PUNJAB PUBLIC SERVICE COMMISSION

COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE-2019

SUBJECT: COMPUTER SCIENCE (PAPER-I)

TIME ALLOWED: THREE HOURS **MAXIMUM MARKS: 100**

NOTE: Attempt Any FIVE Questions in All, Please attempt AT LEAST 1 Question from each Section

SECTION-A

Q No.1: **a)** Write an algorithm to find an element from a SORTED array A[] consisting of N elements using binary search.

b) Convert 9948 into Binary, Octal, and Hexadecimal representations.

c) What is the difference between Thin Client and Thick Client application, explain with the help of an example? **(10+5+5=20 Marks)**

Q No.2: **a)** Prime number is a number that is completely divided by itself or by 1, e.g. 3, 5, 9 are primer numbers. You are supposed to write a function in C++ or Java to find if an input number is prime or not. Use the following signature:

bool isPrime(int number)

b) We need to build a software system that needs to manage the data of a departmental store where we sell many Items, each item has a name, id, and price. The system should store the name, id, date of birth, joining date, and salary of all the employees. We also need to generated invoices (bills) for all the transactions where we need to store the items purchased, quantity of an item, and the record of the employee who generated that invoice.

i. Identify the classes and their attributes that will be used in this scenario.

ii. Extract one example of Composition of classes from your identified classes. **(10+10=20 Marks)**

SECTION B

Q No.3: **a)** What is the meant by parity bit?

b) Draw the XOR & XNOR Gates.

c) Simplify the Boolean function using k-map and draw the circuit diagram.

$F x(, y,z) = \Sigma(1,3,5,6,7)$

d) Design a full adder circuit with the two half adders. Draw block & circuit diagram and truth table. **(2+2+6+10=20 Marks)**

Q No.4: **a)** Define OSI model and explain the functioning of each layer in OSI model.

b) Define HDLC. Explain different frame formats with control field used by HDLC?

c) What are the characteristics of fast Ethernet? **(10+7+3 =20 Marks)**

P.T.O

Q No.5: **a) Explain the following connecting devices:**

i) Passive hub ii) Repeater iii) Bridge

iv) Router v) Gateway

b) What is difference between Combinational logic & Sequential logic? Explain with diagram.

c) What are the differences between TCP and UDP header formats?

(10+5+5=20 Marks)

SECTION C

Q No.6: **a)** Recent software development is employing Agile Software Development Process. Scrum is one of the widely used processes for agile software development. Please explain the Scrum methodology in detail?

b) Write an algorithm for a function void addNodeSorted(int data) that adds a new node in a sorted linked list so that the list remains sorted.

(10+10=20 Marks)

Q No.7: **a)** What is Semaphore? How is it useful in the working of an Operating System?

b) Explain the concept of Page Fault and the situations in which page fault occurs.

c) What is the concept of Virtual Memory, and how does it increase the performance of an operating system?

d) Graph is one of the most widely used application data structure for real life problems. Discuss two real life scenarios where Graph is the best suitable data structure.

(4 X5=20 Marks)

Q No.8: **a)** What is the complexity of the following algorithms?

i) Quick Sort ii) Bubble Sort iii) Binary Search

iv) Graph Traversal v) Heap Sort

b) What are two main advantages of Block Chain Technology?

c) Write a function void searchElement(int data) to find a data element in a Binary Search Tree.

d) What are the main components of a compiler?

(4x5=20 Marks)

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SUBJECT: COMPUTER SCIENCE (PAPER-II)

TIME ALLOWED: THREE HOURS **MAXIMUM MARKS: 100**

NOTE: **Attempt FIVE Questions in All. Calculator is allowed. (Not programmable)**

Q. No. 1:
a) What are regular expressions in a language and how it can be built and beneficial in context of its implementation? Justify with the help of suitable two examples?
b) Define terms for context free grammar (CFG) such as parse **trees, ambiguous grammars, left and right most derivations and Document type Definitions (DTD)?**
c) Enlist any three programming techniques in Turing Machines? Explain any two with the help of examples. **(10+5+5=20 Marks)**

Q. No. 2:
a) Find parse trees, left most and right most derivations for each of the following statements?
i) (b,b) ii) (b,(b,b)) iii) (b,((b,b),(b,b)))
b) What is a code generator in compilers? Draw the position of code generator and explain issues of code generator with suitable examples?
(12+8=20 Marks)

Q. No. 3:
a) What are the advantages and disadvantages of Multi-pass Compiler compared to a One-pass compiler.
b) Discuss different issues related to Memory management and instruction selection in the design of Code generator. **(10+10=20 Marks)**

Q. No. 4:
a) Differentiate between Raster scanning and Random Scanning techniques.
b) What is meant by Clipping also explain any one clipping algorithm.
(10+10=20 Marks)

Q. No. 5:
a) Describe advantages and disadvantages of SQL in relational databases with the help of suitable examples.
b) What is normalization in Databases and explain two approaches to convert a Unnormalized Form (UNF) Table to First and Second Normalized Form (1NF & 2NF) relation(s) with the help of suitable examples?
(10+10=20 Marks)

Q. No. 6:
a) Describe various CPU scheduling algorithms and justify your answer with the help of suitable examples?
b) Explain the structure of a distributed operating system and its advantages?
(10 + 10=20 Marks)

Q. No. 7:
a) Define Testing and explain the difference between white box testing and black box testing.
b) Describe the role of Risk analysis in an evolutionary process model like the "spiral Model". **(10 + 10=20 Marks)**

Q. No. 8:
a) Differentiate between
i) Strong A1 and Weak A1.
ii) Supervised and Unsupervised Learning.
b) Use the trapezoidal rule of numerically integrate f(x) from a=0 to b=2, where

$$f(x) = 0.2 + 25x + 3x^2$$

Also computer Relative Error
(10 + 10=20 Marks)