

125

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall-2021
Program: B. Sc. in Computer Science and Engineering (1st year/2nd semester)

Course Code: CHEM 111

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 Bohr model accounts for such limitation in the case of a hydrogen atom? 15
- b. Define line spectra. Calculate the wavelength of the yellow sodium emission, which has a frequency of 5.09×10^{14} /s. 10

OR

- a. The size of elements decreases in the 2nd period of the periodic table from Li to Ne. Explain with the help of effective nuclear charge. 15
- b. Define ionization energy. The first ionization energy of nitrogen is higher than that of oxygen-justify. 10

2. a. Show the steps involved in the determination of lattice energy of an ionic compound by Born-Haber cycle. 15
- b. Predict and draw the geometry of the followings: 10
- i) NH_4^+ ii) SF_6 iii) PO_4^{3-} iv) I_3^-

OR

- a. Draw the potential energy diagram for the formation of a covalent bond and explain that the bond length and bond dissociation energy can be calculated from the diagram. 15
- b. Draw the geometry of PCl_5 and predict the net dipole moment (zero or non-zero) and justify your answer. 10

3. a. Show the molecular view of a solution process when an ionic solid is dissolved in a polar solvent. 15
- b. Define the term 'true solution'. Gold used in ornaments is a solid solution. -Justify. 10

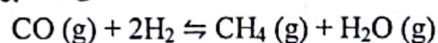
4. a. What are the colligative properties? The lowering of vapor pressure due to the addition of a non-electrolyte and non-volatile solute is independent of the nature of the solute but dependent on the concentration of solution-Explain. 15
- b. Calculate the mole fractions of glucose and water in a solution containing 5.67 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$, dissolved in 25.2 g of water? 10

Please turn over

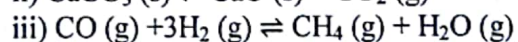
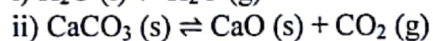
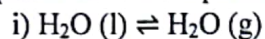
5. a. Derive the expression of integrated rate for the first order reaction; $A \rightarrow (\text{Product})$ and show the expression for the half-life for such reaction. ~~15~~ **15**

b. b) The conversion of cyclopropane to propene in the gas phase is a first-order reaction with a rate constant of $6.73 \times 10^{-4} \text{ s}^{-1}$ at 500°C . If the initial concentration of cyclopropane was 0.25 M , what is the concentration after 8.8 min ? ~~10~~ **10**

6. a. Draw i) typical reaction profile (concentration vs time) for the following reaction ii) draw the rate with respect to any of the reactants and the product showing the formation of an equilibrium state. ~~10~~ **10**



b. b) Write down the expression of the equilibrium constant for the following reactions: ~~10~~ **10**



c. c) What are the factors that affect the rate of a chemical reaction? ~~05~~ **05**

A white

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

Final Examination Fall 2021 1st Year 2nd 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 program when user enters two strings "abc" and "abc123" as input. **EXPLAIN WHY?** [10]

```
void main(){
    char s[80], t[80];
    gets(s);
    gets(t);
    if(strcmp(s,t) == strcmp(t,s))
        printf("YES");
    else
        printf("NO");
}
```

- b. Write down a C program where you take an English sentence as input and do the followings: [15]
- i. Print the first consonant appearing in the sentence.
 - ii. Print number of vowels in the sentence.

For example, if the input is, **GO AND SHAKE A TOWER**

Your output will be as follows:

The first consonant is **G**

The number of vowels is **7**

OR

- a. What is the output of the following piece of code? Explain how you derived your solution. [10]

```
char s[20]= "Hell";
char t[20]= "World";
strncpy(t, s, 4);
printf("%s", t);
```

- b. Write down a program that will take two sentences as input and will print YES if both sentences have the same number of vowels, and same number of consonants. The program will print NO otherwise. For example, if a user enters the following two sentences:

[15]

GO AND SHAKE A TOWER

GO AND TAKE A SHOWER

The output will be YES because the first sentence contains 7 vowels, and 9 consonants, and the second one also contains 7 vowels, and 9 consonants.

2. Write down a structure that can store an employee's record having two attributes (a) Employee ID, and (b) salary. Using this structure take N employees' information as input where N will also be input to your program. Write down a function that will take all employees information as parameter and will return the maximum salary of the employees. Calculate and show the size of the employee structure.

[25]

OR

- Write down a structure that can store a movie star's records having three attributes (a) starID, (b) name, and (c) age. Using this structure take N movie stars' information as input where N will also be input to your program. Write down a function that will take movie stars information as parameter and will return average age of the movie stars. Calculate and show the size of the movie star structure.

[25]

3. a. What will be the value of b, c, and d after executing the following piece of codes?

[10]

```
int a [ ] = { 2, 3, 6, 1, 9, 5};
int i = 2, b, c, d;
b = ++a[i]; 7
c = a[i++]; 1
d = a[i]; 6
```

- b. Write down a program that reverses the elements of a given array. The number of elements and all elements of the array will be input to your program.

[15]

Input: Input array elements 5 9 30 15 40 0 7 11 16 100
Output: Reversed array: 100 16 11 7 0 40 15 30 9 5

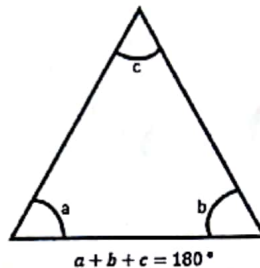
temp=5
5=100
100=5

0=9-1
1=8-2

4. a. Consider the following printMe(n) function. What will be the output if we execute printMe(3) from the main function? Show the function calling in a block diagram [10]

```
void printMe(int n){
    if(n == 0) return;
    else{
        printf("%d ", n);
        printMe(n-1);
        printf("%d ", n);
    }
}
```

- b. A triangle is valid if sum of its all angles is 180 degree and no angle is 0 degree. See the figure below: [15]



Write a C function that will take three angles of a triangle as parameters and returns 1 if the triangle is valid and zero otherwise.

5. Show the required program segment to create a 2D array like below: [10]

```
-0 for(j<6,j++)
-1 0
-2
-3
```

1	0	0	0	0	1
0	1	0	0	1	0
0	0	1	1	0	0
0	1	0	0	1	0
1	0	0	0	0	1

- b. Write a code that fills out an N x M two-dimensional array with user inputs and then calculates the sum of the **maximum** elements at each column. Example: For the 2D array shown bellow, the max element at each column has been shown in gray box. Your program should calculate the sum of these max elements at each column i.e., sum = 9 + 5 + 9 + 8 + 8 = 39. [15]

```
int i,j;
for(i=0;i<5;i++)
    for(j=0;j<5;j++)
        scanf("%d",&arr[i][j]);
```

5.	5	8	8	7
1.	0	2	4	6
7.	4	4	5	6
9.	3	9	4	1
7.	1	3	1	8

arr[i][j]

6. a. Suppose the address of a is 500 and address of b is 600. Fill out the following table showing the value of the variables after executing each line of codes. [10]

	a	b	a_p	b_p
int a = 5, b = 0;	5	0		
int *a_p = &a, *b_p = &b;	5	0	500	600
b = a + *b_p;	5	5	500	600
b_p = a_p;	5	5	500	500
a = (*a_p) * (*b_p);	25	5	500	500
*b_p = a/b;	5	5	500	500
*a_p = a % b;	0	5	500	500

- b. Consider the following declaration: [10]

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

Suppose address of x is 700. What are the values of the followings?

- (i) p+2 720
- (ii) *p+2 9
- (iii) *(p+2) 7
- (iv) *(p+2) - *p 0
- (v) ++(*p) 8

7. While opening a file using fopen, what kind of errors might occur? Describe. [5]

$$\begin{array}{r} 4 \overline{) 15, 12, 8} \\ 9 \overline{) 15, 3, 02} \\ 5, 1, 92 \end{array}$$

$$\begin{array}{r} 7 \overline{) 12, 8} \\ 3, 2 \end{array}$$

University of Asia Pacific
Department of Computer Science and Engineering
Semester Final Examination, Fall – 2021
Program: B.Sc. in CSE (1st Year, 2nd Semester)

Course Title: Electrical and Electronic Engineering I Course Code: EEE 121 Credit Hours: 3.00
 Time: 3 hours Full Marks: 150

[There are **eight** questions. Answer any **six** including Q1 to Q4. Figures in the right margin indicate marks]

For the circuit give in figure 1, find:

- i) The equivalent resistance R_{eq} . 10.83
- ii) The current I_s . 1.38
- iii) The current I_o . 0.92
- iv) The voltage V_o . $5/2$

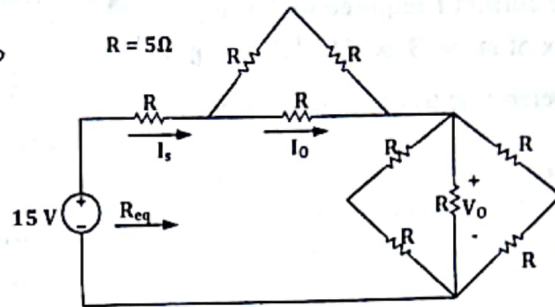


Figure 1

[25]

- a. Using nodal analysis, find the node voltages V_a , V_b and V_c in figure 2.
- b. Using mesh analysis, find the mesh currents i_1 , i_2 and i_3 in figure 2.

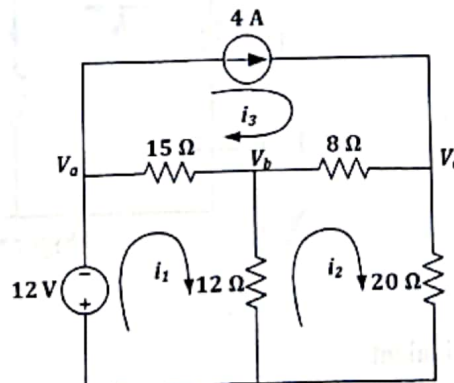


Figure 2

- a. Calculate the equivalent capacitance C_{eq} in figure 3.

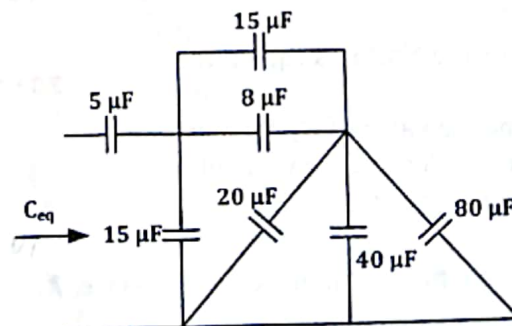


Figure 3

[12.5]

- b. For figure 4,
 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.

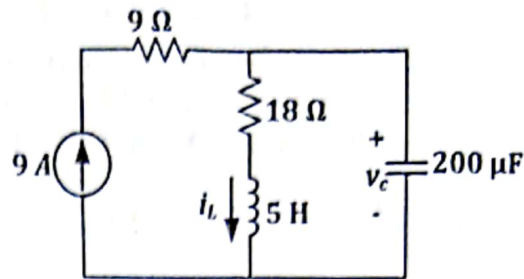


Figure 4

[12.5]

For the series magnetic circuit given in the figure 5, find:

- i) the current I required to develop a flux of $\phi = 3 \times 10^{-4} \text{ Wb}$.
 ii) Determine μ_r of the materials.

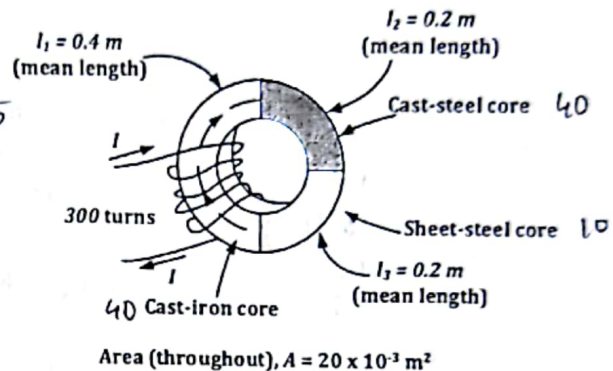


Figure 5

[25]

Using superposition theorem, find voltage i_o in figure 6.

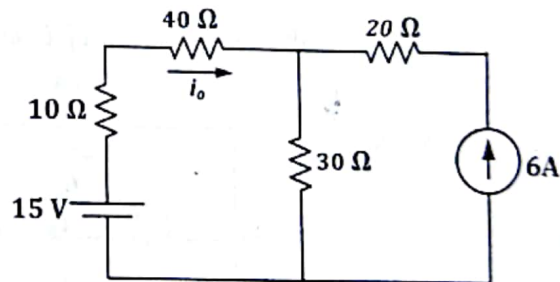


Figure 6

[25]

OR

- 6 i) Draw the Thevenin's equivalent circuit at the terminal marked a and b . ($a - b$ are the load terminals) in Figure 7.
 ii) Draw the Norton's equivalent circuit.
 iii) Find the value of R_L for maximum power transfer and the value of maximum power.

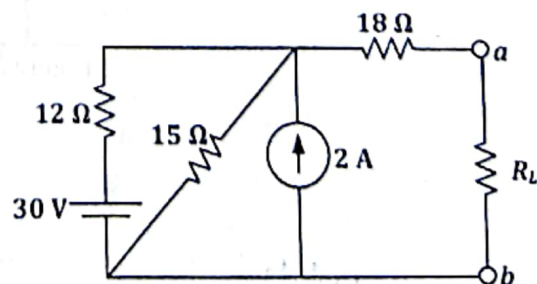


Figure 7

[25]

- a. The current through an inductive reactance, X_L is given by, $i = 50 \sin(200t + 45^\circ) \text{ A}$.
 i) Find the expression for the voltage, v .
 ii) Sketch v and i on the same axis.

[12.5]

[12.5]

[12.5]

b. Find the average and the R.M.S value of the wave shape given in figure 8.

0.65

~~8.44~~

2.34

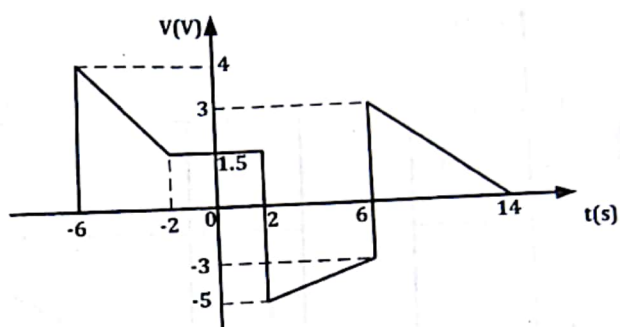


Figure 8

OR

[25]

8

For the circuit given in Figure 9, find:

i) Z_T ii) I_S iii) I_1 iv) I_2 v) V_L

vi) Power delivered to the circuit

vii) Power factor

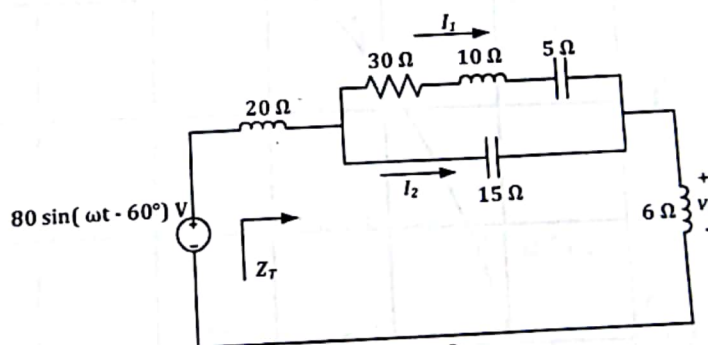
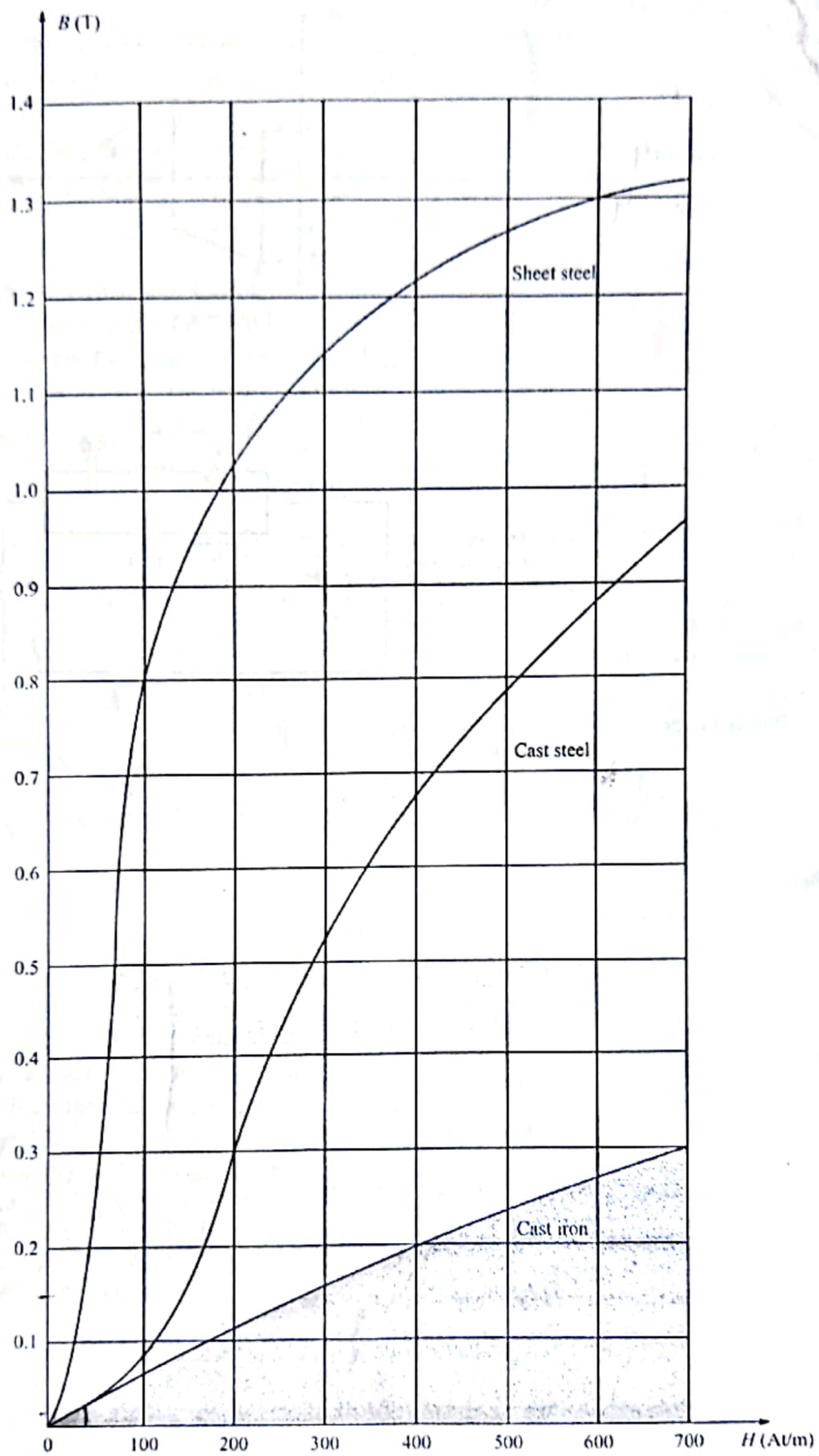


Figure 9



University of Asia Pacific

Department of Basic Sciences & Humanities

Final Examination, Fall -2021

Program: B. Sc in Computer Science and Engineering

Course Title: Math II: Linear Algebra Course No. MTH 103

Credit: 3.00

Time: 3.00 Hours.

Full Mark: 150

There are Six Questions. Answer all of them. Figures in the right margin indicate marks.

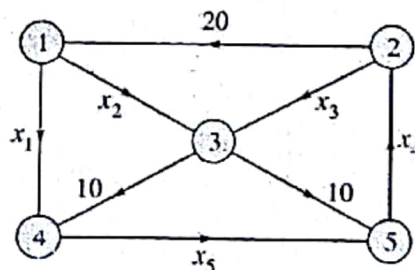
1. (a) If $\vec{a} = 3\hat{i} + 2\hat{j} + 6\hat{k}$, $\vec{b} = 2\hat{i} + 4\hat{j} - 4\hat{k}$, find 10

- (i) Angle between \vec{a} , \vec{b}
- (ii) Projection of \vec{a} on \vec{b}
- (iii) Projection of \vec{b} on \vec{a}
- (iv) Show that \vec{a} and \vec{b} is commutative

(b) If $\phi = 3x^2 - yz$ and $\vec{a} = 3xyz^2\hat{i} + 2xy^3\hat{j} - x^2yz\hat{k}$, find the followings at the point $(1, -1, 1)$. 15

- (i) $\vec{\nabla} \cdot \vec{a}$
- (ii) $\vec{a} \cdot (\vec{\nabla} \phi)$
- (iii) $\vec{\nabla} \cdot (\phi \vec{a})$
- (iv) $\vec{\nabla} \cdot (\vec{\nabla} \phi)$

2. Set up a system of linear equations to represent the network shown in the following figure and solve the system. 25



3. (a) A medicine company "Square Group" wishes to produce three types of medicine type X, Y and Z. To manufacture a type X medicine requires 2 minutes each on machine I and II. 3 minutes on machine III. A type of Y medicine requires 2 minutes on machine I, 3 minutes on machine II and 4 minutes on machine III. A type Z medicine requires 3 minutes on machine I, 4 minutes on machine II and 3 minutes on machine III. There are 3.5 hours available on machine I, 4.5 hours available on machine II and 5 hours available on machine III. How many medicine of each type should company make in order to use all the available time? 15

(b) Determine the polynomial $P(x) = a_0 + a_1x + a_2x^2$ whose graph passes through the points $(1,4)$, $(2,0)$ and $(3,12)$. 10

Q11A

4. (a) Let $W = L(S)$, where $S = \{(1, 2, -1, 3, 4), (2, 4, -2, 6, 8), (1, 3, 2, 2, 6), (1, 4, 5, 1, 8), (2, 7, 3, 3, 9)\}$ is a subset of \mathbb{R}^5 . Find the basis and dimension of W . 10

(b) Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 3 & 2 \\ -1 & 0 \end{bmatrix}$. 15

5. Find a matrix P that diagonalize the matrix $A = \begin{bmatrix} -14 & 12 \\ -20 & 17 \end{bmatrix}$. Also determine $P^{-1}AP$. 20

(b) Find the characteristic polynomial of $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$. 5

OR

(a) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$. 15

Hence find A^{-1} .

(b) Find Rank and Nullity of the following matrix. 10

$$A = \begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

6. (a) For which value of λ will be the vector $v = (1, \lambda, 5)$ is a linear combination of the vectors $v_1 = (1, -3, 2)$ and $v_2 = (2, -1, 1)$. 10

(b) Determine whether the vectors $v_1 = (1, \frac{1}{2}, \frac{1}{4})$, $v_2 = (-2, -4, -8)$ and $v_3 = (3, 9, 27)$ Span of generate \mathbb{R}^3 . 15

OR

(a) Test the dependency of the vectors $\{(1, 2, -3), (2, 0, -1), (7, 6, -11)\}$. 10

(b) Prove that the vectors $(1, 2, 0)$, $(0, 5, 7)$ and $(-1, 1, 3)$ form a basis of \mathbb{R}^3 . 15

-16 12
-20 15

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

Final Examination Fall 2021

1st Year 2nd Semester

Course Code: CSE 105

Course Title: Discrete Mathematics

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 Boolean Logic? [5]

~~b.~~ Explain XOR logic operation in bit masking. [5]

~~c.~~ Find F, where $F = A'B'C'D + A'BC'D' + A'BCD'X + ABCDX'$. Draw necessary diagram along with truth table. [15]
It is to be noted that X is HIGH if your gender is female and vice versa.

OR

a. What is an universal logic in Boolean algebra? [5]

b. Explain NOR logic operation as AND logic. [5]

c. Find X, where $X = P'QR'S + PQ'R'S' + PQR'C' + PQRC$. Draw necessary diagram along with truth table. [15]
It is to be noted that C is HIGH if you are Covid vaccinated of exactly 2 doses and vice versa.

2. a. What is graph traversal? [5]

~~b.~~ Does the following graph Euler? Explain your opinion. [5]

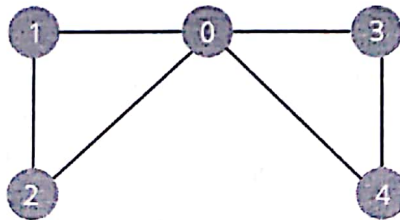


Figure-1.

~~c.~~ Traverse the graph mentioned in Figure-1 using BFS technique. [15]

OR

a. Compare graph with tree. [5]

$\overline{B'D + BD'}$
 $\overline{B'D \cdot BD'}$

- b. Find the adjacency matrix for the following graph:

[5]

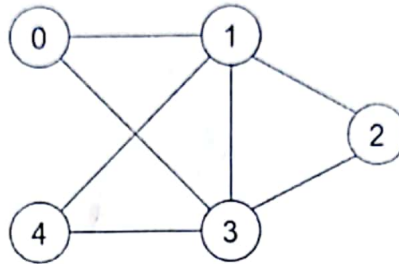


Figure-2.

- c. Traverse the graph mentioned in Figure-2 using DFS technique.

[15]

3. a. How does binary logic is related to electronics?

[5]

- b. Transform binary logic to electronic signals.

[5]

- c. $((11011100)_8 / (0010)_2) - (2)_{10} * (1A)_{16} + (23A56)_{11} = (?)_3$

[15]

$$(2021210200202)_3$$

4. a. What is Venn diagram in set theory?

[5]

- b. Explain the mechanism of set difference with necessary example.

[5]

- c. Calculate the power set for $S = \{p, o, w, e, r\}$.

[15]

5. a. "Probability is the math to predict the future" - write down your opinion.

[5]

- b. Compare permutation with combination.

[5]

- c. 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 randomly, what is the probability that it is a blue pen? Use Bayes' Theorem to solve the problem.

[15]

6. a. Define tautology in propositional logic.

[5]

- b. Does $[(A \rightarrow B) \wedge A] \rightarrow B$ is a tautology? Explain your opinion.

[5]

- c. Prove $\neg(A \vee B)$ and $(\neg A) \wedge (\neg B)$ are equivalent in both matching truth table and using tautology.

[15]