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**CS-60**

# BACHELOR OF COMPUTER APPLICATION
## (Pre-Revised)

02984

## Term-End Examination

## December, 2014

## CS-60 : FOUNDATION COURSE IN MATHEMATICS IN COMPUTING

*Time : 3 hours* *Maximum Marks : 75*

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

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**1.** (a) If $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and $B = \{3, 4, 5\}$, show that $(A \cup B)' = A' \cap B'$.

(b) Prove that the function $f : Q \to Q$ given by $f(x) = 2x - 3$ for all $x \in Q$ is a bijection.

(c) Determine whether the relation defined as $R = \{(x, y) : y \text{ is divisible by } x\}$ is reflexive, symmetric and transitive.

(d) Find $\frac{dy}{dx}$ if $y = \sec(\log x^n)$.

(e) Evaluate :

$$\int_0^{\pi/4} \sin 3x \sin 2x \, dx.$$

(f) Prove that the points (4, 3), (7, –1) and (9, 3) are the vertices of an isosceles triangle.

(g) Find the slope of the line joining the points (2, – 5) and (4, 1) and hence find the equation of the line.

(h) Find the equation of the circle, whose centre is the point (2, – 3) and radius is 5.

(i) Find the coordinates of the vertex and the focus of the parabola $2y^2 + 3y + 4x = 2$.

(j) Find the equation of the ellipse in the standard form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, if its foci are $(\pm 4, 0)$ and length of the latus rectum is $\frac{20}{3}$.

(k) Find the coordinates of the foci, the eccentricity and the equations of the directrices of the hyperbola $4x^2 - 9y^2 = 36$.

(l) Evaluate :

$$\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} \, dx$$

(m) Express $(5 - 3i)^3$ in the form $a + ib$.

(n) Solve the simultaneous equations,
$x + 3y = 4$ and $2x - 4y = 7$.

(o) If $y = \frac{x^2 - 2x}{x^2 + 7}$, find $\frac{dy}{dx}$. *15×3=45*

2. (a) Find the equation of the plane passing through the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ at the point $(0, 7, -7)$.

(b) Find the equation of the sphere through the points $(0, 0, 0)$, $(0, 1, -1)$, $(-1, 2, 0)$ and $(1, 2, 3)$.

(c) Find the equation of the cylinder, whose axis is $x = 2y = -z$ and radius is 4. *3+4+3*

3. (a) For any two sets A and B in a universal set U, prove that $(A \cap B)' = A' \cup B'$.

(b) Convert the complex number $\frac{-16}{1 + i\sqrt{3}}$ into polar form.

(c) Solve $2x^3 + 3x^2 + 3x + 1 = 0$, using Cardan's method. *3+3+4*

4. (a) Evaluate :

$$\int \frac{dx}{x(x^3 + 1)}.$$

(b) Prove that $\int_0^{\pi/2} \log \sin \theta \, d\theta = -\frac{\pi}{2} \log 2$.

(c) Find $\frac{dy}{dx}$, if $y = \sin^{-1} \frac{2x}{1 + x^2}$. *3+3+4*

**5.** (a) Find the equation of the circle passing through the points (0, 1), (4, 3) and having its centre on the line $4x - 5y = 5$.

(b) Find the coordinates of the points at which the straight line $2x - 3y + 16 = 0$ intersects the parabola $y^2 = 16x$.

(c) Prove that the equation

$$9x^2 + y^2 - 36x + 8y + 43 = 0$$

represents an ellipse. Find its foci. *4+3+3*

**6.** (a) Find the equation of the normal to the curve $x^2 = 4y$, which passes through the point (1, 2).

(b) Find the equation of the tangent to the curve $x + 3y - 3 = 0$, which is parallel to the line $y = 4x - 5$.

(c) Find the intervals in which $f(x) = -x^2 - 2x + 15$ is increasing or decreasing. *3+4+3*

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