

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

Final Examination    Fall 2019

1<sup>st</sup> Year 2<sup>nd</sup> Semester

Course Code: CSE 103

Course Title: Structured Programming

Credits: 3

Full Marks: 150

Duration: 3 Hours

**Instructions:**

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

1. a. What is the output of the following code segment? Show intermediate results at each step of the program. [12]

```
#include <stdio.h>
#include <string.h>
int main() {
    char s1[30] = "Twin";
    char s2[30] = "little ";
    char s3[30] = "kle ";
    char s4[30] = "star.";
    char s5[30];
    strcat(s1, s3);
    strcpy(s5, "");
    strcat(s2, s4);
    strcat(s1, s2);
    strncat(s5, s1, 8);
    strcat(s5, s1);
    strupr(s5);
    printf("%s", s5);
    return 0;
}
```

1. b. Write down a program that will take a string as an input and will determine whether it is a palindrome or not. You are allowed to use any library function you need. A palindrome is a string which remains the same even after reversing it. [13]

OR

1. a. Write down a program that will print all prime numbers between 2 to n to a text file named "prime.txt." n will be input to your program. [12]

1. b. Write down a program that will copy the content of a text file to another text file. The name of both files will be given as string input to your program. [13]

2. a. Write down a structure **employee** capable of storing the following information about an employee of an organization: [5]

- Employee ID number
- Age
- Salary
- Department

There are THREE departments in the organization and their codes are: "CSE", "EEE" and "ETE".

2. b. Use the above mentioned **employee** structure to take N employees' information as input. N will also be input to your program. [5]
2. c. An employee is considered as old if his/her age is over 50. Write down a function that will take an array of **employee** structure and the number of employees as parameters and returns the number of old employees. [7]
2. d. Write down a function that will take an array of **employee** structure, and the number of employees as parameter and will return the index of the employee getting lowest amount of salary. Call this function from your main function and print the employee's information from the returned index. [8]

OR

2. a. Write down a structure **movieStar** that is capable of storing the following information about movie stars of the film industry: [5]

- Name
- Age
- Annual income
- Gender

The gender information must be stored as a character 'M' or 'F' to represent male and female movie stars respectively.

2. b. Use the above mentioned **movieStar** structure to take input of N movie stars' information. N will also be input to your program. [5]
2. c. Write down a function that will take an array of **movieStar** structure and the number of movie stars as parameters and returns the income of the highest annual earning movie star. [7]
2. d. Write down a function that will take an array of **movieStar** structure and the number of movie stars as parameters and returns the age of the youngest movie star in the industry. [8]

3. a. Write down a program that will find the summation of the following series: [12]

$$1 - 1/2 + 1/3 - 1/4 + \dots 1/n$$

where n will be input to your program.

Sample Output:

Enter n: 4

Summation is: 0.58333

- b. An array is called **balanced** if the summation of elements in the first half is equal to the summation of the elements in the second half. Write down a program that will take 10 integers as input and print "YES" if the array is balanced, and print "NO" otherwise. For example if your array is: [13]

{3, 5, 2, 6, 7, 8, 9, 2, 1, 4}

your program should output NO because summation of first 5 elements is,  $3+5+2+6+7=23$  and summation of last 5 elements is,  $8+9+2+1+4 = 24$  and  $23 \neq 24$ . However if the inputs are as follows:

{0, 1, 2, 6, 8, 7, 2, 3, 1, 4}

your program should output YES because summation *matches*.

4. a. Write down program that will take an integer  $n$  as input and display a triangle made of  $n$  lines of digits. The pattern that needs to be displayed for  $n = 5$  is shown below. Assume that  $n \leq 9$ . [12]

```
0
1 1
2 2 2
3 3 3 3
4 4 4 4 4
```

- b. Show the required lines of code to fill out an  $N \times N$  matrix  $A[N][N]$  to create the following pattern. Assume that  $N$  will be input to your program. [13]

0	1	1	1	1	1
-1	0	1	1	1	1
-1	-1	0	1	1	1
-1	-1	-1	0	1	1
-1	-1	-1	-1	0	1
-1	-1	-1	-1	-1	0

5. a. Write down a function with the following prototype: [10]

**int MAX(int a, int b);**

The function determines and returns maximum of two numbers  $a$  and  $b$  passed as parameters. In your main function take FOUR integers as input and use only the above function (more than once) to determine maximum of four. You are not allowed to write any more functions; neither can you use any logical operators in your main function. Use logical operators only inside MAX function.

- b. What is a header file in c programming? What are the contents of a header file? [5]

- c. Consider the following series: [10]

$$\text{Sum}(n) = \frac{1}{1} + \frac{1}{2} + \frac{1}{3} \dots \dots \dots + \frac{1}{n-1} + \frac{1}{n}$$

- Write down the recursive definition of  $\text{Sum}(n)$ .
- Write down the base case or stopping condition.
- Write down a recursive function that will return the value of  $\text{Sum}(n)$

6. a. Consider the following declaration:

[10]

```
int x[5] = {10, 3, 7, 98, 7};
int *p;
p = &x[2];
```

Suppose address of x is 500. What are the values of the followings?

- (i) p+2
- (ii) p-2
- (iii) \*p+5
- (iv) \*(p-1)
- (v) ++(\*p)

- b. Suppose the address of a and b in the following piece of code is 300 and 400 respectively. Fill out the following table appropriately.

[15]

	a	b	p	q
int a = 70, b = 20;			-	-
int *p, *q;			-	-
p = &b;				
q = &a;				
a = b + *p;				
q = p;				
a = (*p) * (*q);				
*p = a % b;				
*q = a / b;				



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

**Final Examination**  
**Credits: 3.0**

**Duration: 3 Hour**

**Fall 2019**  
**Discrete Mathematics**

**1<sup>st</sup> Year 2<sup>nd</sup> Semester**  
**Course Code: CSE 105**  
**Full Marks: 150**

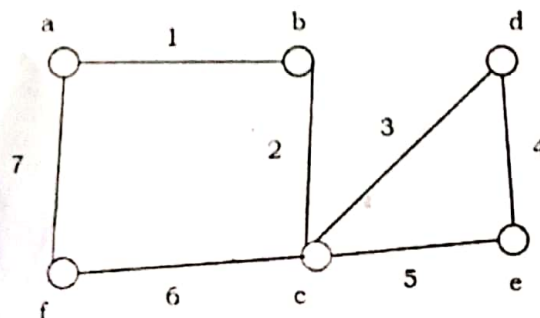
**Instructions:**

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

- ✓ a) How does binary logic is related to electronics. 5
- b) Why number transformation is essential in computer science? Perform the following number transformation: 20  

$$(1101)_8 - (2)_{10} * (1A)_{16} + (123456)_{11} = (?)_3$$
2. a) What is Boolean Logic? Name all the logics. 5
- b) Explain the universality of NOR logic with figures and tables. 20  

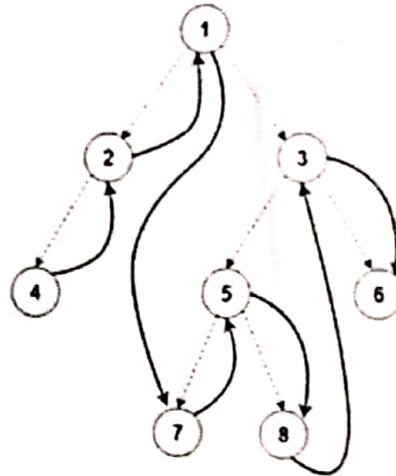
or
- a) Derive and prove the Identity Laws for OR operation. 5
- b) What is K'-Map? Explain it for 3 variables given that,  $f(A, B, C) = \{1, 2, 3, 7\}$  20
3. a) What is Computer Algorithm? Explain with the necessary Example. 5
- b) Write down the Structured English and the Algorithm to perform "P<sub>r</sub>" and "C<sub>r</sub>". 20
4. a) "Probability is the math to predict the future" - write down your opinion. 5
- b) Consider three pen-stands. The first pen-stand contains 2 red pens and 3 blue pens; the second one has 3 red pens and 2 blue pens; and the third one has 4 red pens and 1 blue pen. There is equal probability of each pen-stand to be selected. If one pen is drawn at random, what is the probability that it is a red pen? Apply Bayes' Theorem and calculate it. 20
5. a) Define cardinality of a set. Give a necessary example. 5
- b) Explain set union, intersection, difference, cross product and power set. 20
6. a) Is the following graph Euler? Explain your opinion. 5



b) What is Graph Traversal? Write down the *Breadth First Search* algorithm and explain it. 20

or

a) What is a tree in computer science? Explain the following tree operation: 5



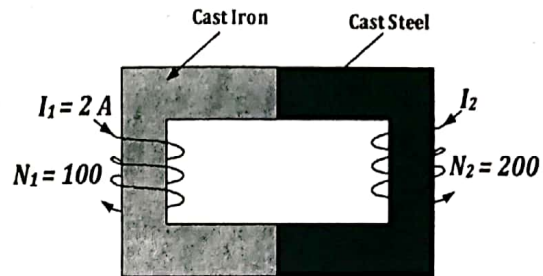
b) Prove that the average insertion complexity of a graph is  $O(\log(n))$ . 20

**University of Asia Pacific**  
**Department of Computer Science and Engineering**  
**Semester Final Examination, Fall – 2019**  
**Program: B.Sc. Engineering (1<sup>st</sup> Year, 2<sup>nd</sup> Semester)**

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

[There are eight questions. Question no. 1 to 4 are compulsory. Answer question no. 5 or 6 and 7 or 8]

- 1 a. Find the current,  $I_2$  necessary to establish a flux of  $\Phi = 1 \times 10^{-4}$  Wb in the series magnetic circuit shown in Figure 1.



[10]

Figure 1

$l_{\text{cast iron}} = l_{\text{cast steel}} = 0.5 \text{ m}$   
 Area(throughout) =  $10 \times 10^{-4} \text{ m}^2$

- b. For Figure 2,  
 i) Find the value of  $i_L$  and  $v_c$ .  
 ii) Calculate the energy stored in the inductor.  
 iii) Calculate the energy stored in the capacitor.

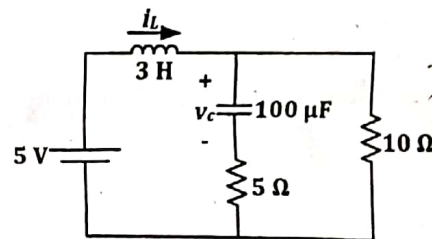


Figure 2

[15]

$\frac{1}{2} \times i_L^2 L$   
 $\frac{1}{2} \times v_c^2 C$   
 $\frac{1}{2} \times i_L^2 L$

- 2 a. The voltage across a capacitive reactance,  $X_C = 20 \Omega$  is given by,  
 $v = 60 \sin(\omega t - 80^\circ)$ .  
 i) Find the expression for the current,  $i$ .  
 ii) Sketch  $v$  and  $i$  on the same axis.  
 iii) Write down the phase difference and phase relationship between  $v$  and  $i$ .  
 b. Find the average and the rms value of the wave shape given in Figure 3.

[10]

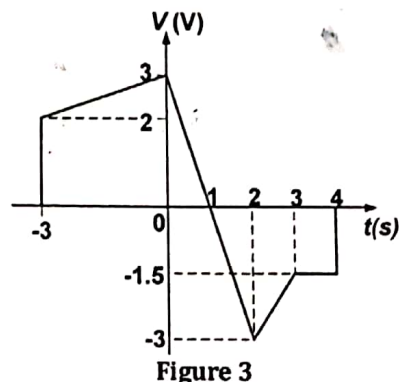


Figure 3

[15]  $i = \frac{v}{X_C}$   
 $V = 2$   
 $f = \frac{1}{T}$

- 3 For the circuit given in Figure 4, find:
- the total impedance,  $Z_T$ .
  - the currents  $I_s$ ,  $I_1$  and  $I_2$ .
  - the voltages,  $V_{R1}$  and  $V_{R2}$ .
  - the power factor of the circuit indicating whether it is leading or lagging.

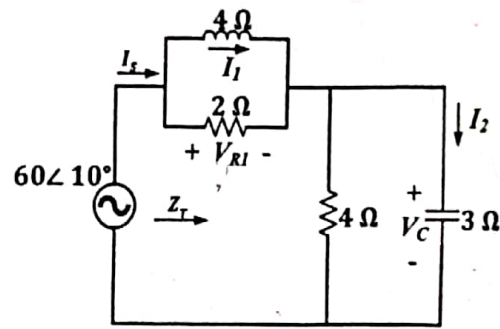


Figure 4

4. a. Draw the input and the output characteristics graph of an *nnp* transistor showing the different regions of operation. [10]  
Write down the condition of base-emitter and collector-base junction for each operating region.

- b. Name the dc bias configuration used in Figure 5. Find:

- |            |                     |
|------------|---------------------|
| i) $I_B$   | vi) $V_B$           |
| ii) $I_C$  | vii) $V_{CE}$       |
| iii) $I_E$ | viii) $V_{CB}$      |
| iv) $V_C$  | ix) $I_{C_{sat}}$   |
| v) $V_E$   | x) $\alpha$ (alpha) |

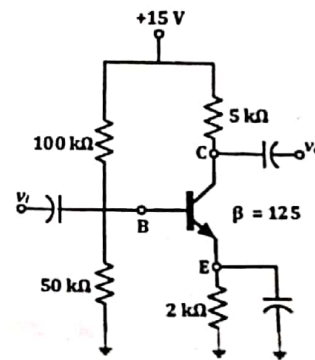


Figure 5

- 5 a. Using nodal analysis, find the node voltages,  $V_a$  and  $V_b$  in Figure 6. [10]  
b. Using mesh analysis, find the mesh currents  $i_1$ ,  $i_2$  and  $i_3$  in Figure 6. Also find the power dissipated in the  $5\Omega$  resistor. [15]

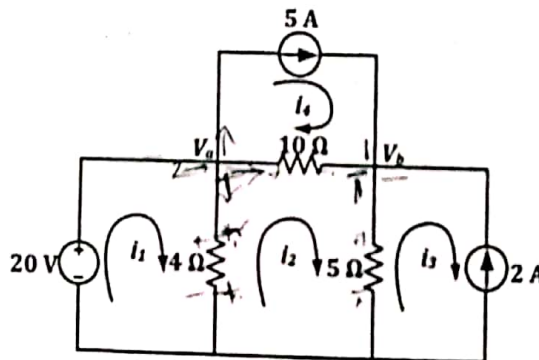


Figure 6

OR

- 6 a. Using superposition theorem, find voltage  $v$  in Figure 7. [10]



b. For Figure 7, find:

- Draw the Thevenin's equivalent circuit at the terminal marked  $a$  and  $b$ . ( $a - b$  are the load terminals).
- Draw the Norton's equivalent circuit at the terminal marked  $a$  and  $b$ .
- Find the value of  $R_L$  for maximum power transfer and maximum power delivered to the circuit.

[15]

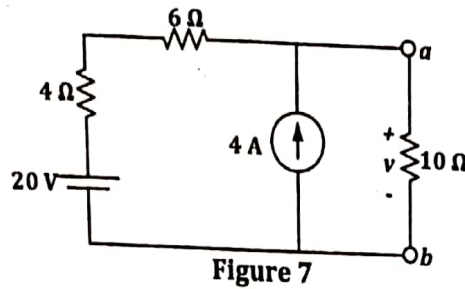


Figure 7

7 a. Answer the following questions briefly:

- What is meant by n-type and p-type material?
- What are the majority and minority carriers in n-type and p-type material?
- What is hole?

[3+3  
+4]

b. Draw the characteristics curve of a diode and explain its operation during reverse bias condition using necessary figures. [15]

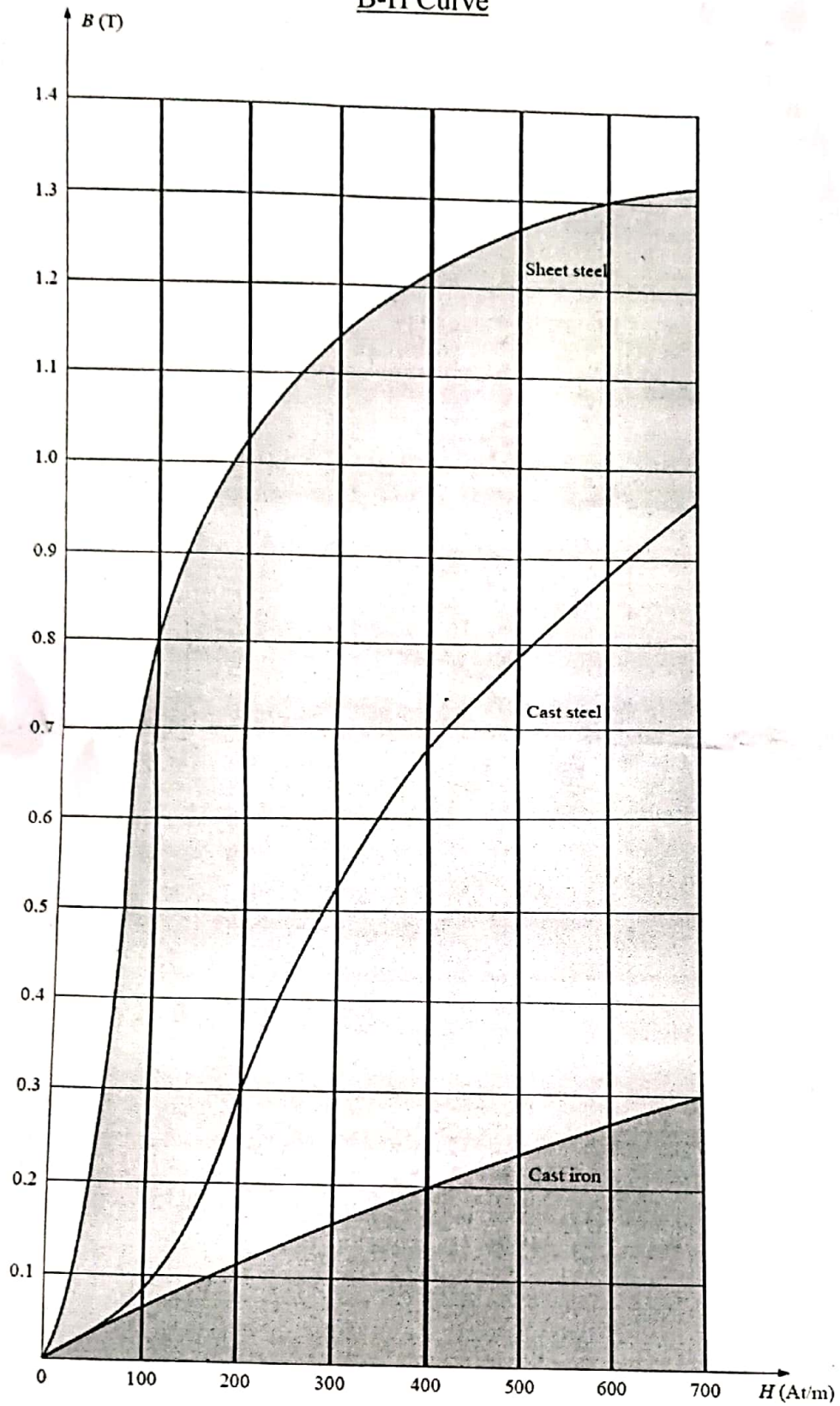
OR

8 a. Compare half wave and full wave rectifier.

[10]

b. Draw the circuit diagram of a half wave rectifier circuit, explain its operation and draw its output current and voltage wave shapes. Also derive the average and rms value of the output voltage. [15]

B-H Curve



**University of Asia Pacific**  
**Department of Basic Sciences & Humanities**  
**Final Examination, Fall 2019**  
**Program: B.Sc. Engineering (Computer Science)**  
**1<sup>st</sup> Year / 2<sup>nd</sup> Semester**

Course Title: Math-II  
 Time: 3.00 Hours

Course Code: MTH 103

Credit: 3.00  
 Full Marks: 150

There are 8 questions. Answer 6 questions including 1, 2, 3 and 4. All questions are of equal value. Figures in the right margin indicate marks.

1. Define eigenvalue and eigenvector. Find all eigenvalues and corresponding eigenvectors of A where  $A = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ . 25  
 Hence find an invertible matrix P which is created by the eigenvector of A also prove that  $P^{-1}AP$  is diagonal.
2. If  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be a linear operator defined by:  $T(x, y) = (2y, 3x - y)$  with respect to the basis  $\{f_1 = (1, 3), f_2 = (2, 5)\}$  verify that  $[T]_f[v]_f = [T(v)]_f$  where  $\forall v \in \mathbb{R}^2$ . 25
3. (a) Let U be the subspace of  $\mathbb{R}^3$  generated by the vectors  $(1, 2, 1)$ ,  $(0, -1, 0)$  and  $(2, 0, 2)$ . Find a basis and the dimension of U. 15
- (b) Consider the basis  $u = \{u_1, u_2, u_3\}$  for  $\mathbb{R}^3$  where  $u_1 = (1, -1, 2)$ ,  $u_2 = (2, 1, -3)$ ,  $u_3 = (1, 0, -2)$ . Find a formula for the linear transformation  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^2$  for which  $T(u_1) = (-3, -1)$ ,  $T(u_2) = (9, 0)$ ,  $T(u_3) = (2, -2)$  and hence compute  $T(5, -2, 7)$ . 10
4. (a) Let  $H = \begin{bmatrix} 1 & 1+i & 2i \\ 1-i & 4 & 2-3i \\ -2i & 2+3i & 7 \end{bmatrix}$  be a Hermitian matrix. Find a nonsingular matrix P such that  $P^T H P$  is diagonal. 15
- (b) Let  $A = \begin{pmatrix} i & 1 \\ 1 & 1 \\ 0 & 0 \end{pmatrix}$ . 10  
 Compute the singular values and the singular value decomposition of A.

5. Consider the vector space  $R^3$  with the Euclidean inner product. Apply the Gram-Schmidt process to transform the basis  $u_1 = (1, 1, 1)$ ,  $u_2 = (1, 1, 0)$  and  $u_3 = (1, 0, 0)$  into an orthonormal basis. 25

OR

6. State Cayley-Hamilton theorem. Prove the Cayley-Hamilton theorem for A 25

where  $A = \begin{pmatrix} 1 & 0 & 1 \\ -1 & -1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$  hence find the inverse of A.

7. (a) Solve the following system using determinants 15

$$x + y + z = 5$$

$$(a) \quad x - 2y - 3z = -1$$

$$2x + y - z = 3$$

- (b) Solve the following system by Gauss-Seidal method: 10

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110.$$

OR

8. (a) Define linear mapping. Verify that the mapping T is linear where  $T : R^3 \rightarrow R^2$  is defined by  $T(x, y, z) = (z, x + y)$ . 15

- (b) Define Kernel and Image. Let  $T : R^4 \rightarrow R^3$  be a linear operator defined by  $T(x, y, s, t) = (x - y + s + t, x + 2s - t, x + y + 3s - 3t)$ . Find a basis and dimension of the (i) Image of T and (ii) Kernel of T. 10



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

Final Examination      Fall 2019

1<sup>st</sup> Year 2<sup>nd</sup> Semester

Course Code: Chem111

Course Title: Chemistry

Credits: 3

Full Marks: 150

Duration: 3 Hours

**Instructions:**

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

- ✓ 1. a) What is the main limitation of the atomic model proposed by Rutherford? How Borh model accounts for such limitation in the case of hydrogen atom? 2+7=9
- b) Arrange the ions according to the size. Justify your answer. 6
- $K^+ \quad Ca^{+2} \quad S^{2-} \quad Cl^-$
- c) What is the meaning of VSEPR. Predict and draw the geometry of the following molecules/ions; 10
- $H_3O^+, BF_3, PO_4^{3-}$

**OR**

- a) Write down the significance of  $\psi$  and  $\psi^2$  used in the Schrodinger wave equation. 9
- b) How can you interpret the decrease in size of the elements of the 2<sup>nd</sup> period from Li to Ne in the periodic table? 6
- c) Draw the geometry of  $CH_4$  and  $CH_3Cl$ . Compare the angle of H-C-H bond in both cases. 10
- ✓ 2. a) Show a general profile for a reaction and show that instantaneous rate of reaction can be determined from such curve. 8
- b) Derive the expression of integrated rate for the reaction;  $A \rightarrow \text{Product}$ . 8
- c) For the equilibrium;  $FeSCN^{2+} (aq) \rightleftharpoons Fe^{3+} (aq) + SCN^- (aq)$
- Predict the direction of reaction if you add solution of i)  $Fe(NO_3)_3$  ii)  $SCN^-$  iii) Oxalic acid in the reaction mixture. 9

**OR**

- a) What is the scope of chemical kinetics? What are the different factors that affect the rate of reaction? 2+7=9
- b) The conversion of cyclopropane to propene in the gas phase is a first-order reaction with a rate constant of  $6.73 \times 10^{-4} s^{-1}$  at  $500^\circ C$ . If the initial concentration of cyclopropane was  $0.25 M$ , what is the concentration after 8.8 min? 6
- c) Define reaction quotient. Explain that with the help of equilibrium constant reaction quotient can be predicted the direction of a reversible chemical reaction. 10
- ✓ 3. a) Define solution. Gold used in ornaments is a solid solution- Justify. 3+5=8
- b) Show the molecular view of a solution process. 10
- c) 27 g of a gas dissolves in 1 L of water at 1.0 atm pressure. If the partial pressure of the gas is increased to 12 atm, what is its solubility of the gas in the water? 7

*Please turn over*

4. a) What do you understand by the term 'colligative properties'? Write down the name of different colligative properties. 8  
 b) Vapor pressure lowering is independent of the nature of the solute-justify the statement. 10  
 c) Calculate the concentration of a 10% (w/w) solution of sodium chloride. 7
5. a) Explain the concept of delocalization of bonding electron with a suitable example. How can you consider the high electrical conductivity of metals from the concept of delocalization of bonding electrons? 10  
 b) In a five electron pair system why it is preferable for the lone pair in equatorial position rather than the axial one? 8  
 c) Show that the  $\text{BF}_3$  has a zero dipole moment. 7
6. a) With a suitable example explain that the equilibrium constant is the ratio of the rate constants of the forward reaction and that of the backward reaction. 8  
 b) Write down the expression of the equilibrium constant for the following reaction. 6  
 i)  $\text{H}_2\text{O} (\text{l}) \rightleftharpoons \text{H}_2\text{O} (\text{g})$   
 ii)  $\text{CaCO}_3 (\text{s}) \rightleftharpoons \text{CaO} (\text{s}) + \text{CO}_2 (\text{g})$   
 iii)  $\text{CO} (\text{g}) + 3\text{H}_2 (\text{g}) \rightleftharpoons \text{CH}_4 (\text{g}) + \text{H}_2\text{O} (\text{g})$   
 c) Hydrogen and iodine react according to the equation  

$$\text{H}_2 (\text{g}) + \text{I}_2 (\text{g}) \rightleftharpoons 2\text{HI} (\text{g})$$
 Suppose 1.00 mol  $\text{H}_2$  and 2.00 mol  $\text{I}_2$  are placed in a 1.00 L vessel. How many moles of substances are in gaseous mixture when it comes to equilibrium at  $458^\circ\text{C}$ ? The equilibrium constant at this temperature is 49.7. 11