

# **BACHELOR OF COMPUTER APPLICATIONS (BCA)**

## **(Revised Syllabus)**

BCA(Revised Syllabus)/ASSIGN/SEMESTER-V

### **ASSIGNMENTS**

**(July - 2026 & January - 2027)**

**(BCS-051, BCS-052, BCS-053, BCS-054, BCS-055**

**BCSL-056, BCSL-057, BCSL-058)**



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES  
INDIRA GANDHI NATIONAL OPEN UNIVERSITY  
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## CONTENTS

| Course Code | Assignment No.                | Submission-Schedule            |                              | Page No. |
|-------------|-------------------------------|--------------------------------|------------------------------|----------|
|             |                               | For July-December Session      | For January-June Session     |          |
| BCS-051     | BCA(V)/051/Assignment/26-27   | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 3        |
| BCS-052     | BCA(V)/052/Assignment/26-27   | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 5        |
| BCS-053     | BCA(V)-53/Assignment/26-27    | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 6        |
| BCS-054     | BCA(V)/054/Assignment/26-27   | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 9        |
| BCS-055     | BCA(V)/055/Assignment/26-27   | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 12       |
| BCSL-056    | BCA(V)/L-056/Assignment/26-27 | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 15       |
| BCSL-057    | BCA(V)/L-057/Assignment/26-27 | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 16       |
| BCSL-058    | BCA(V)/L-058/Assignment/26-27 | 31 <sup>st</sup> October, 2026 | 30 <sup>th</sup> April, 2027 | 18       |

### Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.
2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to BCA Programme Guide.
3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the BCA Programme Guide.

|                                  |          |                                                               |
|----------------------------------|----------|---------------------------------------------------------------|
| <b>Course Code</b>               | <b>:</b> | <b>BCS-054</b>                                                |
| <b>Course Title</b>              | <b>:</b> | <b>Computer Oriented Numerical Techniques</b>                 |
| <b>Assignment Number</b>         | <b>:</b> | <b>BCA(V)/054/Assignment/2026-27</b>                          |
| <b>Maximum Marks</b>             | <b>:</b> | <b>100</b>                                                    |
| <b>Weightage</b>                 | <b>:</b> | <b>25%</b>                                                    |
| <b>Last Dates for Submission</b> | <b>:</b> | <b>31<sup>st</sup> October, 2026 (For July 2026 Session)</b>  |
|                                  | <b>:</b> | <b>30<sup>th</sup> April, 2027 (For January 2027 Session)</b> |

**This assignment has seven questions of total 80 marks. Answer all the questions. 20 marks are for viva voce. You may use illustrations and diagrams to enhance explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Illustrations/ examples, where-ever required, should be different from those given in the course material. Use of simple calculator is allowed.**

**Q1:**

- (a) Explain each of the following concepts, along with at least one suitable example for each: **(6 Marks)**  
 (i) Fixed-point number representation (ii) round-off error (iii) representation of zero as floating point number (iv) significant digits in a decimal number representation (v) normalized representation of a floating point number (vi) overflow
- (b) Explain with suitable example that in computer arithmetics ( i.e., numbers represented in computer, with +, −, \*, / as implemented in a computer) the multiplication operation( \*) may not be distributive over plus (+), i.e.  $(a * (b + c)) = ((a * b) + (a * c))$  may not be true for some computer numbers a, b and c **(2 Marks)**
- (c) Find out to how many decimal places the value  $22/7$  is accurate as an approximation of  $3.14159265$ , where the latter is value of  $\pi$ , calculated up to 8 places after decimal? **(6 Marks)**
- (d) Calculate a bound for the truncation error in approximating  $f(x) = \sin x$  by  $\sin(x) = x - x^3 / (\text{fact } 3) + x^5 / (\text{fact } 5)$ , where  $-1 \leq x \leq 1$  and (fact n) denotes factorial of n **(3 Marks)**
- (e) Obtain Approximate the value of  $(3.7)^{-1}$  using first three terms of Taylor's series expansion. **(3 Marks)**

**Q2:**

- (a) Solve the system of equations **(4 Marks)**  

$$4x_1 + x_2 + 2x_3 = 16$$

$$2x_1 + 5x_2 + 3x_3 = 19$$

$$3x_1 + 2x_2 - x_3 = 12$$
 using Gauss elimination method with partial pivoting.

- (b) Perform four iterations (rounded to four decimal places) using (8 Marks)

(i) Jacobi Method and  
(ii) Gauss-Seidel method,  
for the following system of equations.

$$\begin{bmatrix} 5 & -5 & -1 \\ 1 & -4 & 1 \\ -2 & 1 & 6 \end{bmatrix} \begin{bmatrix} x_1 \\ y_2 \\ z_3 \end{bmatrix} = \begin{bmatrix} -8 \\ -4 \\ -18 \end{bmatrix}$$

With  $\mathbf{x}^{(0)} = (0, 0, 0)^T$ . The exact solution is  $(1, 2, 3)^T$ .

Which method gives better approximation to the exact solution?

**Q3:**

- (a) Determine the smallest roots of the following equation: (8 Marks)

$$f(x) = x^2 \cos(x) + \sin(x) = 0$$

to three significant digits using

(i) Regula-falsi method (ii) Newton-Raphson method (iii) Bisection method (iv) Secant method

**Q4:**

- (a) Explain what is the role of interpolation in solving numerical problems? (2 Marks)  
(b) Express  $\Delta^3 f_i$  as a backward difference. (2 Marks)  
(c) Express  $\Delta^3 f_i$  as a central difference. (2 Marks)  
(d) For the following data develop difference table and find forward differences and backward differences (4 Marks)

| I | $x_i$ | $y_i$           |  |
|---|-------|-----------------|--|
| 0 | -1    | 16.8575         |  |
| 1 | 0     | 24.0625         |  |
| 2 | 1     | 16.5650         |  |
| 3 | 2     | -13.9375        |  |
| 4 | 3     | 28.5625         |  |
| 5 | 4     | <b>144.0625</b> |  |

**Q5:**

- (a) By decennial census, the population of a town was given below. (10 Marks)

Year (x) : 1917 1981 1991 2001 2011

Population (y) : 112 132 158 189 226 (in thousands)

- (i) Using Stirling's central difference formula, estimate the population for the year 2006
- (ii) Using Newton's forward formula, estimate the population for the year 1992.

Using Newton's backward formula, estimate the population for the year 1980.

- (b) If values of the function  $f: x \rightarrow y$  are given as  $f(1) = -32$ ,  $f(4) = 08$ ,  $f(5) = 52$ ,  $f(7) = 167$ , find the Lagrange's interpolation polynomial of  $f(x)$ . Also, find  $f(3)$ . (5 Marks)

**Q6:**

Find the values of the first and second derivatives of  $f(x)$  at  $x = 76$  from the following table. Use  $O(h^2)$  forward difference method. Also, find Truncation Error (TE) and actual (5 Marks)

|   |   |    |    |    |    |
|---|---|----|----|----|----|
| x | : | 76 | 81 | 86 | 91 |
|---|---|----|----|----|----|

**Q7:**

Compute the value of the integral (10 Marks)

$$\int_{8.4}^{10.4} (5x + 4x^2 + 3) dx \quad \text{by using}$$

Rectangular Rule (ii) Trapezoidal Rule and then (iii) Simpson's 1/3 Rule