

**Final Term Examination – Spring 2005**  
**Time Allowed: 150 Minutes**

**Please read the following instructions carefully before attempting any of the questions:**

1. Attempt all questions. Marks are written adjacent to each question.
2. Do not ask any questions about the contents of this examination from anyone.
  - a. If you think that there is something wrong with any of the questions, attempt it to the best of your understanding.
  - b. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.
  - c. Write all steps, missing steps may lead to deduction of marks.
3. The duration of this examination is 150 **minutes**.
4. This examination is closed book, closed notes, closed neighbors.
5. Calculator is allowed.
6. **Pasting the equations of math type from word file into software may cause some visibility problem, so please note that do not copy equations of math type into software from word file. Paste the equations from math type directly into software.**
7. *In order to get full marks do all necessary steps.*

**\*\*WARNING: Please note that Virtual University takes serious note of unfair means. Anyone found involved in cheating will get an `F` grade in this course.**

**Total Marks: 60**

**Total Questions: 11**

**Question No. 1**

**Marks : 01**

There is a full binary tree that has 10 internal vertices and 13 terminal vertices

- ☐ No
- ☐ Yes

### Question No. 2

Marks : 10

Show that the following statement is a tautology

$$\sim q \wedge (p \rightarrow q) \rightarrow \sim p$$

Note: In order to get full marks do all necessary steps.

### Question No. 3

Marks : 10

Use mathematical induction to prove that

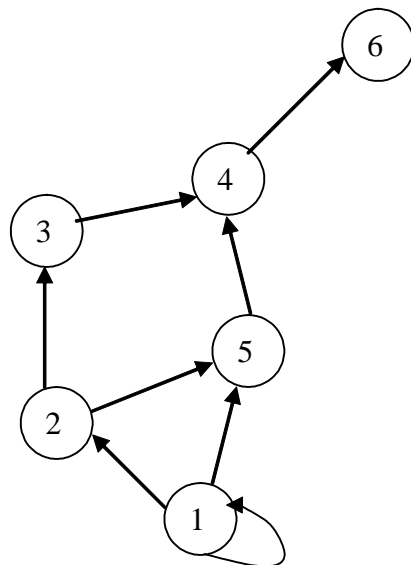
$$1 + 4 + 7 + \dots + (3n - 2) = n\left(\frac{3n - 1}{2}\right)$$

Note: In order to get full marks do all necessary steps.

### Question No. 4

Marks : 10

Find the adjacency matrix for the following graph



Note: In order to get full marks do all necessary steps.

### Question No. 5

Marks : 10

Find the probability in each case

A bag contains 40 balls out of which 5 are green ,15 are black and the remaining are yellow, A ball is taken out the bag.

Events happening:

- (i) The ball is black
- (ii) The ball is green
- (iii) The ball is not green

Note: In order to get full marks do all necessary steps

**Question No. 6**

**Marks : 01**

By mathematical induction, for all integers  $n \geq 1$

$$1^2 + 2^2 + 3^2 + \dots + n^2 =$$

- ☐  $\frac{n(n+1)(2n+1)}{6}$
- ☐  $\frac{n(n+1)(2n+1)}{2}$
- ☐  $\frac{n(n+1)(2n+1)}{6}$
- ☐  $\frac{n(n-1)(2n+1)}{6}$
- ☐  $\frac{n(n+1)(2n+1)}{6}$

**Question No. 7**

**Marks : 01**

Combination of  $n$  and  $k$  i.e.  $C(n, k)$  is equal to.

- ☐  $C(n, k) = \frac{n!}{(n-k)!}$
- ☐  $C(n, k) = \frac{n!}{k!(n-k)!}$
- ☐  $C(n, k) = \frac{P(n, k)}{(n-k)!}$
- ☐ None of above.

**Question No. 8**

**Marks : 01**

Using the Euclidean algorithm  $\gcd(330, 156)$

- ☐ 6

- ☐ 3
- ☐ 11
- ☐ None of above

**Question No. 9**

**Marks : 10**

Find the 31<sup>st</sup> term of the Arithmetic sequence, if its 4<sup>th</sup> term is 7 and 8<sup>th</sup> term is 19

Note: In order to get full marks do all necessary steps.

**Question No. 10**

**Marks : 01**

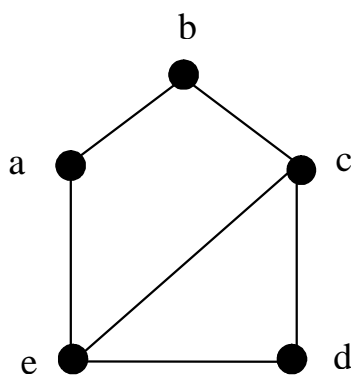
Which is true statement

- ☐  $\{x\} \in \{x\}$
- ☐  $\emptyset \in \{x\}$
- ☐  $\{x\} \in \{\{x\}\}$
- ☐ None of above

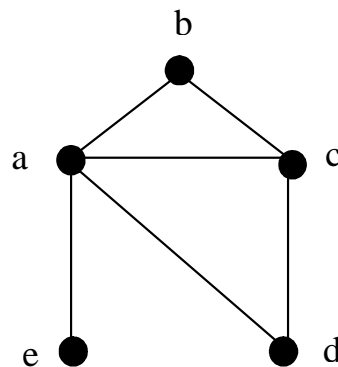
**Question No. 11**

**Marks : 05**

Determine whether the graphs A, B shown in the figures are isomorphic or not isomorphic? Give reasons.



A



B

Note: In order to get full marks do all necessary steps