University of Central Punjab

FOITCS Graduate Programs – Sample Paper

Total Marks: 60 **Time Duration: 90 Minutes**

Sections	Marks
English	15
Analytical & Quantitative	15
Specialization	30

English

1. Bede, the author of A History of the English Church and People, was so widely _____ that he has been almost universally known as "The Venerable Bede" since the ninth century. Select one: (MCQ - CHOOSE ONE)

- Esteemed
- Diminished
- Consoled
- Criticized
- Defamed

2. Worried that he had lost the support of his party, the Prime Minister forcefully _____ his controversial statement that healthcare would not be a priority. Select one: (MCQ - CHOOSE ONE)

- Ignored
- Validated
- Affirmed
- Denied
- Overlooked

3. In addition to the detailed written regulations regarding play, a novice golfer must also learn the _____, but nonetheless important, rules of etiquette. Select one: (MCQ - CHOOSE ONE)

- Implied
- Brief
- Manifest
- Isolated
- Express

4. It is difficult to provide _____ proof for the existence of ghosts and other spiritual beings that remain unseen by the majority of the population. Select one: (MCQ - CHOOSE ONE)

- Uncanny
- Demonstrable
- Momentous
- Skeptical
- Daunting

5. Wealth and technology wrought by industrialization gave nations in the northern hemisphere strategic _____. This included sophisticated weaponry that could easily overpower the more _____ arms held by the countries of the southern hemisphere. Select one: (MCQ - CHOOSE ONE)

- Consequence , Complicated
- Consequence , Risky
- Adoration , Complicated
- Adoration , Risky
- Advantage , Rudimentary

6. Sylvia Plath was not as _____ a poet as was her husband Ted Hughes, having produced just two volumes of poetry in her short lifespan. Select one: (MCQ - CHOOSE ONE)

- Dejected
- Constructive
- Joyful
- Celebrated
- Satiric

7. E.L. Doctorow argues that the role of artists in the 21st century is to provide a reminder that even in
_____world, one thing is_____: America will always be a nation of _____ free expression. Select one: (MCQ - CHOOSE ONE)

- An idiosyncratic , Egregious , Jingoistic
- An idiosyncratic , Autonomous , Circumscribed
- An Arcadian , Egregious , Jingoistic
- An Arcadian , Egregious , Circumscribed
- A volatile , Immutable , Unfettered

8. A mathematician should not automatically reject theorems that might at first seem witless or juvenile; advanced degrees are not a license for _____, nor do they _____ arrogance or egotism. Select one: (MCQ - CHOOSE ONE)

- Substantiation , dispel
- Pride , sanction
- Substantiation , cultivate
- Silliness , cultivate
- Silliness , dispel

9. After a series of storms, the once arid landscape became _____ for the first time in many months. Select one: (MCQ - CHOOSE ONE)

- Green
- Barren
- Transparent
- Harmless
- Dismal

10. While some academics applaud the modernist movement in many universities to treat history and fiction as inherently related fields, there remains a vocal group of traditional historians and literary critics who _____ such _____ worldview and insist that the_____ nature of the two disciplines must be inviolate. Select one: (MCQ - CHOOSE ONE)

- Admire , A dogmatic , Logical
- Celebrate , An axiomatic , Intertwined
- Ridicule , A heretical , Separate
- Celebrate , A dogmatic , Logical
- Admire , A dogmatic , Intertwined

11. The politician insisted that he did not seek to enrich himself during the campaign, but the ethics committee concluded that he was motivated by _____. Select one: (MCQ - CHOOSE ONE)

- Hostility
- Apprehension
- Greed
- Charity
- Compassion

12. A good editor must be able to quickly _____ excellent submissions from a pile of dross, distinguishing the best offerings from the worst in an efficient manner. Select one: (MCQ - CHOOSE ONE)

- Consolidate
- Scrutinize
- Integrate
- Plot
- Intimate

13. "Out of sight, out of mind" is a useful _____ for those who cannot develop a logical argument to defense their failure to be concerned about poverty in foreign nations. Select one: (MCQ - CHOOSE ONE)

- Maxim
- Query
- Allusion
- Waiver
- Fallacy

14. The con artist was so _____ that he most often left his victims feeling pleased that they had given him their money. Select one: (MCQ - CHOOSE ONE)

- Innocent
- Cunning
- Crafty
- Maladroit
- Unskillful

15. Possessing few natural resources upon its newly-granted independence in 1863, Singapore remained economically _____ until an influx of industrialization and foreign investment took hold there. Select one: (MCQ - CHOOSE ONE)

- Powerful
- Fortuitous
- Prosperous
- Dubious
- Solvent

Analytical

1. 8, 20, 36, 56, ... (MCQ - CHOOSE ONE)

- 80
- 100
- 64
- 84

2. 11, 33, 55, 77, ... (MCQ - CHOOSE ONE)

- 99
- 88
- 121
- 101

3. RAP, MAP, HOT, FUN, ... (MCQ - CHOOSE ONE)

- HNE
- PGI
- STN
- CAT

4. PAT, PEN PIN, POT,... (MCQ - CHOOSE ONE)

- PIG
- PET
- PUT
- POT

5. CALENDER is coded in a code as CLANAEDR. Find the code for CIRCULAR under the same rule. (MCQ - CHOOSE ONE)

- LACANDER
- CRIUCALR
- CLANADER
- None of these

6. In a code language 35796 is written as 44887. Find the code for 46823. (MCQ - CHOOSE ONE)

- 55914
- 57194
- 55934
- 55745

7. If 84x13=8, 37x13=6, 26x11=6, then 56x22=? (MCQ - CHOOSE ONE)

- 36
- 39
- 7
- 11

Quantitative

1. How many pillars are needed to construct a bridge of 300 meter long, if pillars are at a distance of 12
½ meters each. (MCQ - CHOOSE ONE)

- 22
- 24
- 25
- None of these

2. If 1 = 1, 2 = 4, 3 =1 0 and 4 = 22, then 5 = ? (MCQ - CHOOSE ONE)

- 39
- 34
- 44
- 46

3. Insert the numerical signs in the following numerical figure. 8 8 2 1 = 14 (MCQ - CHOOSE ONE)

- -,+,-
- -,/,x
- x,/,-
- +,-,x

4. The ratio of boys and girls in a school is 3:2, 20% of boys and 25% of girls are scholarship holders. The percentage of students who are scholarship holder are? (MCQ - CHOOSE ONE)

- 45
- 35
- 60
- 22

5. Change the sign to find the equation 48 - (3+4) + (2x2) = 0 (MCQ - CHOOSE ONE)

- Change + into x
- Change x into +
- Change - into +
- Change + into –

6. If TOUR is written as 1234, CLEAR is written as 56784 and SPARE is written as 90847, find the code for CARE (MCQ - CHOOSE ONE)

- 1247
- 4847
- 5247
- 5847

7. In a code language 256 means 'you are good', 637 means 'we are bad', 358 means 'good and bad'. Find the code for 'and'. (MCQ - CHOOSE ONE)

- 2
- 5
- 8
- 3

8. If Gun is coded as HVO, find the code for PEN. (MCQ - CHOOSE ONE)

- QFO
- CDP
- RST
- NOT

Specialization

Topic: Data Structure and Algorithms

1. In a queue, if front is initialized to zero, and rear is initialized to 1, the correct code for insert function would be _____. (MCQ - CHOOSE ONE)
   - void insert(int x) { item[++front]=x; }
   - void insert(int x) { item[++rear]=x; }
   - void insert(int x) { item[front++]=x; }
   - void insert(int x) { item[rear++]=x; }

2. The operation for adding an entry to a stack is traditionally called: (MCQ - CHOOSE ONE)
   - add
   - append
   - insert
   - push

3. Pre-order traversal of the BST constructed by inserting the nodes 40, 50, 30, 35, 55 would be _____. (MCQ - CHOOSE ONE)
   - 40, 30, 35, 50, 55
   - 40, 35, 30, 50, 55
   - 40, 30, 35, 55, 50
   - None of these

4. IS A relationship in C++ is (MCQ - CHOOSE ONE)
   - Inheritance
   - Encapsulation
   - Composition
   - None of the above

5. Abstract class cannot have _____. (MCQ - CHOOSE ONE)
   - Zero instances.
   - Multiple instances.
   - Both Zero instances & multiple instances.
   - None of these options

6. The operation of processing each element in the list is known as (MCQ - CHOOSE ONE)
   - Sorting
   - Merging
   - Inserting
   - Traversal

7. Which of the following statements accesses the 10th element of an array? (MCQ - CHOOSE ONE)
   - A[10]
   - A[9]
   - A[9+1]
   - Both 1st and 3rd option

Topic: Operating System

8. Which of the following are NOT one of the Coffman's conditions that lead to a deadlock. (MCQ - CHOOSE ONE)
   - Progress
   - Hold & Wait
   - No Pre-emption
   - Circular Wait

9. Which of the following best describes medium-term scheduling? (MCQ - CHOOSE ONE)
   - It controls the degree of multiprogramming.
   - This relates to processes that are in a blocked or suspended state.
   - Is part of the swapping function.
   - makes the finest-grained decision of which process should execute next

10. What is cycle stealing? (MCQ - CHOOSE ONE)
    - A process forces another process to relieve control of CPU
    - DMA controller may force the CPU to temporarily suspend operation
    - Amount of CPU cycles spent in pre-emptive scheduling policy
    - None of the above

11. Define access time with respect to disk I/O. (MCQ - CHOOSE ONE)
    - Time required to move the disk arm to the required track.
    - The time it takes for the beginning of the required sector to reach the head.
    - Sum of option A and B.
    - Time taken to actually transfer a span of data.

Topic: Computer Networks

12. To determine a suitable path between the source and destination nodes through the Internet, the following can be used: (MCQ - CHOOSE ONE)
    - Spanning tree protocol
    - Routing Information Protocol
    - Hypertext transfer protocol
    - both (a) & (b)

13. Digital networks consist of one or more _____ that work together to transmit information to the correct user. (MCQ - CHOOSE ONE)
    - Routers
    - Switches
    - Hubs
    - None of these

14. Three (3) basic devices are used in setting up a single Network. Which of the following best describes these devices? (MCQ - CHOOSE ONE)
    - NIC(Ethernet), Hub, Twisted pair/Coaxial cable
    - Disk drive, CPU, Hub
    - Hub, CPU, NIC(Ethernet)
    - Disk drive , Hub, NIC(Ethernet)

15. Which of the following performs modulation and demodulation? (MCQ - CHOOSE ONE)
    - fiber optics
    - satellite
    - coaxial cable
    - modem
    - none of the above

Topic: Introduction to Database

16. The definition "EMP(ENO, ENAME, TITLE, SAL, PNO, RESP, DUR)" represents a (MCQ - CHOOSE ONE)
    - Relation
    - Relation extension
    - Relation Scheme
    - None of them

17. The following reflects a _____ anomaly' "if the salary of an employee is raised, then multiple tuples have to be changed to reflect this raise." (MCQ - CHOOSE ONE)
    - Deletion
    - Removal
    - Insertion
    - None of them

18. What is a 'tuple'? (MCQ - CHOOSE ONE)
    - Another name for a table in an RDBMS
    - A row or record in a database table
    - An attribute attached to a record
    - Another name for the key linking different tables in a database

19. Which particular level of data "Rashid in DBMS class" represents? (MCQ - CHOOSE ONE)
    - Real-World
    - Metadata
    - Data Occurrence

Topic: Software Engineering

20. In black-box testing, test cases are derived from (MCQ - CHOOSE ONE)
    - The code
    - The specification
    - The flowchart of the program
    - None of these

21. The term "Software" refers to _____ (MCQ - CHOOSE ONE)
    - Process + Artifacts + Program
    - Product + Artifacts + Program
    - Process + People + Program
    - Process + Product + Program
    - None

22. Which of the following is/are symptom of software failure? (MCQ - CHOOSE ONE)
    - Poor quality
    - Poor testing
    - Control Changes
    - Modules don't fit
    - None

23. Which of the following is not related with Software Requirement Engineering? (MCQ - CHOOSE ONE)
- Something that is needed in order for something to happen
- Something that a rule, law, contract, etc. states that you must do
- Set of connected things that work together for a particular purpose
- Capability needed by the user to solve a problem to achieve an objective
- All of them

Topic: Design and Analysis of Algorithm

24. Which of the following sorting algorithms has O(n log n) time complexity on average, but O(n2)time complexity in the worst case? (MCQ - CHOOSE ONE)
- Heap sort
- Quick sort
- Bubble sort
- Selection sort

25. How many swappings will occur if the list 50, 40, 30, 20, 10 is sorted in ascending order using Selection Sort ? (MCQ - CHOOSE ONE)
- 10
- 8
- 6
- 4
- 2

26. Suppose we are sorting an array of ten integers using a some quadratic sorting algorithm. After four iterations of the algorithm's main loop, the array elements are ordered as shown here:
1 2 3 4 5 0 6 7 8 9
Which statement is correct? (Note: Our selectionsort picks largest items first.) (MCQ - CHOOSE ONE)
- The algorithm might be either selectionsort or insertionsort.
- The algorithm might be selectionsort, but could not be insertionsort.
- The algorithm might be insertionsort, but could not be selectionsort.
- The algorithm is neither selectionsort nor insertionsort.

Topic: Theory of Automata

27. Deterministic Finite Automata is defined as a n-tuple where n is (MCQ - CHOOSE ONE)
- 3
- 4
- 5
- 6

28. If n is the number of states, the running time of Deterministic Finite Automata is (MCQ - CHOOSE ONE)
- O(n)
- O(n log n)
- O(n2)
- O(1)

29. Finite Automata is allowed to use what type of memory? (MCQ - CHOOSE ONE)
    - No Memory
    - Tape Memory
    - Stack Memory
    - Queue Memory

30. Choose the best answer (MCQ - CHOOSE ONE)
    - Turing Machines can be used to accept or reject strings
    - Turing Machines can be used to calculations
    - Both (a) and (b)
    - None of the above

Reference Material for preparation:

Data Structure and Algorithms

Book: Data Structures and Algorithms Made Easy by Narasimha Karumanchi
- Chapter 1: Introduction
- Chapter 3: Recursion and Backtracking
- Chapter 5: Linked Lists
- Chapter 6: Stack
- Chapter 7: Queue
- Chapter 8: Trees
- Chapter 10: Heap
- Chapter 11: Graph Theory
- Chapter 13: Hashing
- Chapter 20: Complexity Classes

Book: Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein
- Chapter 3: Growth of Functions
- Chapter 6: Heapsort
- Chapter 10: Elementary Data Structures
- Chapter 11: Hash Tables
- Chapter 12: Binary Search Trees
- Chapter 13: Red-Black Trees
- Chapter 15: Dynamic Programming
- Chapter 16: Greedy Algorithms
- Chapter 22: Elementary Graph Algorithms
- Chapter 23: Minimum Spanning Trees
- Chapter 24: Single-Source Shortest Paths

Reference Book:

Book: Algorithms by Robert Sedgewick and Kevin Wayne
- Chapter 1: Fundamentals (Sections 3-5)
- Chapter 2: Sorting (Sections 1-4)
- Chapter 3: Searching (Sections 1-5)
- Chapter 4: Graphs (Sections 1-5)

Object Oriented Programing

Book: Object-Oriented Thought Process by Matt Weisfeld

- Chapter 1: Introduction to Object-Oriented Concepts
- Chapter 3: How to Think in Terms of Objects
- Chapter 4: Advanced Object-Oriented Concepts
- Chapter 5: The Anatomy of a Class
- Chapter 6: Class Design Guidelines

Book: Practical Object-Oriented Design: An Agile Primer Using Ruby by Sandi Metz

- Chapter 1: Object-Oriented Design
- Chapter 2: Designing Classes with a Single Responsibility
- Chapter 3: Managing Dependencies
- Chapter 4: Creating Flexible Interfaces
- Chapter 6: Acquiring Behavior Through Inheritance

Reference Books

Book: Object-Oriented Analysis and Design with Applications by Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston

- Chapter 3: The Object Model
- Chapter 5: Classifying Objects
- Chapter 6: Object Responsibilities

Book: Clean Code: A Handbook of Agile Software Craftsmanship by Robert C. Martin

- Chapter 10: Classes

Operating System

Book: Operating System Concepts.
Ninth Edition, Silberschatz, Galvin and Gagne

Chapters

1. Introduction
2. Operating-System Structures
3. Processes
4. Threads
5. Process Synchronization
6. CPU Scheduling
7. Deadlocks
8. Memory Management
9. Virtual Memory
10. Mass-Storage Structure

Computer Networks

Book: "Data Communications and Networking" by Behrouz A. Forouzan

- Chapter 1 Introduction
- Chapter 2 Network Models
- Chapter 11 Data Link Control
- Chapter 13 Wired LANs: Ethernet
- Chapter 14 Wireless LANs
- Chapter 20 Network Layer: Internet Protocol
- Chapter 31 Network Security

Book: "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross

- Chapter 1 Computer Networks and the Internet
- Chapter 2 Application Layer
- Chapter 3 Transport Layer
- Chapter 4 The Network Layer
- Chapter 6 The Link Layer and LANs
- Chapter 7 Wireless and Mobile Networks

Book: “Computer Networks: A Systems Approach” by Larry L. Peterson, Bruce S. Davie

- First 5 Chapters

Reference Books

Book: "TCP/IP Illustrated, Volume 1" by W. Richard Stevens

Book: "Computer Networks and Internets" by Douglas E. Comer

Introduction to Database

Book-1
FUNDAMENTALS OF Database Systems
Ramez Elmasri, Shamkant B. Navathe

- Chapter 1 Databases and Database Users
- Chapter 2 Database System Concepts and Architecture
- Chapter 3 The Relational Data Model and Relational Database Constraints
- Chapter 4 Basic SQL
- Chapter 5 More SQL: Complex Queries, Triggers, Views, and Schema Modification
- Chapter 7 Relational Database Design by ER- and EER-to-Relational Mapping
- Chapter 11 Object and Object-Relational Databases
- Chapter 13 Introduction to SQL Programming Techniques
- Chapter 15 Basics of Functional Dependencies and Normalization for Relational Databases
- Chapter 16 Relational Database Design Algorithms and Further Dependencies

Book-2
Database Systems. A Practical Approach to Design, Implementation, and Management.
6th Edition
Thomas Connolly • Carolyn Begg

- Chapter 1 Introduction to Databases
- Chapter 2 Database Environment
- Chapter 3 Database Architectures and the Web
- Chapter 4 The Relational Model
- Chapter 5 Relational Algebra and Relational Calculus
- Chapter 6 SQL: Data Manipulation
- Chapter 7 SQL: Data Definition
- Chapter 12 Entity–Relationship Modeling
- Chapter 13 Enhanced Entity–Relationship Modeling
- Chapter 14 Normalization
- Chapter 15 Advanced Normalization
- Chapter 22 Transaction Management
- Chapter 23 Query Processing
- Chapter 24 Distributed DBMSs—Concepts and Design
- Chapter 25 Distributed DBMSs—Advanced Concepts

Reference Book-1
Introduction to Database Systems
8th Edition
C. J. Date

Reference Book-2
Database Management Systems Paperback
3rd Edition
Johannes Ramakrishnan Raghu; Gehrke

Software Engineering

Book Title: Software Engineering.
Author: Roger S. Pressman.
Referred sections: Part 1-4 (Software Processes, Modeling, Quality Management, Managing Software Projects).

Design and Analysis of Algorithm
Topics:
1. Introduction to analysis of algorithms
2. Insertion sort, merge sort
3. Asymptotic notation, recurrences, substitution
4. Master method
5. Divide and conquer, strassen, Fibonacci polynomial multiplication
6. Quicksort, randomized algorithms
7. Linear time sorting, lower bounds, counting sort, radix sort
8. Order statistics median
9. Hashing and hash functions
10. Universal hashing, perfect hashing

11. Relation of bsts to quick sort, analysis of random bst
12. Red black trees, rotations, insertions, deletions
13. Augmenting data-structures, dynamic order statistics, interval trees
14. Skip-lists
15. Amortized-algorithms-table-doubling-potential-method
16. Competitive-analysis-self-organizing-lists
17. Dynamic-programming
18. longest-common-subsequence
19. Greedy-algorithms
20. Minimum-spanning-trees
21. Class & Method Design
22. Shortest paths
23. Dijkstras algorithm
24. Breadth-first-search

Reference Books

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press, 2009 (3rd Edition).
2. Algorithms, Richard Johnsonbaugh, Marcus Schaefer, Prentice Hall, 2003.
3. Algorithm Design, Jon Kleinberg, Va Tardos, Pearson Education, 2011(2nd Edition).
4. Introduction to the Design and Analysis of Algorithms, Anany Levitin, Addison-Wesley, 2011

Theory of Automata

1. Introduction to Automata
2. Course Syllabus, Organization, Review of Set Theory
3. Formal Language, Definition, Examples
4. Regular Languages, Finite Automata
5. Deterministic Finite Automata, Design and working of Deterministic State Machine
6. Closure and decision properties
7. Non-Deterministic Finite Automata with and with-out lambda transition, Design and working of Non-Deterministic State Machine with or without lambda transition
8. Equivalence of NFA with and without lambda transition to DFA
9. Regular Expression its working and closure properties
10. Equivalence among Regular Expression and Finite State Machine
11. Non-regular languages and Context Free Languages
12. Difference between Regular and Context Free Languages
13. Definition, working & Closure properties of CFGs
14. Ambiguity, Parse Tree and derivation
15. Deterministic and Non-Deterministic Push Down Automata
16. Turing Machine

Textbook: John C. Martin. *Introduction to Languages and the Theory of Computation*. Fourth Edition. 2003. McGraw-Hill. ISBN: 0-07-115468-X (International Students Edition).

Reference Books:

1. John E. Hopcroft. Jeffery D. Ullman. *Introduction to Automata Theory, Languages, and Computation*. 1979. Addison-Wesley. ISBN 0-201-02988
2. T.A. Sudkamp: Languages and Machines (Addison-Wesley, 2nd Edition, 1997)
3. Harry R. Lewis, Christos H. Papadimitriou: Elements of The Theory of Computation, Second Edition, 1998.
4. Daniel I. A. Cohen. *Introduction to Computer Theory*. Second Edition. 1997. John Wiley & Sons. ISBN: 0-471-13772-3.
5. Michael Sipser. *Introduction to the Theory of Computation.* 1997. PWS Publishing Company.