ABC(O)CS-II/20

2021

COMPUTER SCIENCE

PAPER-II

Time Allowed — 3 Hours   Full Marks — 200

If the questions attempted are in excess of the prescribed number, only the questions attempted first up to the prescribed number shall be valued and the remaining ones ignored.

*Answers may be given either in **English** or in **Bengali** but all answers must be in one and same language.*

Answer any five *questions.*

1. (a) What is operator overloading? How does the compiler interpret the operator overloading functions? What is the difference between the functions that overload the increment operator in prefix and in postfix format? Give example.   10

   (b) What is the use of class template? Create a function template for the bubble sort algorithm.   2+4=6

   (c) Explain the following terms with suitable example in respect to object oriented programming: 3+3=6

      (i) Data encapsulation

      (ii) Late binding

   (d) Explain the advantages of fibre optics over other modes of communication. If a binary signal is sent over a 3 kHz channel whose signal to noise ratio is 20 dB, what is the maximum achievable data rate?   4+4=8

   (e) Explain the different persistent methods of CSMA.   10

2. (a) What is the need of indexing? Differentiate between primary indexing and secondary indexing. How is hashing different from indexing?   3+4+3=10

   (b) What is normalization? Explain first, second and third normal form using proper example.   2+(4×2)=10

   (c) Write a program with comment to evaluate the following arithmetic statement: 5×2=10

      (i) Using a general register computer with two address instructions.

      (ii) Using an accumulator type computer with one address instructions.

   (d) Explain Prototype model.   10

3. (a) Define the term Quality Assurance. Discuss its importance in system design. **10**

(b) Consider a photocopy shop that follows SJF scheduling. Suppose, the shop owner takes 2min to photocopy a page. Information about five consumers who visit the shop on a particular day is given below:

Customer	Arrival time	Number of pages
C1	10:00 AM	5
C2	10:02 AM	1
C3	10:10 AM	10
C4	10:15 AM	2
C5	10:20 AM	6

Calculate their average turnaround time and average waiting time if the scheduling algorithm is (i) non-preemptive and (ii) preemptive. **10**

(c) Describe a runtime address translation scheme with proper example. **10**

(d) Consider a segmentation based system. At some point in the system operation, the main memory has the following holes and in this order: 21K, 5K, 90K, 54K, 10K, 25K, 56K; there are three new requests for memory of sizes: 10K, 7K and 22K. The system follows FCFS service for memory allocation requests. Explain which holes will be taken for First fit, Worst fit and Best fit memory allocation scheme. **10**

4. (a) Draw the timing diagram of the instruction LDA 9000H for 8085 microprocessor. **16**

(b) Design an up-down counter to count 0 to 9 and 9 to 0 continuously with a 1·5 second delay (frequency 2MHz) between each count and display the count at one of the output ports. Show the delay calculation. **10**

(c) Describe Sutherland-Cohen algorithm. Find the visible portion of the line joining two points P1(–307,631) and P2(820,–136). Given clipping window A(0,0), B(1023,0), C(1023,1023), D(0,1023), apply mid-point subdivision algorithm to find clipped portion within the window. **14**

5. (a) Define the term "Multimedia Interface Design". Write at least 7 rules that need to be followed in the design of computer based instructions. **16**

(b) Worker (worker_id: integer, first_name: string, last_name: string, salary: integer, join_date: string, department: string)

Bonus (worker_ref_id: integer, bonus_date: string, bonus_amount: integer)

Title (worker_ref_id: integer, worker_title: string, affected_form: string)

Based on the above relation schemas answer the following questions: **24**

(i) Write an SQL query to print the first three characters of First_Name from worker table.

(ii) Write an SQL query to print all worker details from the worker table order by First_Name ascending and Department descending.

    (iii) Write an SQL query to fetch worker names with salaries>=50000 and<=100000.

    (iv) Write an SQL query to print details of the workers who have joined in Feb, 2014.

    (v) Write an SQL query to print details of the workers whose salary lies between 100000 and 500000.

    (vi) Write an SQL query to print details of the workers who are also managers.

6. (a) Explain ambiguous grammer G : E → E + E | E * E | (E) | –E | id for the sentence id+id*id.   10

  (b) Construct SLR parsing table for the following grammer: G : E → E + T | TT | → T * F | FF → (E) | id.   15

  (c) Explain each step of compilation using proper example.   15

7. (a) Explain in detail various error detection and correction codes with examples.   10

  (b) Explain Booth's algorithm for multiplying binary integer in signed 2's complement representation.   15

  (c) Explain various types of addressing modes.   15

8. Write short notes on *any four* of the following: 10×4=40

    (i) RSA algorithm

    (ii) Three level architecture of DBMS

    (iii) Shared-Memory Multiprocessor Architecture

    (iv) JPEG compression

    (v) Safety algorithm

    (vi) Coupling and Cohesion

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