No. of Printed Pages : 5

CS-60

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Pre-Revised)

Term-End Examination

00191

June, 2017

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 questions no. 2 to 6. Use of calculator is permitted.*

1. (a) Which of the collections mentioned below are sets ?

(i) The collection of all intelligent people in India.

(ii) The collection of natural numbers that are perfect squares.

(iii) The collection of all colours in a rainbow.

(b) Which of the following sets are finite, and which are infinite ?

(i) ϕ

(ii) The solution set of $x^2 - 7x + 12 = 0$

(iii) The set of all points on the boundary of a regular hexagon

(c) If $f(x) = x + \frac{1}{x}$, prove that $f\left(\frac{1}{y}\right) = f(y)$. For what value of y is the relation not valid ?

(d) Show that the points (– 3, 2); (3, 10); (7, 2) are the vertices of an isosceles triangle.

(e) Express the equation of the straight line, $3x + 4y = 5$ in the slope-intercept form and hence find the slope and intercept on the y-axis.

(f) Find the equation of the circle whose centre is at (2, 3) and radius is 4 units.

(g) Find the equation of the parabola whose directrix is $x + a = 0$ and the focus is at (a, 0).

(h) Find the foci and the eccentricity of the ellipse, $9x^2 + 25y^2 = 225$.

(i) Find the distance between the points (1, 2, 3) and (3, 4, 5).

(j) Find $\frac{dy}{dx}$, if $y = e^{x^2 + 3}$.

(k) Evaluate :

$$\int \sec x \, dx$$

(l) Find $\frac{dy}{dx}$, if $y = \log_e t$, $x = t^2$.

(m) Express $\frac{1}{3 + 4i}$ in the form $a + ib$.

(n) Evaluate :

$$\int_1^2 \log_e x \, dx$$

(o) Solve the simultaneous equations $x + y = 2$, $2x + 3y = 5$ graphically. *15×3=45*

2. (a) It is given that the Power Set P(S) of any set S is the set of all subsets of S, including the empty set and the set S itself.

Write down all the elements of P(S), if S is the set {1, 2, 3}.

(b) For any two sets A and B in a universal set U, prove that

$$(A \cap B)^c = A^c \cup B^c.$$

(c) Let b and c be real numbers. Then for what values of b and c, will the quadratic equation $x^2 + bx + c = 0$ have $(1 + i)$ as one of its roots ? *3+3+4*

3. (a) If 1, ω, ω^2 are the cube roots of unity, find the value of $(1 - \omega + \omega^2)(1 + \omega - \omega^2)$.

(b) If a, b are real and $a + ib = 0$, then prove that $a = b = 0$.

(c) If α, β are the roots of the quadratic equation, $x^2 + px + q = 0$, find the value of

$$(\alpha + p)^{-4} + (\beta + p)^{-4}.$$ *3+2+5*

4. (a) Find $\frac{dy}{dx}$ when

(i) $y = \tan^{-1}\left(\frac{a + bx}{b - ax}\right)$

(ii) $x^3 + y^3 = 3axy$

(b) Evaluate :

$$\int \frac{x^2 + 1}{x^4 + 1}\, dx$$ *3+3+4*

5. (a) Find the condition under which the straight line, $y = mx + c$ is a tangent to the circle, $x^2 + y^2 = a^2$.

(b) Find the equations of the normals to the parabola $y^2 = 8x$ at the points, (8, 8) and (2, 4). Show that the two normals intersect on the curve. *4+(3+3)*

6. (a) Show that the distance of the origin from the plane, $6x - 3y + 2z = 14$ is 2 units.

(b) Find the point where the line joining the points $(2, -3, 1)$; $(3, -4, -5)$ cuts the plane, $3x + y + z = 8$.

(c) Find the centre and the radius of the sphere

$$3x^2 + 3y^2 + 3z^2 + 2x - 4y - 2z - 1 = 0.$$ *3+4+3*