University of Sargodha

BS 3rd Semester/Term Exam 2021.

29394

Subject: I. T   Paper: Discrete Structure (CMPC-205)

Time Allowed: 2:30 Hours

Maximum Marks: 80

Note: Objective part is compulsory. Attempt any four questions from subjective part.

Objective Part   (Compulsory)

Q.1.   Write short answers of the following in 2-3 lines each.

(2*16)

i.   What are the contrapositive, the converse, and the inverse of the conditional statement: "Home team wins whenever it is raining".

ii.   Use a Truth Table to verify the first De Morgan law?

iii.   Find whether 17 is congruent to 5 modulo 6 and whether 24 and 14 are congruent to 6

iv.   Using truth-table, verify the equivalence "$p \vee T \equiv T$".

v.   Determine whether the relation R= $\{(1,1), (1,2), (2,1), (3,2)\}$ on the set A = $\{1,2,3\}$ is reflexive or not?

vi.   Express the sum of the first 100 terms of the sequence $\{a_n\}$ where $a_n = 1/n$ for n=1,2,3....

vii.   What is meant by Euler path and Euler circuit?

viii.   Define this function $f(x) = x+1$ onto or one-to-one. Domain consists of all integers.

ix.   Derive average case complexity of insertion sort.

x.   What is bipartite graph?

xi.   How many edges are there in a graph with ten vertices each of degree six?

xii.   What is the secret message produce from the message "MEET YOU IN THE PARK" using the Caesar Cipher?

xiii.   What is the greatest common divisor of 24 and 36?

xiv.   State pigeon hole principal by using suitable example.

xv.   Suppose that $f(n) = f(n/3) +1$ when n is divisible by 3, and $f(1) = 1$, find $f(27)$.

xvi.   Translate this sentence into logical expression "You can access the internet from campus only if you are a computer science major or you are not a freshman."

Subjective Part   (4*12)

2.2.   How many different spanning trees does each of these simple graphs have?
   a) K3   b) K4   C) K2,2   d) C5

2.3.   Construct a complete binary tree of height 4.

2.4.   Use Divide and Conquer algorithm to put 6, 1, 2, 3 into increasing order.

2.5.   Write Binary search algorithm for searching a number in an array ?and also calculate its time complexity in term of big O notion.

2.6.   a) Use mathematical induction to prove that for any natural number n,
   $1^2 + 2^2 + ... + n^n = n(n+1)(2n+1)/6$
   b) Let $f(x) = x^2+1$ and $g(x) = x+2$, are functions from R to R find fog and gof.

2.7.   a) What are the terms a_0, a_1, a_2 and a_3 of the sequence $\{a_n\}$, where an equals
   i. $(-2)^n$ ii. $7 + 4^n$ iii. $2^n + (-2)^n$
   b) Draw the Venn diagram for each of these
   i. $A \cap (B-C)$ ii. $A \cap (B \cup C)$ iii. $(A \cap B) \cup (A \cap C)$