



PUNJAB PUBLIC SERVICE COMMISSION
COMBINED COMPETITIVE EXAMINATION
FOR RECRUITMENT TO THE POSTS OF
PROVINCIAL MANAGEMENT SERVICE, ETC -2022
CASE NO. 2C2023

SUBJECT: COMPUTER SCIENCE (PAPER-I)

TIME ALLOWED: THREE HOURS

MAXIMUM MARKS: 100

NOTE:

- i. All the parts (if any) of each Question must be attempted at one place instead of at different places.
- ii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
- iii. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- iv. Extra attempt of any question or any part of the question will not be considered.

NOTE: Attempt FIVE Questions in All. Attempt at least ONE question from each Section.

SECTION-A

- Q No.1:**
- a) The instruction set architecture (ISA) is the set of basic instructions that a processor understands. Historically, there are two philosophies of instruction sets. Write down the names of these two philosophies.
 - b) Differentiate between Compilers and Interpreters. Give at least two differences.
(6+14=20 Marks)

- Q No.2:**
- a) How would you define a function in programming language? Explain the main components of a function.
 - b) Write a program in any programming language to add the matrix of 3X3 using arrays.
(10+10=20 Marks)

- Q No.3:**
- a) How program testing is done? Explain different types of software testing in detail.
 - b) Write a program using functions to differentiate between pass by value and pass by reference.
(10+10=20 Marks)

SECTION-B

- Q No.4:**
- a) Consider yourself as the network administrator for a surveillance company. Your company has offices in several countries, and they need to create a network that allows those offices to connect with one another. In this situation, you must determine the type of network that will emerge.
 - b) Thick Ethernet uses thick coax cable. Transceiver or drop cables connect NIC to transceiver. Different machines send data on the cable which can cause reflectance that in turn damages the data. Keeping in view thick Ethernet, you are required to answer the following questions:
 - i. Which device is used to avoid the Reflectance of signal?
 - ii. Which form of signal does AUI carry?**(8+12=20 Marks)**

- Q No.5:** a) What do you know about Minterms and Maxterms? Also explain sum of Minterms and Product of Maxterms with examples.
b) Define Logic Gates. Enlist the Digital Logic Gates alongwith their names, graphical symbols, algebraic functions & Truth Tables. **(10+10=20 Marks)**

- Q No.6:** a) What is meant by adder? Explain half adder and full adder with example.
b) Draw the NAND logic diagram for each of the following using multiple-level NAND gate circuits:
i. $(AB' + CD')E + BC(A + B)$
ii. $w(x + y + z) + xyz$ **(10+5+5=20 Marks)**

SECTION-C

- Q No.7:** a) Write down the three ways in which we can implement the Queue data structure.
b) What is the output of following program?

```
MyQueue q;  
MyStack s;  
q = new MyQueue();  
s = new MyStack();  
s.push(5);  
s.push(6);  
s.push(7);  
q.enqueue(s.pop());  
q.enqueue(5);  
cout<<s.pop();  
q.enqueue(6);  
cout<< q.dequeue();  
s.push(q.dequeue());  
cout<<s.pop();  
cout<<s.pop();
```

(6+14=20 Marks)

- Q No.8:** a) Consider performance of FCFS algorithm for three computer-bound processes. If process P1 takes 24 seconds, P2 takes 3 seconds and P3 takes 3 seconds and processes arrive in the given order P1, P2, P3. You need to calculate the following.
i. Turnaround time per process
ii. Average turnaround time of processes

- b) Enlist the four conditions of the deadlock. **(12+8=20 Marks)**

- Q No.9:** a) What do you know about inter process communication? Explain semaphores and binary semaphores in detail
b) In which technique paging and segmentation are combined? Explain with example. **(10+10=20 Marks)**



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SUBJECT: COMPUTER SCIENCE (PAPER-II)

TIME ALLOWED: THREE HOURS

MAXIMUM MARKS: 100

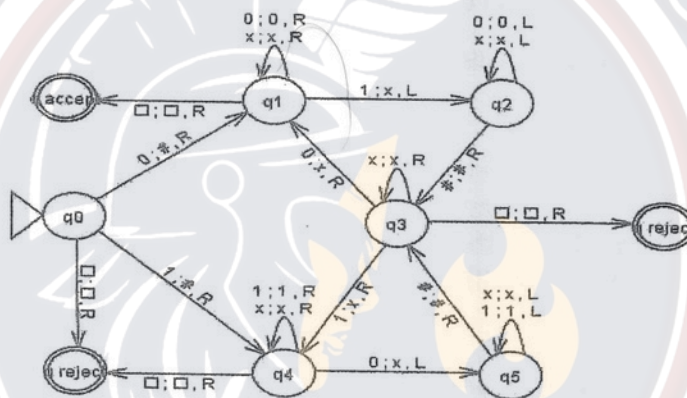
NOTE:

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- No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
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NOTE: Attempt any FIVE Questions in All. Calculator is allowed (Non-Programmable)

Q.No.1

Following is a state diagram of a TM. q0 is the start state, "q accept" is the accept state and "q reject" is the reject state.



Does the TM accept the string 1100? Show the execution of the TM on the input by giving the sequence of configurations from the start to the halting configuration.

(20 Marks)

Q.No.2

(a) Construct a Context Free Grammar (CFG) for possible sequences of if and else in 'C'.

(b) Find the moves of the above grammar to derive the if - else sequence of the string: ifeie.

(20 Marks)

Q.No.3

The table below shows the values of the function $f(x)$ at various points x :

x	0	1	2	3	4
$y = f(x)$	1	3	5	7	9

(a) Use Lagrange interpolation to find the polynomial of degree 4 that passes through all the given points.

(b) Use polynomial approximation to approximate $f(1.5)$ and $f(2.5)$.

(15+5=20 Marks)

P.T.O

Q.No.4

A)

I) Convert the following table into 1st normal form.

emp_id	emp_name	emp_address	emp_mobile
101	James	UK	2390231
102	Asad	Lahore	881212 9900012
103	Ron	US	8881212
104	Rocky	Paris	12300 80345

II) Convert the following table into 2nd normal form.

teacher_id	subject	teacher_age
111	Biology	38
111	Physics	44
222	Chemistry	38
333	Physics	49
333	Maths	40

B) What is the Hierarchical data model? Explain the hierarchical data model in detail.

C) Explain "Group By" Clause in SQL.

(7+7+6=20 Marks)

Q.No.5

(a) Consider the case, where we are using beam search as an NLP for searching computational cost. Beam search provides a tradeoff between accuracy versus computational cost as of the flexible choice. It is referred to as greedy search algorithm because of its projection. The sample nodes are given as:

Given:

The process of beam search involves:

Beam Size=2

Maximum length of an output sequence= 3.

The candidate nodes output sequences are AA, CC, ABAB, CECE, ABDABD, and CEDCED.

You are required to backtrack the searching nodes and draw/give the tree for that beam search.

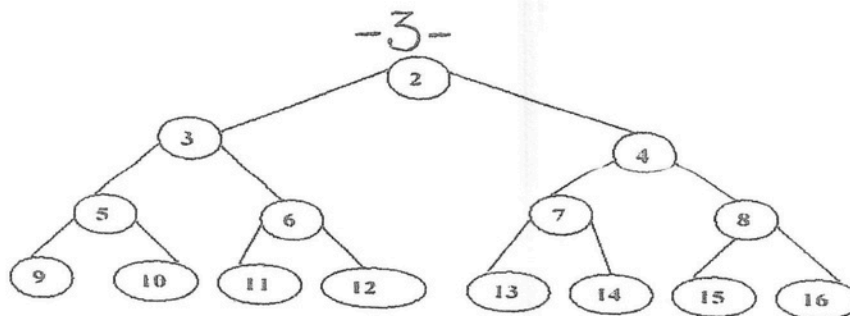
(b) Apply the Breadth First Search in the formation of tree data structure as given below to figure out your goal state.

Given: Goal state is 5.

Note:

- 1) Just mention the values of 'Q' and 'Visited' queues/lists at every step.
- 2) No need to draw tree for showing any step.

Contd.....P/3



(10+10=20 Marks)

Q.No.6

"Partition Testing" is one of the strategies to help you select the test cases for testing your system. In Partition testing, you identify groups of inputs that have common characteristics and should be processed in the same way. You should choose tests from within each of these groups.

Now consider a method named "RemoveBlankSpaces" which replaces a sequence of blank spaces with a single space character. Identify the testing partitions and derive a set of tests (i.e. write down the strings that you will test and the test case that will be applied) for the "RemoveBlankSpaces" method.

(20 Marks)

Q.No.7

- A) What is the intelligent agent in AI, and where are they used?
- B) What is overfitting? How can it be overcome in Machine Learning?
- C) What is game theory? How is it important in AI?

(7+6+7=20 Marks)

Q.No.8

Consider the Incremental line algorithm (given below) for drawing a straight line. Two points (2, 3) and (5, 6) are given. You are required to run this algorithm for these points to draw a straight line. Also show the values of variables at each step/iteration against every instruction.

Incremental_line (Point p1, Point p2)

$dx = p2.x - p1.x$

$dy = p2.y - p1.y$

$m = dy / dx$

$x = p1.x$

$y = p1.y$

$b = y - m * x$

if $|m| < 1$

for counter = p1.x to p2.x 8 times

drawPixel (x, y)

$x = x + 1$

$y = m * x + b$

else

for counter = p1.y to p2.y

drawPixel (x, y)

$y = y + 1$

$x = (y - b) / m$

(20 Marks)