Time: 3 Hrs. Marks: 100

N.B. : 1) All questions are compulsory.
   2) In each question from question No.2 to question No. 7, sub-question (a) is compulsory and attempt any one from sub-question (b) and (c).
   3) Figures to right indicate full marks.

Q.1] Attempt any one of the following:
   (a) Describe the following graphs with one example and one theorem related to each:
      (i) Connected graph       (ii) Bipartite graph       [10]

   (b) Write note on Pigeonhole principle.       [10]

Q.2] (a) State first principle of finite induction and using it show that       [8]
$$\frac{1}{3.5} + \frac{1}{5.7} + \frac{1}{7.9} + \ldots\ldots + \frac{1}{(2n+1)(2n+3)} = \frac{n}{3(2n+3)}.$$
(Note that 3.5 means product of 3 and 5)

   (b) Check the logical equivalence of statements.       [7]
      (i) $(P \leftrightarrow Q)$       (ii) $(P \rightarrow Q) \land (Q \rightarrow P)$.

   (c) Find the number of integers between 1 and 500 including both that are divisible by 2 or 3 or 7.       [7]

Q.3] (a) Write Cartesian product A×B of the sets A = {1,2,3} and B = {x,y}. Also, find B×A. Is A×B = B×A?       [8]

   (b) Show that any two equivalence classes are equal or disjoint.       [7]
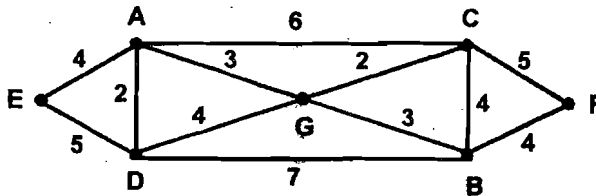
   (c) Is $D_{20}$, set of all positive divisors of 20 , a poset? Further check if it is a lattice. [7]

Q.4] (a) Define and give one example of ,(i) injective function (ii) surjective function (iii) bijective function.       [8]

   (b) Show that binary operation * is associative and commutative if * is defined as a*b = a + b − 10 for all a and b in Z.       [7]

   (c) Show that if seven colors are used to paint 50 bicycles then atleast 8 bicycles must have same color. Clearly state the result or theorem used.       [7]

①

Q.5]    (a) Draw Peterson's graph. Further, draw three subgraphs of Peterson's graph.    [8]

       (b) Find Hamiltonian cycle of minimal weight for the graph given below.    [7]



       (c) Write a note on methods of tree searching.        [7]

Q.6]    (a) Show that $(Q^+, *)$ forms an abelian group if $*$ is defined as $a*b = \dfrac{ab}{2}$.    [8]

       (b) Let $e : B^2 \to B^6$ be an (2,5) encoding function defined as $e(00) = 00000$, $e(01) = 11011$, $e(11) = 11100$ and $e(10) = 00101$. (i) Find minimum distance. (ii) How many errors can $e$ detect? (iii) How many errors can $e$ correct?    [7]

       (c) Show that the set $S = \{\pm 1, \pm i, \pm j, \pm k\}$ with vector dot product is an integral domain but not a field.    [7]

Q.7]    (a) Determine the coefficient $x^6$ of generating function $(1-5x)^8$.    [8]

       (b) The number of bacteria in a culture is 1000 and this number increases by 250% every two hours. Using recurrence relation, find number of bacteria present after one day.    [7]

       (c) Solve the recurrence relation $a_{n+2} - a_{n+1} - a_n = 0$, where $n \geq 0$, $a_0 = 0$ and $a_1 = 1$.    [7]

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**Con. 233–16.**     Computer Graphics     **OP–4338**

(3 Hours)     [Total Marks : 100

**N.B. : All** questions are **compulsory**.

1. Attempt following question :—
   (a)  Explain Refresh Cathode Ray Tube with neat diagram.     5
   (b)  Distinguish between Raster Scan Display & Random Scan Display.     5

2. Attempt following question :—
   (a)  Rasteurize line AB having end point co-ordinates A (10,20) & B (20,12) using     5
        DDA algorithm.
   (b)  Calculate the pixel positions along a straight line AB having end points A (5,5)     5
        & B (13,9) using Bresenhan's line drawing algorithm.
   (c)  Derive the steps in Midpoint circle algorithm.     5

3. Attempt following question :—
   (a)  Give the matrix representations for the following 3D transformations.     5
        Translation
        Rotation
        Scaling
        Reflection
   (b)  Translate an object ABC with A (1,1), B (3,1) & C (2,3) by 2 units along x-axis     5
        & 6 units along y axis.
   (c)  Scale the triangle ABC as A (2,2,), B (4,2), C (3,4) for given values of Sx & Sy.     5
        (i)   SX = 2.5, SY = 2.5
        (ii)  SX = SY = 1.5

4. Attempt following question :—
   (a)  A rectangle A (2,2), B (5,2), C (5,3) & D (2,3) is rotated by 90° about origin     5
        in Anticlockwise direction. Find new co-ordinate of rectangle after rotation.
   (b)  Find the mirror reflection of triangle P (10,50), Q (40,80), & R (10,80) about     5
        Line y = 2x + 4.
   (c)  Scale an object ABCD with respect to point A by scalling factors Sx = 2 &     5
        Sy = 3 as A (2,1), B (5,1), C (5,3), D (2,3).

5. Attempt following question :—
   (a)  Explain Flood fill algorithm using 8 point connectivity.     5
   (b)  Explain Boundary fill algorithm using 4 point connectivity.     5
   (c)  Write a note on inside-outside test.     5

6. Attempt following question :—
   (a)  Develop the perspective transformation of an object onto the xy-plane with the     5
        Center of projection at (100, 100, –100). What will be the projection of line
        segment ? AB with  A (150, 250, 150) & B (250, 350, 100) ?
   (b)  State and explain steps of animation.     5
   (c)  Write a note on Key Frame animation.     5

7. Attempt following question :—
   (a)  What is shading ? Explain ?     5
   (b)  State the light model techniques ?     5
   (c)  Write a short note on morphing & Its advantages ?     5

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Time: 3 hours                                           Marks:100

N.B. :   1. All questions are compulsory (Q1-Q7)

**Q1**      Attempt the following:
  a)    What is cursor? Explain the types of cursors.                    5m
  b)    What is view? Explain different types of view with example.      5m
**Q2**      Attempt any three from the following:
  a)    What is a sequence? Explain syntax for creating a sequence.      5M
  b)    List and explain the different types of constraints with example.   5m
  c)    Write SQL statements for the following database :                5m
        student(Student_ID, Student_name, Percentage, Course_ID)
        course(Course_ID, Course_name, Course_head)
            i)      List all the students whose name's second charcter is 'r'.
            ii)     List all the students whose percentage is in between 40 to 60.
            iii)    List the course name whose head is 'Mathur'.
            iv)     List the student name who scored highest percentage in course_id
                    'USPT1A'
            v)      List all the students whose name start with 'j'.
  d)    Explain GROUP BY clause along with example.                      5m
**Q3**      Attempt any three from the following:
  a)    What is a privilege? Explain Grant and Revoke commands with example.    5M
  b)    Explain multiple column subqueries with example.                 5m
  c)    What are set operators? List and explain the any two set operators with example.   5m
  d)    Using Date Time functions, how to calculate age from date of birth?   5m
**Q4**      Attempt any three from the following:
  a)    Explain the different data types used in PL/SQL.                 5M
  b)    List and explain advantages of PL/SQL.                           5m
  c)    Discuss the rules about the block structure in PL/SQL.           5m
  d)    What is transaction? Explain COMMIT, ROLLBACK and SAVEPOINT in transaction.   5m
**Q5**      Attempt any three from the following:
  a)    Explain the PL/SQL control structure with its types and syntax.  5M
  b)    Write a PL/SQL block of code for area of Triangle two times with different values.    5m
        Store the values in table.
  c)    Write short note on %NOTFOUND and %ROWCOUNT attributes on the same table.   5m
  d)    What is exception? Explain the syntax of exception handling in PL/SQL.   5m
**Q6**      Attempt any three from the following:
  a)    How to create and call Stored Procedure? Explain with the help of examples.   5M
  b)    What is subprogram? How to create Modularized and Layered subprogram?   5m
  c)    What are package in PL/SQL? List the benefits of packages.       5m
  d)    Write short note on Data Dictionary and PL/SQL Source Code.      5m
**Q7**      Attempt any three from the following:
  a)    What is Trigger? Explain the syntax of creating trigger with example in PL/SQL.    5M
  b)    Write short note on %TYPE and %ROWTYPE attribute.                5m
  c)    What are Dynamic queries? How to execute PL/SQL Block Dynamically?    5m
  d)    Distinguish between BEFORE and AFTER Triggers with example.      5m
                          ***                                           5m

Marks : 100                                          TIME : 3 hrs

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Note: - 1. Question No. 1 is compulsory.
         2. Every question has an option.
         3. All questions carry equal marks.

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Q.1.   Design the class Customer containing get_custInfo( ) and display_custInfo( ) as     (10)
       two of its methods which will be used for reading and displaying the customer
       information respectively. Where get_custInfo( ) will be private method.

Q.2.   Write any 3 from the following.
       a) List a few areas of application of OOP technology.                             (05)
       b) Differentiate between procedural & object oriented approach.                   (05)
       c) Define the terms Inheritance and polymorphism.                                 (05)
       d) What is structure and class? Explain with example.                             (05)

Q.3.   Write any 3 from the following.
       a) How the member function can define inside class and outside the class.         (05)
       b) Explain what is a copy constructor with suitable program.                      (05)
       C) What are the different types of constructor? Explain any two.                  (05)
       d) Explain what is destructor with example.                                       (05)

Q.4.   Write any 3 from the following.
       a) What is operator overloading? Write any 4 rules to overload operator.          (05)
       b) Explain what is friend class & friend function.                                (05)
       c) Explain the different types of type conversions.                               (05)
       d) Write a program to overload the increment and decrement operator.              (05)

Q.5.   Write any 3 from the following.
       a) Explain the different types of File mode.                                      (05)
       b) Explain the term Virtual function and write the rules for it.                  (05)
       c) Explain the different forms of inheritance.                                    (05)
       d) What is an abstract class? Explain.                                            (05)

Q.6    Write any 3 from the following.
       a) List the Assignment and Append operators of string.                           (05)
       b) Write a short note on C++ exception handling mechanism.                        (05)
       c) When do we use multiple catch blocks? Explain.                                 (05)
       d) Define the terms:-Input stream & Output stream.                                (05)

Q.7.   Write any 3 from the following.
       a) What is Class template? How it is define and call?                            (05)
       b) Write a short note on Function overloading.                                    (05)
       c) Write a short note on iterator classes.                                        (05)
       d) Explain the terms vector and stack.                                            (05)

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(5)

Time: 3hrs

Marks-100

.Note: All Questions are compulsory.

Q1 Answer any 2 of the following    10m

a) Explain about RAID.
b) Write a short note on OS generation.
c) Explain in brief about PCB.
d) Explain Tree Structured Directory.

Q2 Answer any 3 of the following.    15m

a) Define and explain OS in brief.
b) Write a short note on Clustered System.
c) Explain Distributed system in brief.
d) Write a short note on Real Time Operating System.

Q3 Answer any 3 of the following.    15m

a) Write a short note on OS Design and Implementation.
b) Write a short note on Layered architecture.
c) Define system programs and give its types.
d) Write a short note on Virtual Machine.

Q4 Answer any 3 of the following.    15m
a) What is Critical Section Problem?
b) Explain Multi Threading Models.
c) Give 5 state model of a process.
d) Explain different benefits of Threads.

Q5 Answer any 3 of the following.    15m

a) Write a short note on Segmentation.
b) Explain paging in brief.
c) What are the different types of page replacement algorithms for external fragmentation?
d) Write a short note on Swapping.

Q6 Answer any 3 of the following.                                             15m

    a) Explain the concept of Resource Allocation Graph.
    b) Explain Disk Structure in brief.
    c) Write a short note on file sharing and NFS.
    d) What are the four conditions necessary for Deadlock?

Q7 Answer any 3 of the following.                                             15m
    a) Write a short note on Access Matrix.
    b) Explain two level directory structure.
    c) What are different types of Security Problems?
    d) Explain about the capability based system with example.

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S.Y.B.Sc (I.T)
Sem - IV