

University of Asia Pacific
Department of Computer Science and Engineering
Semester Final Examination, Spring-2017
Program: B. Sc. Engineering (1st Year / 2nd Semester)

Course Title : Electrical and Electronic Engineering I Course Code: EEE 121 Credits: 3.00
 Time : 3.00 Hours Full Marks: 150

[There are Eight Questions. Answer any Six. Figure in the right margin indicate marks]

1. ✕ State Ohm's Law. Define voltage, current, power and energy with necessary diagrams. [2+8]
- (b) Find current and voltages in the circuit shown in the Figure 1. [15]

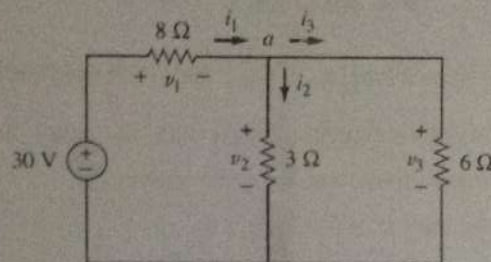


Figure 1

2. (a) State Kirchoff's voltage and current law with appropriate diagrams. [10]
- (b) Find the value of R_L for the maximum power transfer for the circuit in Figure 2. Find maximum power. [10+5]

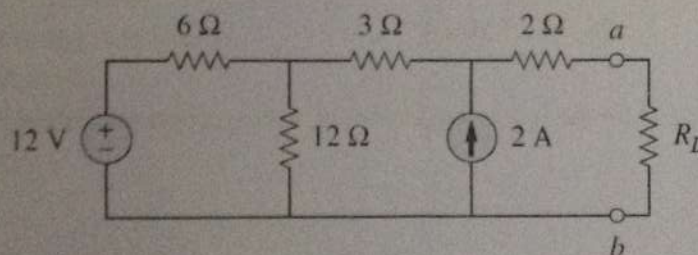


Figure 2

3. ✕ Define resistivity and conductivity. Explain short circuit and open circuit in an electrical system with necessary diagrams. [2+6]

✗ Find equivalent resistance for the terminal a-b shown in the Figure 3.

[15]

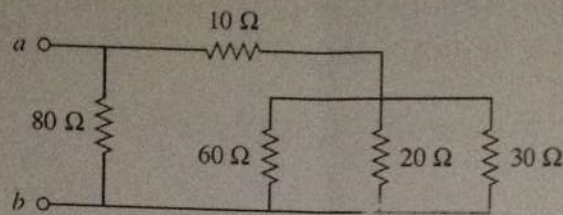


Figure 3

4. (a) What is phasor? Discuss phasor with appropriate diagram.

[2+3]

(b) Find the amplitude, phase, period and frequency of the following sinusoidal voltage.

[10]

$$V = 40\cos(5\pi t - 100)$$

(c) If $V_1 = -10\sin(\omega t - 300)$ and $V_2 = 20\cos(\omega t + 450)$, find the angle between V_1 and V_2 .

[10]

5. ✗ Discuss the formation of the p-type and n-type material with necessary diagram.

[10]

(b) What are the differences between intrinsic and extrinsic materials.

[5]

✗ Determine I_D , V_{D_2} and V_0 for the circuit in the Figure 4.

[10]

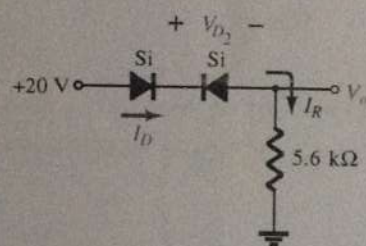


Figure 4

6. ✗ Explain the diode operation for the following conditions with appropriate diagrams.

[15]

i. Forward bias

ii. Reversed bias

iii. No Bias

(b) Determine V_0 , I_1 , I_{D_1} and I_{D_2} for the circuit in the Figure 5.

[10]

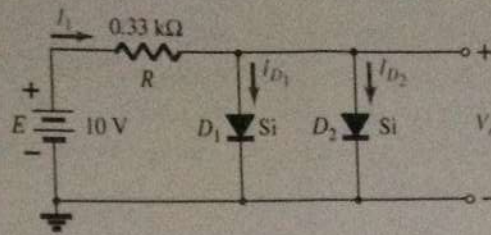


Figure 5

7. ~~(a)~~ Explain the working principle of a Bipolar Junction Transistor with appropriate diagram. [10]
- ~~(b)~~ Draw the circuit diagram for the following BJT configuration and draw their input and output characteristics curve: [15]
- Common Base
 - Common Collector
 - Common Emitter
8. (a) For the following circuit prove that $\frac{V_o}{V_i} = -\frac{R_f}{R_1}$. [10]

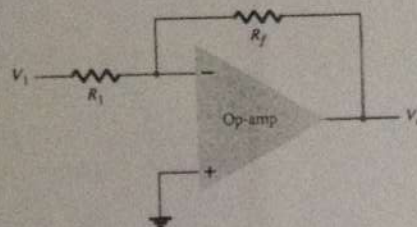


Figure 6

- (b) Draw the circuit configuration for the following circuit using op-amp and write their gain equation. [15]
- Inverting Amplifier
 - Non-inverting Amplifier
 - Unity Follower
 - Summing Amplifier
 - Integrator

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination, Spring-2017
Program: B.Sc. Engineering (Computer Science)
1st Year/ 2nd Semester

Course Title: Math II
 Time: 3.00 Hours.

Course Code: MTH 103

Course credit: 3.00
 Full Marks: 150

There are **Eight** questions. Answer any **Six**. All questions are of equal value, indicated in the right margin.

1. ✕ Write $v = (1, -2, 5)$ as a linear combination of $u_1 = (1, 1, 1)$, $u_2 = (1, 2, 3)$ and $u_3 = (2, -1, 1)$. 12
 (b) Express the polynomial $v = t^2 + 4t - 3$ in $P(t)$ as a linear combination of the polynomials $p_1 = t^2 - 2t + 5$, $p_2 = 2t^2 - 3t$ and $p_3 = t + 1$. 13

2. ✕ Determine whether the vectors $(1, 2, -3, 1)$, $(3, 7, 1, -2)$ and $(1, 3, 7, -4)$ in R^4 are linearly dependent or independent. 12
 (b) Determine whether $(1, 1, 1, 1)$, $(1, 2, 3, 2)$, $(2, 5, 6, 4)$, $(2, 6, 8, 5)$ form a basis of R^4 . If not, find the dimension of the subspace they span. 13

3. (a) Suppose the mapping $F : R^2 \rightarrow R^2$ is defined by $F(x, y) = (x + y, x)$. Show that F is linear. 10
 (b) Consider the basis $u = (u_1, u_2, u_3)$ for R^3 where $u_1 = (1, -1, 2)$, $u_2 = (2, 1, -3)$, $u_3 = (1, 0, -2)$ and let $T : R^3 \rightarrow R^2$ be a linear transformation defined by $T(u_1) = (-3, -1)$, $T(u_2) = (9, 0)$, $T(u_3) = (2, -2)$. Find $T(5, -2, 7)$. 15

4. (a) Let $F : R^4 \rightarrow R^3$ be the linear mapping defined by $F(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t)$. Find a basis and the dimension of (i) the Image of F ; (ii) the Kernel of F . 13
 (b) Let $F : R^2 \rightarrow R^2$ be the linear operator defined by $F(x, y) = (2x + 3y, 4x - 5y)$. Find the matrix representation of F relative to the basis $S = \{u_1, u_2\} = \{(1, 2), (2, 5)\}$. 12

5. (a) Consider the polynomials $f(t) = t + 2$ and $g(t) = 3t - 2$ in $P(t)$ with the inner product $\langle f, g \rangle = \int_0^1 f(t)g(t)dt$. (i) Find $\langle f, g \rangle$ (ii) Find $\|f\|$ and $\|g\|$ (iii) Normalize f and g . 13
 (b) Let W be the subspace of R^5 spanned by the vectors $u = (1, 2, 3, -1, 2)$, $v = (2, 4, 7, 2, -1)$. Find a basis of the orthogonal complement W^\perp of W . 12

6. (a) Find the Fourier coefficient c and the projection of $v = (1, -2, 3, -4)$ along $w = (1, 2, 1, 2)$ in \mathbb{R}^4 . 10

(b) Consider the vector space with the Euclidean inner product. Apply the Gram-Schmidt process to transform the basis vectors $u_1 = (1, 1, 1)$, $u_2 = (-1, 1, 0)$, $u_3 = (1, 2, 1)$ into an orthogonal basis and then normalize the orthogonal basis vectors to obtain an orthonormal basis. 15

7. (a) Find the determinant of 12

$$A = \begin{bmatrix} 5 & 4 & 2 & 1 \\ 2 & 3 & 1 & -2 \\ -5 & -7 & -3 & 9 \\ 1 & -2 & -1 & 4 \end{bmatrix}$$

(b) Find the solution of the following system of linear equations using Cramer's rule: 13

$$\begin{aligned} x_1 + x_2 + x_3 &= 4 \\ 2x_1 + 5x_2 - 2x_3 &= 3 \\ x_1 + 7x_2 - 7x_3 &= 5 \end{aligned}$$

8. (a) Use determinants to find those values of k for which the following system has (i) a unique solution, (ii) more than one solution, (iii) no solution. 12

$$\begin{cases} kx + y + z = 1 \\ x + ky + z = 1 \\ x + y + kz = 1 \end{cases}$$

9. Let $A = \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$. Find the characteristic equation, the eigenvalues and corresponding eigenvectors of the matrix A . 13

Department of Computer Science & Engineering
University of Asia Pacific (UAP)

Final Examination Spring 2017 1st Year 2nd Semester

Course Code: Chem 111

Course Title: Chemistry

Credits: 3

Full Marks: 150

Duration: 3 Hours

Instructions:

1. There are Eight (8) Questions. Answer any Six (6). All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

- ~~X~~ ~~X~~ Define 'lattice energy' of an ionic crystal. Draw a schematic diagram and show the method of calculation of the lattice energy according to Born-Haber Cycle. 3+7=10
- ~~X~~ Discuss the bond dissociation energy and bond length with suitable examples. Draw the potential energy diagram in formation of a covalent bond and show that the bond dissociation energy and bond length can be calculated from such diagram. 8+7=15
- ~~X~~ ~~X~~ CH₄ and CH₃Cl both have tetrahedral geometry. Draw the geometry. What do you think about the bond angle of H-C-H in CH₄ and CH₃Cl. Explain if there is any difference in bond angle. 4+3=7
9
- ~~X~~ Predict and draw the geometry of the following compounds: 9
- i) PO₄³⁻ ii) NH₃ iii) H₃O⁺
- ~~X~~ What is the hybridized state of PBr₅? Show the hybridization process. 3+7=10
3. a) Define 'solution'. Explain the molecular view of solution process. 2+6=8
- ~~X~~ What is the effect of temperature on the solubility of gas in liquid? How the effect is related with the ecological imbalance in aquatic environment. 2+2+3=7
- ~~X~~ Define the following terms: 3+5=8
- ~~X~~ Molality ~~X~~ molarity iii) ppm. 10
4. a) Define 'colligative properties'. Show that lowering of vapor pressure is a colligative property.
- b) Draw a phase diagram and explain the boiling point elevation and depression of freezing point upon the addition of a non-electrolyte and non volatile solute.
- c) Ethylene glycol (EG), CH₂(OH)CH₂(OH), is a common automobile antifreeze. It is water soluble and fairly nonvolatile (b.p. 197°C). Calculate the freezing point of a solution containing 651 g of this substance in 2505 g of water. Would you keep this substance in your car radiator during the summer? The molar mass of ethylene glycol is 62.01 g. 7
- ($k_f = 1.86^\circ\text{C}/m$)

Please turn over

5. a) What are the scopes of chemical kinetics? How the rate of reaction is influenced by the different factors. 3+8=11
- b) Derive the integrated rate expression for the following reaction when the order is one. 8

$$2\text{N}_2\text{O}_5(\text{g}) = 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$$
- c) The conversion of cyclopropane to propene in the gas phase is a first-order reaction with a rate constant of $6.73 \times 10^{-4} \text{ s}^{-1}$ at 500°C . If the initial concentration of cyclopropane was 0.25 M , what is the concentration after 8.8 min ? 6
6. a) Explain the collision theory of reaction rate and state the limitation of the theory. 12
- b) What is the quantitative relation between temperature and reaction rate? Show the relation graphically. 7
- c) The rate constant of a first-order reaction is $3.46 \times 10^{-2} \text{ s}^{-1}$ at 298 K . What is the rate constant at 350 K if the activation energy for the reaction is 50.2 kJ/mol ? 6
- ~~X~~ Define equilibrium constant, K_c and K_p and show the relation between them. 6
- ~~X~~ Write down the expression for equilibrium constant for the following conversions: 6
- i) $\frac{1}{2} \text{N}_2(\text{g}) + \frac{3}{2} \text{H}_2(\text{g}) \rightleftharpoons \text{NH}_3(\text{g})$
- ii) $3\text{Fe}(\text{s}) + 4\text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{Fe}_3\text{O}_4(\text{s}) + 4\text{H}_2(\text{g})$
- ~~X~~ What is reaction quotient? Predict the direction of reaction when i) reaction quotient smaller than equilibrium constant ii) reaction quotient is same as equilibrium constant iii) reaction quotient is larger than equilibrium constant. 6
- ~~X~~ Hydrogen iodide, HI, decomposes at moderate temperatures according to the equation 7

$$2\text{HI}(\text{g}) \rightleftharpoons \text{H}_2(\text{g}) + \text{I}_2(\text{g})$$
- When 4.00 mol HI was placed in a 5.00-L vessel at 458°C , the equilibrium mixture was found to contain 0.442 mol I_2 . What is the value of K_c for the decomposition of HI at this temperature? 9
8. a) Explain the phase, component and degrees of freedom with suitable examples. 9
- b) Draw the phase diagram of water and show that at the triple point the degree of freedom is zero. 9
- c) Estimate the vapor pressure of water at 85°C . Note that the normal boiling point of water is 100°C and that its heat of vaporization is 40.7 kJ/mol . 7

University of Asia Pacific
Department of Computer Science & Engineering
Mid-Semester Examination Spring-2017
Program: B. Sc. Engineering (1st Year/ 2nd Semester)

Course Title: Structured Programming
Time: 3.00 Hour

Course No.: CSE 103

Credit: 3.00
Full Marks: 150

There are **Eight** Questions. Answer any **Six**. All questions are of equal value. Figures in the right margin indicate marks. Assume anything if needed.

X Y Write a function named ADDER to find out the summation of the given series below: 10
 $1+2+3+ \dots + n$

Value of n will be taken as parameter of the function.

X What will be the output of following code segment? 15

Code Segment:

```
#include <stdio.h>
int main()
{
    int *a, **b, x=10, y=20; // address of x = 1300, address of y = 1500
    a=&x;
    b=&a;
    printf("%d\n", a);
    printf("%d\n", *a);
    *a++;
    *a++;
    printf("%d\n", a);
    printf("%d\n", *a);
    a=&y;
    (*a)++;
    printf("%d\n", a);
    printf("%d\n", *a);
    a=&x;
    **b=20;
    printf("%d\n", x);
    a=&y;
    printf("%d\n", a);
    printf("%d\n", *a);
    return 0;
}
```

2. X Write a look-up table for the following "for loop". 10

Code Segment:

```
#include <stdio.h>
int main()
{
    int sum=0, i=0, j=0;
    for(i=1; i<8; i=i+2)
    {
        for(j=i; j<9; j=j+3)
        {
```



```

        sum=sum - (i*j);
    }
}
printf("%d", sum);
return 0;
}

```

- ✗ int PLUM(int x) is a magical function which does one of the two things. If the parameter x is positive, it multiplies the given number by 2 and returns this multiplied number. On the other hand, if x is negative, the function simply returns its absolute value. However, if the number 0 (zero) is encountered, the function simply turns 0 into a random positive number, and calls itself again. Now write code to demonstrate this function. 15

3. ✗ (a) Write the output of the following code segment: 10

```

#include <stdio.h>

int fibonacci(int n){
    if(n==1) return 0 ;
    if(n==2) return 1 ;
    int ret = 2*(fibonacci(n-1) + fibonacci(n-2));
    printf("%d\n",ret);
    return ret;
}

int main(){
    int n = 5 , f ;
    f = fibonacci(n);
    printf("%d\n",f);
    return 0;}

```

- b) Write a program to print unique elements from an array. 15

Sample Input	Sample Output
7 -1 10 98 90 67 10 10	-1 10 98 90 67
5 1 1 2 2 3	1 2 3

4. ✗ What is "Call by reference"? Describe with proper example. 5

- ✗ Write the output of the following code segment: 5

```

#include <stdio.h>
#include <string.h>

```



```
char str [150] = "ABC";
```

```
int main(){
```

```
    strcpy (str, "Text 1");
```

```
    strcat (str, "\nText 2");
```

```
    printf ("%s", str);
```

```
    return 0;}
```

- ✗ Write a program which will search for a substring within a string. 15

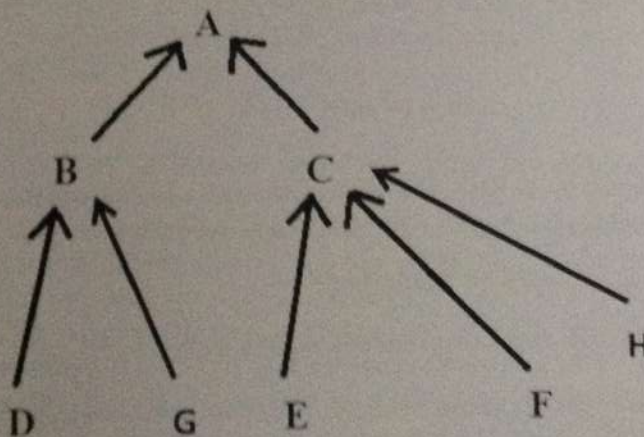
Sample Input	Sample Output
MADAM DA	YES
ADDAA DAD	NO

5. ✗ Write the difference between Structured Programming and OOP. 10

- ✗ Do the following program: 15

- Write a Class 'Calculator' which have four methods (add, sub, prod and div). Each Method will have two parameters.
- Take two input value from user and send these value to the above class methods.
- The output will be like a calculator. If user give 7 and 6 then result will be 13, 1, 42 and 1.67

6. a) 15



Write the appropriate code to depict this situation of inheritance. Give constructor and destructor function for each class.

- b) Refer to the tree above. Write down the sequence of constructor and destructor for the following code segment: 10
- ```
int main(){
```



```
D d;
F f;
return 0;}
```

7. ✗ What is friend class? Why do we need it? 5

✗ Do the corrections for the following snippet if it is necessary otherwise keep as it is. 5

```
#include<iostream>
using namespace std;
class A{
private:
 int x,y;
 void show(){
 cout<<x+y;}
};
void add(void){
 cout<<x+y;}
int main(){
 A ob1;
 ob1.x=5;
 ob1.y=9;
 ob1.show();
 ob1.add();
 return 0;}
```

c) "Friend function cannot be inherited by its base class whereas member functions can be". What's your opinion regarding this statement. Justify your statement with an appropriate example. 15

8. a) What is object reference? Why do we need copy constructor? 5

b) What are the basic differences between overloading and overriding a method? 5

c) "a single operator '+' when placed between integer operands, adds them and when placed between string operands, concatenates them" – What does it mean regarding C++. Explain with an example. 15



**Department of Computer Science & Engineering**  
**University of Asia Pacific (UAP)**

**Final Examination**  
**Course Code: CSE105**  
**Full Marks: 150**

**Spring 2017**  
**Course Title: Discrete Mathematics**

**1<sup>st</sup> Year 2<sup>nd</sup> Semester**  
**Credits: 3**  
**Duration: 3 Hours**

**Instructions:**

1. There are **Eight (8)** Questions. Answer any **Six (6)**. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a) Justify whether the statement "**the Universal relation on any set is an Equivalence relation**" is true or not with necessary explanation. 5

b) Find the zero-one matrix of the transitive closure of the relation R on set  $A = \{a, b, c\}$  where,  $M_R =$  10

|   | a | b | c |
|---|---|---|---|
| a | 1 | 0 | 1 |
| b | 0 | 1 | 0 |
| c | 1 | 1 | 0 |

c) Let R1 be the "less than" relation on the set of real numbers and let R2 be the "greater than" relation on the set of real numbers, that is, 10

$$R1 = \{(x, y) \mid x < y\} \text{ and } R2 = \{(x, y) \mid x > y\}.$$

What are i)  $R1 \cup R2$ , ii)  $R1 \cap R2$ , iii)  $R1 - R2$ , iv)  $R2 - R1$ , and iv)  $R1 \oplus R2$ ?

2. a) Draw a table as the sample table given below and fill it out. 15

- i)  $F(n) = \lceil n/3 \rceil$
- ii)  $F(n) = \sqrt{n}$
- iii)  $F(n) = n^3 + 2$

All functions are from R into R. Justify your answer by proper explanation

**Sample table for question 2(a):**

| No.   | Function? | One-to-one? | Onto?  | Bijjective? | Invertible? |
|-------|-----------|-------------|--------|-------------|-------------|
| i)    | Yes/no    | Yes/no      | Yes/no | Yes/no      | Yes/no      |
| ..... | .....     | .....       | .....  | .....       | .....       |

b) Let the functions  $f(x) = 2x+1$ ,  $g(x) = x^2$ ,  $h(x) = 2-x$  where all functions are from R into R. Find the composition function **hogof**. Then calculate the value of **hogof(-0.5)**. 10

~~A~~ ~~X~~ State the converse, contrapositive and inverse of each of the following implications: 12



If it snows today, I will ski tomorrow.

I come to class whenever there is going to be a quiz.



~~Q~~ Prove that  $\neg(p \wedge q) \equiv \neg p \vee \neg q$  5

~~Q~~ Show that the premises "If it rains, we do not go for swimming", "Today is raining", "If we do not go for swimming, we play cricket" lead to the conclusion "We are playing cricket today". 8

~~Q~~ Consider graph G given below.

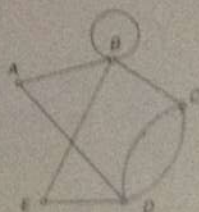


Figure: Graph G

~~Q~~ Verify "Handshaking Theorem" for G

~~Q~~ Does G contain Euler circuit? Explain and find the circuit if your answer is yes. 2

~~Q~~ Does G contain Euler path? Explain and find the path if your answer is yes. 4

~~Q~~ Draw the graphs named below and determine which of these are bipartite. Show how? 10  
i)  $C_5$  ii)  $W_5$  iii)  $K_2$  iv) Null graph

~~Q~~ "No complete graph with more than two vertices is bipartite" - justify whether the statement is true or not. Give necessary examples/explanation. 5

~~Q~~ Consider the expression:  $(a+b)-(2*b)/55$ .

Draw a binary tree representation of the expression and find its:- 12

- Prefix notation
- Postfix notation
- Infix notation

~~Q~~

| Data Item | <del>A</del> | <del>B</del> | <del>C</del> | <del>D</del> | <del>E</del> | F  |
|-----------|--------------|--------------|--------------|--------------|--------------|----|
| Weight    | 10           | 5            | 5            | 15           | 1            | 24 |

Consider the alphabets with weights given in the table above and construct a 2-Tree with a minimum weighted path length using Huffman's algorithm. Calculate the path length of the constructed tree. 13

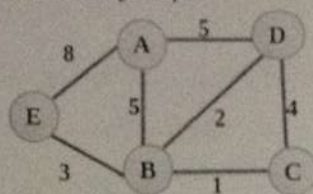


- ~~76~~ ~~77~~ i) In how many ways can three boys and two girls sit in a row? 3  
 ii) In how many ways can they sit in a round table? 3  
 iii) In how many ways can they sit in a row if just the girls are to sit together? 4

- ~~78~~ i) How many automobile license plates can be made if each plate contains three different letters followed by two different digits? 5  
 ii) Solve problem (i) if the first digit cannot be 0. 5

- ~~79~~ Assume there are three men and five women at a party. Show that if these people are lined up in a row, at least two women will be next to each other. 5

- ~~80~~ ~~81~~ Find a minimum spanning tree from graph H given below. Use either Prim's or Kruksal's algorithm and show the necessary steps. 10



- ~~82~~ Draw a binary search tree by sequentially inserting the nodes given below. 3

10, 1, 15, 20, 5, 9, 4

Now represent the tree in memory using-

- i) Linked representation 6

- ii) Sequential representation 6

- ~~83~~ ~~84~~ Is it possible to obtain two different minimum spanning trees from a single graph? Justify your answer with proper explanation/example. 4

- ~~85~~ Using the Pigeonhole principle solve the following problem: 5

Find the minimum number of students needed to guarantee that five of them belong to the same class (consider four classes- Freshman, Sophomore, Junior, Senior).

- ~~86~~ Let  $A = \{1, 2, 3, 4, 5\}$ . Determine the truth value of each of the following statement with explanation: 16

i)  $(\exists x \in A)(x + 3 = 10)$

ii)  $(\forall x \in A)(x + 3 < 10)$

iii)  $(\exists x \in A)(x + 3 < 5)$

iv)  $\neg(\forall x \in A)(x + 3 \geq 10)$