

# S.Y.B.Sc (Comp. Science)

DEC  
2019

Con. 581-19. Foundation Course (II)

JK-7157

(3 Hours)

[Total Marks : 80

- N.B. : (1) All questions are compulsory.  
(2) Figures to the right indicate full marks.

## Section - I

1. Answer any **four** of the following :— 20
- Discuss the Stages in Team Building.
  - Write a note on Chipko Movement.
  - Explain the Styles of Leadership.
  - Explain the effects of Hybrid Disasters.
  - What are the features of Listening Skills ?
  - Discuss Right to Equality provided in the Indian Constitution.
2. Answer any **four** of the following :— 20
- What are the basic functions performed by NGOs ?
  - What is Disaster Mitigation ? Discuss.
  - Comment on the basic principles that make science unique.
  - What steps are being taken against the Violation of Women Right ?
  - What is right to Education Act and What are its challenges ?
  - 'Technology is important in the present scenario' Discuss.

## Section - II

3. Answer any **four** of the following :— 20
- What is Disaster Management ? State the main factors involved in it.
  - Explain the various applications of Nano Technology.
  - Discuss the difference and importance of verbal and non-verbal communication.
  - Discuss the objectives of Consumer Protection Act.
  - Define Environmental Degradation. What are its main causes ?
  - Discuss briefly some of the Air borne diseases.
4. Answer any **four** of the following :— 20
- Explain the different types of Cyber crime.
  - What is Eco-feminism ?
  - Explain A-biotic Component.
  - Write a note on Time Management ?
  - Define Space Technology. Discuss the benefits of Space Technology.
  - What is 'Carbon Trading' ? How does it protect the environment ?

(3 Hours)

[Total Marks : 80]

- N.B. (1) All questions are compulsory.  
 (2) Figures to the right indicate Full marks.

1. Attempt any Four of the following : 16
- For  $a, b \in \mathbb{R}$  prove that  $|a + b| \leq |a| + |b|$ .
  - If  $\langle x_n \rangle$  in  $\mathbb{R}$  is monotonically increasing and bounded above then prove that it is convergent.
  - State and prove Archimedean property of  $\mathbb{R}$ .
  - Show that  $\langle (-1)^n \rangle$  is not a Cauchy sequence.
  - Examine the given series for convergence  $\sum_n \frac{1}{(\log n)^{\log n}}$ .
  - Find radius of convergence of the series  $1 + \frac{x+1}{6} + \frac{(x+1)^2}{6^2} + \dots$ .
2. Attempt any Four of the following : 16
- Let  $f : [a, b] \rightarrow \mathbb{R}$  be continuous on  $[a, b]$  then prove that  $f$  is bounded on  $[a, b]$ .
  - Find the sum of the series  $1 - \frac{3}{4} + \frac{9}{16} - \frac{27}{64} + \dots$
  - Obtain the Fourier expansion of  $e^x$  in the interval  $-\pi < x < \pi$ .
  - Prove that "A closed and bounded interval  $[a, b]$  is compact".
  - Find l.u.b. (if exists) of the set  $S = [0, 1]$ .
  - Show that the open interval  $(a, b)$  in  $\mathbb{R}$  is an open set in  $\mathbb{R}$ .
3. Attempt any Four of the following : 16
- Solve  $\frac{x^2 + 1}{y + 1} = xy \frac{dy}{dx}$ .
  - Prove that "the necessary and sufficient condition for a differential equation  $M(x, y) dx + N(x, y) dy = 0$  to be exact is  $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ ".
  - Calculate  $\iint_R f(x, y) dA$  and verify Fubini's theorem, where  $f(x, y) = 1 - 6x^2y$  and  $R : 0 \leq x \leq 2, -1 \leq y \leq 1$ .

[TURN OVER]

(d) Evaluate the double integral as an iterated integral in polar co-ordinates,

$$I = \iint_S x^2 dA \text{ where } S \text{ is the region bounded by the circle } r = 4\sin\theta.$$

(e) Evaluate  $\int_C x^4 dx + xy dy$  where 'c' is triangular curve consisting of line segment from (0, 0) to (1,0) and from (1, 0) to (0, 1) and from (0, 1) to (0, 0).

(f) Find the work done by the force field  $f(x, y) = (e^x - y^3) \bar{i} + (\cos y + x^3) \bar{j}$  on a particle that travels once around the unit circle  $x^2 + y^2 = 1$  in the counter clockwise direction.

4. Attempt any four of the following :

16

(a) Use a line integral to find the area enclosed by the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ .

(b) Using spherical co-ordinates find the volume of the solid region S is the sphere  $x^2 + y^2 + z^2 = a^2$ .

(c) State the properties of double integrals.

(d) Find the particular solution of  $y'' - y' - 12y = 0$  satisfying the initial condition  $y(0) = 1$  and  $y'(0) = -1$ .

(e) Solve  $y'' - 2y = x - e^x$  using UDC method.

(f) Find the general solution of  $x^2 y'' + xy' - 4y = 0$  given that  $y_1 = x^2$  is one of the solution.

5. Attempt any four of the following :

16

(a) If  $y_1$  and  $y_2$  are two solution of  $\frac{d^2 y}{dx^2} + P(x) \frac{dy}{dx} + Q(x)y = 0$  on  $[a, b]$  then prove that they are linearly dependent if and only if the wronskian is identically zero.

(b) Define the following : (i) Flux across a plane curve, (ii) Gradient of a scalar valued function.

(c) State the value of x for which the series  $\sum_{n=0}^{\infty} n! x^n$  is converges.

(d) Define alternating series and state Leibnitz theorem on alternating series.

(e) Find limit superior and limit inferior of  $\left\langle (-1)^n \left(1 + \frac{1}{n}\right) \right\rangle$ .

(f) State the algebraic properties of IR.

- N.B. (1) All questions are compulsory.  
 (2) Figures to the right indicate Full marks.

1. Answer any Four questions from the following :

16

- (a) Write the general solution of the system and give geometrical interpretation

$$2x - 3y + 4z = 0$$

$$3x + y + z = 0$$

- (b) Find the inverse of the matrix  $A = \begin{bmatrix} 1 & 5 & -2 \\ 2 & -1 & 1 \\ 3 & -1 & 2 \end{bmatrix}$ .

- (c) If  $A \in M_n(\mathbb{R})$  is a invertible matrix, than show that the inverse of  $A$  is unique.

- (d) Reduce the matrix  $\begin{bmatrix} 1 & -2 & 3 & -1 \\ 2 & -1 & 2 & 2 \\ 3 & 1 & 2 & 3 \end{bmatrix}$  to row echelon form.

- (e) If  $W = \{(x, y, z) / x + y + z = 4 ; x, y, z \text{ are real number}\}$  then show that  $W$  is not subspace of  $\mathbb{R}^3$ .

- (f) If  $W_1$  and  $W_2$  are subspace of a vecto space  $V$  than prove that  $W_1 \cup W_2$  is a subspace of  $V$  if and only if  $W_1 \subseteq W_2$  or  $W_2 \subseteq W_1$ .

2. Answer any four questions from the following :

16

- (a) Let  $V = \mathbb{R}^3$  and  $S = \{(1, 1, 0), (2, 0, 2)\}$  Check whether  $(5, 2, 3)$  and  $(4, 1, 5)$  are in  $L(S)$ .

- (b) Prove that "Every nonzero singleton set is linearly independent".

- (c) Define linearly dependent, independent set and convex set in vector space  $V$ .

- (d) Check whether the given is basis of  $\mathbb{R}^3$ , if  $B = \{(1, 1, 0), (-1, 0, 0)\}$  is a subset of  $\mathbb{R}^3$ .

- (e) Show that  $(\mathbb{R}^2, \langle, \rangle)$ , where  $\langle x, y \rangle = 2x_1y_1 + x_1y_2 + x_2y_1 + x_2y_2$ .

- (f) Show that the sum of the square of the diagonals of a parallelogram is equal to the sum of the square of the sides.

3. Answer any four questions from the following :

16

- (a) Let  $T: U \rightarrow V$  be a linear transformation, then show that

(i)  $\ker T$  is a subspace of  $U$ .

(ii)  $\text{Im } T$  is a subspace of  $V$ .

- (b) Let  $A, B$  be two  $n \times n$  matrices over  $\mathbb{R}$ , then show that  $\det(AB) = \det(A) \cdot \det(B)$ .

[TURN OVER

- (c) Prove that the area of the triangle in the plane with vertices  $(x_1, x_2), (y_1, y_2),$

$(z_1, z_2)$  is the absolute value of  $\frac{1}{2} \begin{vmatrix} x_1 & x_2 & 1 \\ y_1 & y_2 & 1 \\ z_1 & z_2 & 1 \end{vmatrix}$ .

- (d) Let  $T : V \rightarrow W$  be a linear transformation. Show that  $T$  is one-one if and only if  $\text{kernel } T = \{0\}$ .
- (e) Solve the following system using Cramer's rule  
 $x - y + 2z = 1, x + y + z = 2, 2x - y + z = 5.$
- (f) Show that "the system of non-homogeneous linear equations  $AX = B$  has a solution if and only if  $\text{rank } A = \text{rank } (A, B)$ ".

4. Answer any four questions from the following :

16

- (a) Show that the following system is inconsistent.  
 $2x + 6y + 11 = 0.6x + 20y - 6z + 3 = 0, 6y - 18z + 1 = 0.$
- (b) For what values of  $\mu, \lambda$  the simultaneous equations given below have no solution  
 $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu.$

(c) Find all eigen values of  $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$ .

- (d) Show that the eigen values of a diagonal matrix  $D$  are same as its diagonal elements.
- (e) If  $\lambda$  be an eigen value of  $T$  than prove that  $\lambda^k$  be the eigen value of  $T^k$ .
- (f) Show that similar matrices have same characteristic polynomial and eigen values.

5. Answer any four questions from the following :

16

- (a) Find eigen value and eigen vector of  $A = \begin{bmatrix} 2 & -1 \\ -8 & 4 \end{bmatrix}$ .
- (b) Let  $A$  be a  $n \times n$  matrix over  $\mathbb{R}$ . Show that  $A + A^t$  is symmetric.
- (c) Show that "If  $S_1$  and  $S_2$  are convex subset of a vector space  $V$  then  $S_1 \cap S_2$  is convex if  $S_1 \cap S_2 \neq \phi$ ".
- (d) Show that the vector  $(1, 2, 3), (2, 2, 0)$  form a linearly independent set.
- (e) Show that "If  $W$  is a subspace of an inner product space  $V$  then  $W = (W^\perp)^\perp$ ".
- (f) Define determinants of  $n \times n$  matrix of reals define adjoint of  $A$ . Show that  $A(\text{adjoint } A) = (\det A) I$ .

(2 Hours)

[Total Marks : 60]

- N.B. :**
- (1) All questions are compulsory.
  - (2) All questions carry equal marks.
  - (3) Figures to right indicate full marks.
  - (4) Use of non-programmable scientific calculator is allowed.

Q.1] Attempt any two of the following.

- i) Design an algorithm to find the sum of first  $n$  natural numbers. Trace it for  $n = 6$ . [5]
- ii) Write recursive algorithm for computing G.C.D. of two non-negative integers. The initial condition is  $\gcd(a, 0) = a$ . Using it find  $\gcd(17, 12)$ . [5]
- iii) Check whether  $f(n) = \frac{1}{2}n^3 + \frac{1}{2}n^2$  is of same order as  $n^3$ . [5]
- iv) Design an algorithm to arrange elements of array into decreasing order. [5]

Q.2] Attempt any two of the following.

- i) Define the following term with an example:-
  - a) Bipartite graph
  - b) Complete graph. [5]
- ii) Is  $K_4$  is planer graph? Explain and draw it if possible. [5]
- iii) Define incidence matrix, Draw the graph represented by the incidence matrix

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

[5]

- iv) State Handshaking lemma and justify with proper example. [5]

Q.3] Attempt any two of the following.

- i) Draw a game tree for nim if the starting position consists of three piles with one, two and three stones respectively. [5]
- ii) Draw a 13-vertex complete binary tree with four levels. Write the height of tree. [5]
- iii) Define the following with one example:-
  - a) Siblings
  - b) Spanning tree. [5]
- iv) Show that if  $T$  is tree then it contains no circuits and has  $n-1$  edges. [5]

Q.4] Attempt any two of the following.

- i) Evaluate  $\int_{-\infty}^{\infty} \frac{dx}{1+4x^2}$ . [5]
- ii) Find the length of the arc of the curve  $y = \log \frac{e^x - 1}{e^x + 1}$  from  $x = 1$  to  $x = 2$ . [5]
- iii) Find the area between the parabola  $y^2 = 2x$  and the line  $y = 4x - 1$ . [5]
- iv) Find the volume of the solid revolving around X-axis and area enclosed by the parabola  $x^2 + 4y = 4$  and X-axis. [5]

Q.5] Attempt any two of the following.

- i) Evaluate the square root of 5 using the equation is  $x^2 - 5 = 0$ , using fixed point method. [5]  
 ii) Drive the Newton-Raphson iterative formula.

$$X_{n+1} = X_n - \frac{f(X_n)}{f'(X_n)} \text{ for solving } f(X) = 0. \quad [5]$$

- iii) Solve the system by using Dolittle's LU-decomposition method: [5]

$$2x + y + 3z = 11, \quad x + 2y + z = 9, \quad 3x + y + 2z = 10.$$

- iv) Using the Bisection method, find an approximation root of the equation [5]  
 $x^6 - x - 1 = 0$  upto 7<sup>th</sup> iteration.

Q.6] Attempt any two of the following.

- i) Estimate  $y(0.5)$  by using Euler's method for  $y' = xy + y + x$  with  $y(0) = 1$  and  $h = 0.25$ . [5]

- ii) Estimate  $y(0.5)$  by using 2<sup>nd</sup> order method for  $y' = x + y$  with  $y(0) = 1$  and  $h = 0.25$ . [5]

- iii) Estimate  $y(2)$  with  $h = 0.5$  for the equation  $\frac{dy}{dx} = \frac{2y}{x}$  using polygon method with  $y(1) = 2$ . [5]

- iv) Derive the formula of Heun's method for solution of initial value problem of ordinary first order differential equations. [5]

\*\*\*\*\*

- N.B. :** (1) All questions are compulsory.  
 (2) All questions carry equal marks.  
 (3) Figures to right indicate full marks.  
 (4) Use of non-programmable scientific calculator is allowed.

Q.1] Attempt any two of the following.

- i) Design an algorithm to find the sum of first  $n$  natural numbers. Trace it for  $n = 6$ . [4]  
 ii) Write recursive algorithm for computing G.C.D. of two non-negative integers.  
 The initial condition is  $\text{gcd}(a, 0) = a$ . Using it find  $\text{gcd}(17, 12)$ . [4]  
 iii) Check whether  $f(n) = \frac{1}{2}n^3 + \frac{1}{2}n^2$  is of same order as  $n^3$ . [4]  
 iv) Design an algorithm to arrange elements of array into decreasing order. [4]

Q.2] Attempt any two of the following.

- i) Define the following term with an example:-  
 a) Bipartite graph                      b) Complete graph. [4]  
 ii) Is  $K_4$  is planer graph? Explain and draw it if possible. [4]  
 iii) Define incidence matrix, Draw the graph represented by the incidence matrix

$$\begin{bmatrix} 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 \end{bmatrix} \quad [4]$$

- iv) State Handshaking lemma and justify with proper example. [4]

Q.3] Attempt any two of the following.

- i) Draw a game tree for nim if the starting position consists of three piles with one, two and three stones respectively. [4]  
 ii) Draw a 13-vertex complete binary tree with four levels. Write the height of tree. [4]  
 iii) Define the following with one example:-  
 a) Siblings                      b) Spanning tree. [4]  
 iv) Show that if  $T$  is tree then it contains no circuits and has  $n-1$  edges. [4]

Q.4] Attempt any two of the following.

- i) Evaluate  $\int_{-\infty}^{+\infty} \frac{dx}{1+4x^2}$ . [4]  
 ii) Find the length of the arc of the curve  $y = \log \frac{e^x - 1}{e^x + 1}$  from  $x = 1$  to  $x = 2$ . [4]  
 iii) Find the area between the parabola  $y^2 = 2x$  and the line  $y = 4x - 1$ . [4]  
 iv) Find the volume of the solid revolving around X-axis and area enclosed by the parabola  $x^2 + 4y = 4$  and X-axis. [4]





Q.5] Attempt any two of the following.

- i) Evaluate the square root of 5 using the equation is  $x^2 - 5 = 0$ , using fixed point method. [4]

ii) Drive the Newton-Rephson iterative formula.

$$X_{n+1} = X_n - \frac{f(X_n)}{f'(X_n)} \text{ for solving } f(X) = 0. \quad [4]$$

- iii) Solve the system by using Dolittle's LU-decomposition method: [4]

$$2x + y + 3z = 11, \quad x + 2y + z = 9, \quad 3x + y + 2z = 10.$$

- iv) Using the Bisection method, find an approximation root of the equation  $x^6 - x - 1 = 0$  upto 7<sup>th</sup> iteration. [4]

Q.6] Attempt any two of the following.

- i) Estimate  $y(0.5)$  by using Euler's method for  $y' = xy + y + x$  with  $y(0) = 1$  and  $h = 0.25$ . [4]

- ii) Estimate  $y(0.5)$  by using 2<sup>nd</sup> order method for  $y' = x + y$  with  $y(0) = 1$  and  $h = 0.25$ . [4]

- iii) Estimate  $y(2)$  with  $h = 0.5$  for the equation  $\frac{dy}{dx} = \frac{2y}{x}$  using polygon method with  $y(1) = 2$ . [4]

- iv) Derive the formula of Heun's method for solution of initial value problem of ordinary first order differential equations. [4]

\*\*\*\*\*

(2 Hours)

[Total Marks : 60

- N.B. :** (1) All questions are compulsory.  
(2) Attempt any two sub-questions from each question.  
(3) Each sub-question carries 5 marks.

**Section I**

1. Attempt any two : 10  
(a) State and prove De Morgan's law.  
(b) Consider the set  $A = \{1,2,3,4,5\}$ .  
 $R = \{(1,2), (1,3), (2,5), (3,2), (3,3), (4,5), (5,1), (5,2)\}$ . Draw a diagram and give matrix of R.  
(c) With  $a_0 = 1$  and  $a_1 = 2$ , find the first five terms in a sequence  $\{a_n\}$  whose recurrence relation is  $a_n = 5a_{n-1} - 3a_{n-2}$
2. Attempt any two : 10  
(a) Explain Breadth first algorithm.  
(b) Let E denote the following algebraic expression  
 $[a + (b - c)] * [(d - e) / (f + g - h)]$ .  
Represent E with binary tree T. Also state the preorder traversal of E.  
(c) Explain the terms: Square matrix, diagonal matrix, Boolean matrix and transpose of matrix.
3. Attempt any two : 10  
(a) Determine the number of ways in which 5 doctors and 6 lawyers be seated so that no two doctors be seated together.  
(b) How many 4-digit numbers can be formed by using the digits 1.3.5.7 when repetition of digit is allowed.  
(c) Find number of permutations for the letter of the word ALLAHABAD and CANADA.

**Section II**

4. Attempt any two : 10  
(a) Write applications of computer graphics.  
(b) Write a short note on Scaling and Translation.  
(c) Explain DDA line drawing algorithm.
5. Attempt any two : 10  
(a) Explain character clipping and its techniques.  
(b) Write a short note on point clipping.  
(c) Discuss properties of Bezier curves.
6. Attempt any two : 10  
(a) Discuss the steps in animation.  
(b) Differentiate between diffuse and point source illumination.  
(c) Write a short note on texture mapping.

- N.B. :** (1) All questions are **compulsory**.  
 (2) Attempt any **two** sub-questions from **each** question.  
 (3) **Each** sub-question carries **4** marks.

### Section I

1. Attempt any **two** : 8
- Solve the recurrence relation :  $5F_{n-1} - 6F_{n-2}$
  - Consider the set  $A = \{4,5,6,7\}$ . Let R be the relation  $\leq$  on A. Draw the directed graph and the hasse diagram of R.
  - What are different ways of defining a set ? Explain them with one suitable example.
  - State and prove De Morgan's law.
2. Attempt any **two** : 8
- Explain depth first algorithm.
  - Prove that conjunction operation is commutative.
  - Explain the terms: Square matrix, diagonal matrix, Boolean matrix and transpose of matrix.
  - Let E denote the following algebraic expression.  
 $[a + (b - c)] * [(d - e) / (f + g - h)]$ .  
 Represent E with binary tree T. Also state the preorder traversal of E.
3. Attempt any **two** : 8
- Explain pigeonhole principle.
  - How many 4 digit numbers can be formed by using the digits 2,4,6,8 when repetition of digit is allowed.
  - Find number of permutations for the letter of the word PEPPER and ALGEBRA.
  - Suppose a hospital contains 13 nurse. Show that at least 2 of them have birthday in the same month.

### Section II

4. Attempt any **two** : 8
- Derive an expression for rotation about the origin.
  - Write a short note on Scaling and Translation.
  - Explain Bresenham's line drawing algorithm with example.
  - Write application of computer graphics.
5. Attempt any **two** : 8
- Write a short note on workstation transformation.
  - Consider a line from (0,0) to (6,6). Use simple DDA to rasterize this line.
  - Discuss properties of Bezier curves.
  - Write a short note on point clipping.
6. Attempt any **two** : 8
- Write a short note on shadow and texture mapping.
  - Explain any two shading techniques.
  - Discuss Z-buffer algorithm.
  - Explain components of animation system.

(2 Hours)

[Total Marks : 48

- N.B. : (1) All questions are compulsory.  
(2) All questions carry equal marks.  
(3) Draw diagrams wherever necessary.

**Section I**

1. Attempt the following (Any two) :— 8  
(a) Define class and explain member function in class in C++.  
(b) Enlist and explain the benefits of OOP's.  
(c) Explain Scope resolution operator with example.  
(d) Explain user defined type and object with example.
2. Attempt the following (Any two) :— 8  
(a) What are Unary Operators ? How to overload unary operators.  
(b) Write a short note on Polymorphism.  
(c) Explain Abstract class and virtual base class.  
(d) Write a short note on Virtual Functions.
3. Attempt the following (Any two) :— 8  
(a) What is STL ? Write its components.  
(b) Explain Function Templates.  
(c) Explain Opening & Closing of file C++ with suitable example.  
(d) What are the Applications of Container classes ?

**Section II**

4. Attempt the following (Any two) :— 8  
(a) Write a note on conditional & relational operator.  
(b) Explain while loop and Do while loop with suitable example in Java.  
(c) Explain constructor overloading in Java.  
(d) Write Arithmetic & Logical Operators in Java.
5. Attempt the following (Any two) :— 8  
(a) Explain Input stream and Output stream.  
(b) Explain any three Java built in exceptions.  
(c) Explain the following keywords in java "extends", "super".  
(d) Write a note on dynamic dispatch method.
6. Attempt the following (Any two) :— 8  
(a) Explain AWT controls : Labels and Buttons with example.  
(b) Write a note on applet life cycle.  
(c) Write a note on Component, container.  
(d) Write note on Event Handling.

(2 Hours)

[Total Marks : 48

- N.B. : (1) All questions are compulsory.  
(2) Figures to the right indicate full marks.  
(3) Mixing of sub-questions is not allowed.

Section - I

1. Attempt the following (any two) :— 8  
(a) State the six inference rules that apply to functional dependencies.  
(b) Explain the 3 different views or architecture of the data.  
(c) Define with examples, entity, entity set, relationship, relationship set and key.  
(d) Explain the different normal forms.
2. Attempt the following (any two) :— 8  
(a) Explain the usage of the following relational algebra operations.  
1. Union 2. Intersect 3. Set Difference  
(b) Write a short note on Self Joins.  
(c) Explain the SQL Built In Conversion Functions.  
(d) Write a note on the aggregate functions of SQL.
3. Attempt the following (any two) :— 8  
(a) Define the following terms :  
1. Dense Primary Index 2. Sparse Primary Index 3. Clustering Index  
4. Secondary Index  
(b) Define a view 2. Discuss the advantages and disadvantages of using a view.  
(c) What are Stored Procedures ? What are their benefits ?  
(d) What is a trigger ?

Section - II

4. Attempt the following (any two) :— 8  
(a) What is software engineering ? State its objectives.  
(b) Write a short note on SDLC.  
(c) List and explain the software product metrics.  
(d) Define Feasibility and Feasibility Analysis.
5. Attempt the following (any two) :— 8  
(a) State and explain the components of SRS.  
(b) Explain Decision Table in detail.  
(c) What is Object Model ? State and explain its elements.  
(d) Explain State Chart Diagram in detail.
6. Attempt the following (any two) :— 8  
(a) What is Data Abstraction ? State and explain its types.  
(b) Explain the steps involved in converting an ERD to a database.  
(c) State the characteristics of a good user interface.  
(d) Explain the role of Verification & Validation in the various phases of SDLC.