No. of Printed Pages : 6

CS-60

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

Term-End Examination

01975

December, 2016

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) If $y = x^2$, then find $\frac{dy}{dx}$.

(b) Compute $\frac{d}{dx}(e^x)$.

(c) If $\sqrt{3} + i = r(\cos\theta + i \sin\theta)$, then find r and θ.

(d) Evaluate :

$$\int 2 \sin x \, dx$$

(e) State *True* or *False*, for each of the following :

(i) $|x + y| \geq |x| + |y|$

(ii) $|x \cdot y| = |x| \cdot |y|$

(iii) $|x - y| \geq \big|\, |x| - |y| \,\big|$

where $|x|$ = absolute value of x.

(f) $f : R \to R$ and $g : R \to R$ are two functions such that

$$f(x) = x^2 \text{ and } g(x) = 2x + 3.$$

Find $f \circ g$ and $g \circ f$.

(g) Evaluate the following :

(i) $\displaystyle\int_1^2 (2x + 3)\, dx$

(ii) $\displaystyle\int_0^2 e^{2x}\, dx$

(iii) $\displaystyle\int_0^{\pi/4} \sin x\, dx$

(h) Solve the following system of linear equations :

$$2x + 3y = 8$$

$$3x + 4y = 11$$

(i) For each of the following, state whether it is *true* or *false*; where A, B, C are sets and $\cup$ and $\cap$ denote set union and set intersection respectively :

(i) $A \cap B = B \cap A$

(ii) $A \cap B = B \cup A$

(iii) $A \cup \phi = \phi$, where ϕ denotes an empty set

(j) Find the area of the region bounded by $x = 1$, $x = 4$, and $y = 6$.

(k) Obtain the conjugate of the following complex numbers :

(i) $4 + 6i$

(ii) 5

(iii) $7i$

where $i = \sqrt{-1}$

(l) Find the value of the following determinant :

$$\begin{vmatrix} 1 & 1 \\ 2 & 2 \end{vmatrix}$$

(m) Determine the equation of a straight line passing through the point $(-1, -2)$ and the point $(1, 2)$.

(n) Find the equation of a sphere with centre $(0, 0, 0)$ and radius as 7 units.

(o) Evaluate :

$$\lim_{x \to 2} \frac{(x-2)^2}{(x+1)(x-2)}$$

15×3=45

2. (a) Find $\frac{dy}{dx}$, if $y = \sin x + \sin 2x + \sin 3x$.

(b) Find the equation of a straight line in the three-dimensional space joining the points (2, 1, 3) and (– 2, 0, 4).

(c) Find the value of the determinant

$$\begin{vmatrix} x & x+4y \\ 7y & 13y \end{vmatrix}.$$

3+3+4

3. (a) Using Trapezoidal rule or Simpson's 1/3 rule and taking four subdivisions of the interval [1, 3], find the approximate value of $\int_1^3 (2x+3)\,dx$.

(b) Find the area of the surface of the solid obtained by revolving the line $y = 3$ about the x-axis that lies between $x = 1$ and $x = 4$.

(c) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & 1 \\ 3 & 5 & -2 \end{bmatrix}$, find $(A + B)^T$.

3+3+4

4. (a) Let $S = 12t - 3t^2$. Find d^2S / dt^2.

(b) Find the equation of the tangent to the curve

$$y = x^2 + 4x + 1$$

at the point, where $x = 3$.

(c) The following pie chart represents the number of valid votes obtained by four students who contested for school leadership. The total number of valid votes polled was 720. What is the minimum number of votes obtained by any candidate ?

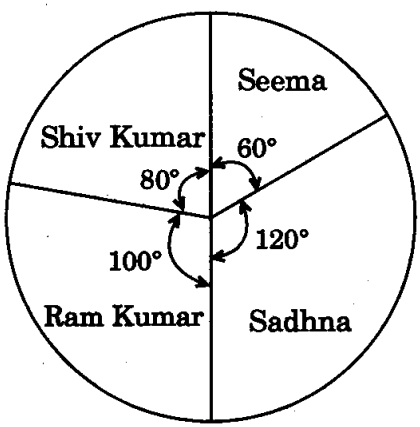

Figure : Pie chart

3+3+4

5. (a) The function f(x) is defined as

$$f(x) = \begin{cases} 5x - 4, & 0 \le x \le 1 \\ 4x^2 - 3x, & 1 < x \le 2 \end{cases}$$

Examine whether f(x) is continuous at $x = 1$.

(b) If $x^y = e^{x-y}$, prove that

$$\frac{dy}{dx} = \frac{\log_e x}{(1 + \log_e x)^2}.$$

(c) If $y = (\sec x + \tan x)$, find $\frac{dy}{dx}$. *3+3+4*

6. (a) The mean of 200 items was 50. Later on, it was discovered that two items were misread as 92 and 8 instead of 192 and 88. Find the correct mean.

(b) Find the vertex, focus and directrix of the parabola given by the following equation :

$$4y^2 + 12x - 12y + 39 = 0.$$

(c) One end of a diameter of the circle

$x^2 + y^2 - 3x + 5y - 4 = 0$ is (2, 1).

Find the co-ordinates of the other end. *3+3+4*
