

2018

COMPUTER SCIENCE — HONOURS

Sixth Paper

Full Marks – 100

The figures in the margin indicate full marks

Candidates are required to give their answers in their own words as far as practicable

Answer **Question No. 1** and **any five** questions, taking at least **one** from each **Group**

1. Answer **any ten** questions : 2 × 10

- (a) What is the application of scope resolution operator :: in C++ ?
- (b) Write two properties of static member function.
- (c) State the importance of destructors.
- (d) When do we use the protected visibility specifier to a class member ?
- (e) What is the difference between a window and view port ?
- (f) What is the principle of animation ?
- (g) Define principal vanishing point.
- (h) What are cohesion and coupling ?
- (i) What do you understand by software failure ?
- (j) Name the different types of software maintenance techniques.
- (k) Define mapping cardinalities.
- (l) Differentiate between domain relational calculus and tuple relational calculus.
- (m) What is the difference between a primary index and a secondary index ?
- (n) Distinguish between procedural DML and non-procedural DML.
- (o) Define null attribute and derived attribute.

Group – A

2. (a) Differentiate between overloading and overriding methods in C++.
 - (b) What do you mean by dynamic initialization of a variable ?
Give an example.
 - (c) Can we have more than one constructor in a class ? — Explain your answer.
 - (d) Create a class FLOAT that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of FLOAT:
$$3+(2+1)+3+7$$
3. (a) Discuss Shallow copy and Deep copy with suitable example.
 - (b) What are the advantages and disadvantages of using friend function ?
 - (c) When do we make a class virtual ?

[Turn Over]

- (d) A class or function template is known as a parameterized class (or function) — Justify. 4+(3+3)+2+4

Group – B

4. (a) Mention the advantages of software reusability.
 (b) Discuss the role of system requirements specification in software life cycle model.
 (c) What are the properties of an SRS ?
 (d) Distinguish between verification and validation process to test a software. 4+3+4+2+3
 (e) Explain the role of "Data Dictionary" in system design. 4+3+4+2+3
5. (a) Write the disadvantages of DFD.
 (b) What are physical and logical data flow diagrams ?
 (c) A software system called RMS calculating software reads three integers from the user in the range of -500 and +500 and determines the root mean square (rms) of the three input numbers and then display it. Construct a DFD (upto level 2) for this system.
 (d) Discuss the process of life cycle testing in brief. 4+4+4+4

Group – C

6. (a) Applying Bresenham's algorithm to draw a line from (4, 4) to (-3, 0).
 (b) Derive the expressions for mid point circle drawing algorithm stating the assumption.
 (c) Write a short note on Bezier Curve. 5+7+4
7. (a) Derive the conditions where the successive transformation of scaling and rotation becomes commutative.
 (b) In 2D clipping, how are lines grouped into visible, invisible and partially visible categories ?
 (c) Use Cohen Sutherland algorithm to clip the line $P_1(70, 20)$ and $P_2(100, 10)$ against a window at the lower left hand corner (50, 10) and upper right hand corner (80, 40). 5+5+6

Group – D

8. (a) We can convert any weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity set ?
 (b) When is the decomposition of R_1 and R_2 of a relation schema R with respect to the functional dependency F said to be a lossless-join decomposition ?
 (c) Discuss division operation in relational algebra. Give suitable examples.
 (d) List two major problems with processing update operations expressed in terms of views. 3+4+5+4

9. (a) Write the basic concepts of functional dependency. Use the definition of functional dependency to argue that each of Armstrong's axioms (reflexivity, augmentation and transitivity) holds good.

(b) Define candidate key.

Compute the closure of the following set F of functional dependencies for relation schema $R = (A, B, C, D, E)$.

$A \rightarrow BC$

$CD \rightarrow E$

$B \rightarrow D$

$E \rightarrow A$

List the candidate keys for R .

(3+4)+(2+7)

10. (a) When are two functional dependencies said to be equivalent ?

Show that the following set of functional dependencies are equivalent :

$F = (A \rightarrow C, AC \rightarrow D, E \rightarrow AD, E \rightarrow H)$ and $G = (A \rightarrow CD, E \rightarrow AH)$.

(b) Given three goals of relational-database design, is there any reason to design a database schema that is in 2NF, but is not in higher-order normal form ? Explain.

(c) Discuss in brief about 3NF. Compare 3NF and BCNF. (1+4)+5+(3+3)

11. (a) When is it preferable to use a dense rather than a sparse index ?

(b) Explain the concept of aggregation. Give a suitable example.

(c) For the following schema of a relational database :

employee (person_name, street, city)

works (person_name, company_name, salary)

company (company_name, city)

manages (person_name, manager_name)

Give an expression in specified languages for each of the queries given below :

(i) Find all employees who live in the same city and on the same street as their managers (SQL).

(ii) Find all employees in the database who do not work for SBI. (Relational algebra)

(iii) Find all employees who earn more than every employee of PNB. (SQL)

3+4+(3+3+3)