PUNJAB PUBLIC SERVICE COMMISSION

COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE -2020

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.

Attempt Any FIVE Questions in All, Please attempt AT LEAST ONE Question from each Section

SECTION-A

Q No. 1: a) Convert the following Octal into equivalent Decimal, Hexadecimal and Binary number.

$(6412)_8$

b) Prove that the following proposition is a tautology by using truth table.

$[\neg p \wedge (p \vee q)] \rightarrow q$

(12 + 8 = 20 marks)

Q No. 2: Write a function in C/C++ that takes two integer arguments in the range [0 – 999]. The function calculates the sum of individual digits in each integer number and returns the integer whose sum is greater than the other. If the sum of both the integers is same, then return the first integer. For example, the sum of individual digits of the integer 219 is 2 + 1 + 9 = 12.
Use the following signature for the function:

int greater_sum (int n1, int n2) **(20 marks)**

Q No. 3: We have conducted a 5-mark quiz in a class of 300 students. The quiz has been marked. Each student's obtained marks are one of the numbers in the set {0, 1, 2, 3, 4, 5}. Write a function in C/C++ that takes, as argument, an unsorted list of obtained marks in the quiz and returns the marks that has the highest frequency. For example, if 20 students got 0 mark, 75 students got 1 mark, 40 students got 2 marks, 90 students got 3 marks, 60 students got 4 marks, and 15 students got 5 marks, then the function should return 3, since 3 marks has the highest frequency.
Use the following signature for the function:

int marks_mode (int marks[], int n) **(20 marks)**

SECTION-B

Q No. 4: Determine the latency (from first bit sent to last bit received) for each of the following:

i. 100-Mbps Ethernet with a single store-and-forward switch in the path and a packet size of 16,000 bits. Assume that each link introduces a propagation delay of 6 μs and that the switch begins retransmitting immediately after it has finished receiving the packet.
ii. Same as (i) but with three switches.
iii. Same as (i), but assume the switch implements "cut-through" switching; it is able to begin retransmitting the packet after the first 100 bits have been received.

(8 + 5 + 7 = 20 marks)

P.T.O

Q No. 5: A company is assigned the prefix 213.8.8.0/24. We are required to create subnets for the following four departments of the company.

Department	No. of hosts
A	90
B	30
C	25
D	20

i. Give a possible arrangement of subnets by specifying subnet number and subnet mask for each subnet.
ii. If the number of hosts in department A grows to 150 then what will be the possible arrangement of subnets. **(15 + 5 = 20 marks)**

Q No. 6:

a) Perform the following binary multiplication of the unsigned binary numbers.
11011 × 1010.

b) Perform the following binary division of the unsigned binary numbers.
11110 ÷ 110

c) Perform the following binary subtraction of the signed binary numbers.
01011101 – 01001101

(6 + 6 + 8 = 20 marks)

SECTION-C

Q No. 7: Write the algorithm of insertion sort. Also, show the operation of insertion sort on the following array.

12	9	11	13	8	10

(10+10=20 marks)

Q No. 8:

a) Differentiate between short-term, medium-term, and long-term scheduling.
b) Differentiate between user-level threads and kernel threads. Also, discuss pros and cons of each.
c) Differentiate between preemptive and non-preemptive scheduling.
d) How each of the following three scheduling algorithms treat short jobs?
i. FCFS
ii. RR
iii. Multilevel feedback queues

(6 + 6 + 2 + 6 = 20 marks)