? If yes, find the co - ordinates of the centre.

   (d) Find the co - ordinates of the focus of the parabola $y^2 = -4x$.

   (e) For what value of k will the equation $9x^2 + kx + 1 = 0$ have real and equal roots ?

(f) Find the equation of the line that is parallel to $2x + 5y = 7$ and passes through the mid point of the line joining $(2, 7)$ and $(-4, 1)$.

(g) Find $\int_0^\pi (x - \cos x)\, dx$

(h) Find the co-ordinates of the point which divides internally the line joining $(1, -3)$ and $(-3, 9)$ in the ratio $1 : 3$.

(i) Find the points where the function has maximum and minimum values :
$$f(x) = 2x + \frac{3}{x}.$$

(j) Find the equation of the circle through the points $(4, 1)$ and $(6, 5)$ and having its centre on the line $4x + y = 16$.

(k) State Lagrange's mean value theorem.

(l) Find the area of the region bounded by the curve $y = 5x - x^2$, $x = 0$, and $x = 5$ and lying above the x - axis.

(m) Differentiate y w.r.t. x, where $y = x(x^2 + 1)$.

(n) Solve the following system of linear equations :
$2x + 3y = 8$
$3x + 4y = 11$

(o) Find the value of the determinant.
$$\begin{vmatrix} 1 & 2 & 2 \\ 2 & 3 & 4 \\ 3 & 5 & 6 \end{vmatrix}$$

2. (a) Find the equation of the ellipse whose foci are $(0, \pm 2)$ and length of the minor axis $2\sqrt{5}$.   **3+3+4**

   (b) Find the equation of a parabola whose focus is $(5, 0)$. Give the equation of directrix also.

   (c) Is the function $f(x) = \begin{cases} \dfrac{x^2 - 1}{x - 1} & \text{when } x \neq 1 \\ 2 & \text{when } x = 1 \end{cases}$

   continuous at $x = 1$? Explain your answer.

3. (a) If $x = a \cos t$, $y = a \sin t$, then find $\dfrac{dy}{dx}$.   **3+3+4**

   (b) If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = 0$,

   where I is a 2×2 unit matrix.

   (c) Evaluate $\displaystyle\int_0^4 e^{2x} \, dx$

4. (a) Find the eccentricity and focus of the ellipse   **3+3+4**

   $$\frac{x^2}{16} + \frac{y^2}{9} = 1$$

   (b) Find the real values of x and y which satisfy

   the equation $\dfrac{x + 3i}{2 + yi} = 1 - i$

(c) Can Rolle's Theorem be applied to the following function ?
$y = \sin^2 x$ on the interval $[0, \pi]$
Find 'C' such that $f'(C) = 0$, in case Rolle's theorem can be applied.

5. (a) If $\sin y = x \sin (a + y)$,   3+3+4

prove that $\dfrac{dy}{dx} = \dfrac{\sin^2(a + y)}{\sin a}$.

(b) Given the perimeter of a rectangle, show that its area is maximum when it is a square.

(c) Express $\dfrac{(8 - 3i)(6 - i)}{2 - 2i}$ in the form of $a + ib$ where a and b are real.

6. (a) Find the equation of a cone whose vertex is at the origin and its guiding curve is :   3+3+4

$$\frac{x^2}{4} + \frac{y^2}{9} + z^2 = 1, \quad x + y + z = 1.$$

(b) Find the centre and radii of the sphere
$x^2 + y^2 + z^2 - 2x - 4y - 6z + 5 = 0$.

(c) Find the coordinates of foci, the vertices, the length of the major axis and minor axis, and the eccentricity of the hyperbola.
$9x^2 - 4y^2 = 36$.