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Roll No.....

IIIrd SEMESTER

B.Tech. (Information Technology)

MID SEMESTER EXAMINATION

September-2019

IT205 Discrete Structures

Time: 1:30 Hours

Max. Marks: 25

Note : Answer all question.

Assume suitable missing data, if any.

Q.1 [A] Write the converse, inverse, contrapositive, and negation of the following statement.

"If Sandra finishes her work, she will go to the basketball game."

(2.5 Marks)

[B] Determine whether the conclusion follows logically from the premises.

Premises: $(\neg p \vee q) \rightarrow r$

$r \rightarrow (s \vee t)$

$\neg s \wedge \neg u$

$\neg u \rightarrow \neg t$

Conclusion: p

(2.5 Marks)

Q.2 [A] Check the following argument logically correct?

Premises: There are men who are soldiers.

All soldiers are strong.

All soldiers are brave.

Conclusion: Therefore, some strong men are brave.

(2.5 Marks)

[B] Let A, B be sets. Prove

$$A - (A - B) = A \cap B.$$

(2.5 Marks)

Q.3 [A] Prove "A positive integer n is odd if and only if n^2 is odd.", using Direct and Contraposition proof technique.

(2.5 Marks)

[B] Find the of recurrence relation for the "number of binary sequences of length n that have no consecutive 0's". Solve it using characteristic root method.

(2.5 Marks)

Q.4 [A] Let's consider a propositional language where

A = "Angelo comes to the party",
B = "Bruno comes to the party",
C = "Carlo comes to the party",
D = "Davide comes to the party".

Formalize the following sentences:

- a) "If Angelo and Bruno come to the party, then Carlo comes provided that Davide doesn't come".
b) "Either Carlo comes to the party, or Bruno and Davide don't come".
(2.5 Marks)

[B] If $R(x,y)$ = "x relies upon y," express the following in unambiguous English:

- a) $\forall x(\exists y R(x,y))$
b) $\exists y(\forall x R(x,y))$

(2.5 Marks)

Q.5 [A] Let $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$. Then prove that $A^n = \begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$, for all $n \geq 1$; Using mathematical Induction. (2.5 Marks)

[B] What is the worst case time complexity of following implementation of subset sum problem.

```
bool isSubsetSum(int set[], int n, int sum)
```

```
{
```

```
// Base Cases
```

```
if (sum == 0)
```

```
return true;
```

```
if (n == 0 && sum != 0)
```

```
return false;
```

```
// If last element is greater than sum, then ignore it
```

```
if (set[n-1] > sum)
```

```
return isSubsetSum(set, n-1, sum);
```

```
/* else, check if sum can be obtained by any of the following  
(a) including the last element
```

```
(b) excluding the last element */
```

```
return isSubsetSum(set, n-1, sum) ||
```

```
isSubsetSum(set, n-1, sum-set[n-1]);
```

```
}
```

(2.5 Marks)