Total No. of Questions – [04]

Total No. of Printed Pages 2

G.R. No.	

Paper code } comp – U218-121(T1)
} IT – U218 – 141(T1)

OCTOBER 2018/ IN-SEM (T1)

S. Y. B. TECH. (COMPUTER ENGINEERING/ INFORMATION TECHNOLOGY) (SEMESTER - I)

COURSE NAME: DISCRETE STRUCTURES & GRAPH THEORY

COURSE CODE: CSUA21171/ ITUA21171

(PATTERN 2017)

Time: [**1 Hour**]

[Max. Marks: **30**]

Instructions to candidates:

1) **Answer Q.1 OR Q.2 and Q.3 OR Q.4.**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data wherever required**

Q.1) a) i) Show that $p \rightarrow q$ and $\neg q \rightarrow \neg p$ are logically equivalent. (06)
ii) Show that $\neg p \leftrightarrow q$ and $p \leftrightarrow \neg q$ are logically equivalent.

b) Prove that $1^2 + 3^2 + 5^2 + \cdots + (2n + 1)^2 = (n + 1)(2n + 1)(2n + 3)/3$ whenever n is a nonnegative integer. (06)

c) Let p and q be the propositions (04)
p : You drive over 65 miles per hour.
q : You get a speeding ticket.
Write these propositions using p and q and logical connectives (including negations).
i) You do not drive over 65 miles per hour.
ii) You drive over 65 miles per hour, but you do not get a speeding ticket.
iii) You will get a speeding ticket if you drive over 65 miles per hour.
iv) If you do not drive over 65 miles per hour, then you will not get a speeding ticket.

OR

Q.2) a) Prove that the statement $1^2 + 2^2 + \cdots + n^2 = n(n + 1)(2n + 1)/6$ for the positive integer n. (06)

b) Among 18 students in a room, 7 study mathematics, 10 study science, and 10 study computer programming. Also, 3 study mathematics and science, 4 study mathematics and computer programming, and 5 study science and computer programming. We know that 1 student studies all three subjects. How many of these students study none of the three subjects? (06)

c) Let p, q, and r be the propositions (04)
p : You have the flu.
q : You miss the final examination.

r : You pass the course.

Express each of these propositions as an English sentence.

i) $p \rightarrow q$

ii) $\neg q \leftrightarrow r$

iii) $q \rightarrow \neg r$

iv) $p \vee q \vee r$

Q.3) a) Use Warshall's algorithm to find the transitive closures of the relation R= {(2, 1), (2, 3), (3, 1), (3, 4), (4, 1), (4, 3)} defined on A= {1, 2, 3, 4}? (06)

b) Find the solution to $a_n = 7a_{n-2} + 6a_{n-3}$ with $a_0 = 9$, $a_1 = 10$, and $a_2 = 32$. (04)

c) Determine whether each of these functions from Z to Z is onto. (04)

i) $f(n) = n - 1$

ii) $f(n) = n^2 + 1$

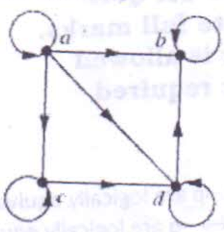
iii) $f(n) = n^3$

iv) $f(n) = n^2$

OR

Q.4) a) Determine whether the relation with the directed graph shown is a partial order. (06)

Also draw the Hasse diagram for the same



b) Find the solution to $a_n = 2a_{n-1} + 5a_{n-2} - 6a_{n-3}$ with $a_0 = 7$, $a_1 = -4$, and $a_2 = 8$. (04)

c) Determine whether each of these functions is a bijection from R to R. (04)

a) $f(x) = 2x + 1$

b) $f(x) = x^2 + 1$