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International Islamic University Chittagong
Department of Computer Science & Engineering
B. Sc. in CSE Semester Final Examination, Autumn-2023
Course Code: PHY-1201 Course Title: Physics-II
Total marks: 50 Time: 2 hours 30 minutes

[Answer **all** the questions. Figures in the right hand margin indicate full marks.
Separate answer script must be used for Group A and Group B]

Group-A

- | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---|---|
| 1. a) Define: i) Crystalline solid ii) Lattice | CLO1 | R | 2 |
| 1. b) Define packing fraction. Find out the packing fraction of
i) Simple cubic Crystal ii) Body centered cubic Crystal. | CLO1 | U | 5 |
| Or,
What are crystal defects in solid? How many types of crystal defects in solid?
Explain all of the crystal defects. | | | |
| 1. c) Lead is body-centered cubic with an atomic radius of $r = 1.564$ A.U. Find the spacing of (220) planes. | CLO2 | E | 3 |
| 2. a) Define Miller indices and draw the plane of (001), (110), (101) and (111). | CLO1 | U | 5 |
| 2. b) Show that in a crystal of cubic structure, the distance between the planes with Miller indices h, k, l is equal to $d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$, where a is the lattice parameter. | CLO1 | U | 5 |
| Or,
Distinction between metal, insulator and semiconductor in terms of energy band. | | | |

Group-B

- | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---|---|
| 3. a) What is the meaning of mass-energy relation? Derive Einstein's mass-energy relation. | CLO1 | U | 7 |
| 3. b) Calculate the velocity that one atomic mass unit will have if it has a kinetic energy equal to twice the rest mass energy. | CLO2 | E | 3 |
| 4. a) What is an X-rays? Write down the properties of X-rays. | CLO1 | R | 3 |
| 4. b) Discuss Bohr Atom Model and hence deduce the expression for the calculation of the radii. | CLO1 | U | 7 |
| Or,
Calculate the following properties of ${}^{64}_{28}\text{Ni}$ particle: | | | |
| i. Nuclear Mass | | | |
| ii. Nuclear Size | | | |
| iii. Nuclear Density | | | |
| iv. Nuclear Charge | | | |
| v. Nuclear Mass defect | | | |
| vi. Nuclear Binding Energy | | | |
| vii. Nuclear Binding Energy per nucleon. | | | |
| 5. a) What is radioactivity? State the laws of radioactive disintegration and prove it. | CLO1 | U | 7 |
| 5. b) The half-life period of radium is 1395 years. In how many years will one gram of pure element (a) lose one centigram (b) be reduced to one centigram. | CLO2 | E | 3 |
| Or,
Calculate the mass of the electron when it is moving with a K.E. of 10MeV. | | | |

International Islamic University Chittagong
Center for General Education (CGED)
Semester End Examination, Autumn-2023

Course Code: URED-1201

Course Title: Basic Principles of Islam

Full Marks: 50

Time: 2 Hours 30 Minutes

(Answer all questions; the columns on the right side indicate to the marks, CLOs, and Bloom's taxonomy domain for each question):

#	Questions	Marks	CLOs	Bloom's taxonomy domain
1	<p>a) "I created not Jinn and Mankind except that they should worship Me"- explain this Ayah summarizing some objectives and conditions of 'Ibadah from the viewpoint of Islam.</p> <p style="text-align: center;">Or,</p> <p>b) Define 'Ibadah literally and terminologically. Explain some extraordinary characteristics of 'Ibadah in Islam.</p>	10	3	Evaluate & Create
2	<p>a) "Whoever abandons the Salah intentionally has disbelieved"- explain this Hadith indicating the ruling of Islam in respect of abandoning the Salah and importance of Salah elaborately.</p> <p style="text-align: center;">Or,</p> <p>b) "Pray as you have seen me pray"- explain this Hadith mentioning the <i>Shurut</i> (prerequisites) and <i>Arkan</i> (pillars) of <i>Salah</i> properly.</p>	10	3	Remember & Create
3	Define <i>Sawm</i> literally and terminologically. Explain some benefits of <i>Sawm</i> in human life elaborately.	10	3	Remember & Create
4	"Zakah is taken from the rich and distributed to the poor"- prove this Hadith explaining those on whom <i>Zakah</i> is obligatory and those who are due recipients of <i>Zakah</i> according to the direction of the holy Qur'an.	10	3	Evaluate & Create
5.	What are the essential works of <i>Hajj</i> ? Analyze the lessons of <i>Hajj</i> for the unity of Muslim <i>Ummah</i> . Compare lessons of <i>Hajj</i> with our present life from the viewpoint of Islam.	10	3	Remember, Analyze & Evaluate

[Answer all the questions. Figures in the right hand margin indicate full marks.
 Separate answer script must be used for Group A and Group B]

Group-A

1. a) Compare the RMS value and the average value of a signal. Find out the RMS and average value of the given signal shown in Fig-1(a). CLO1 Ap 05

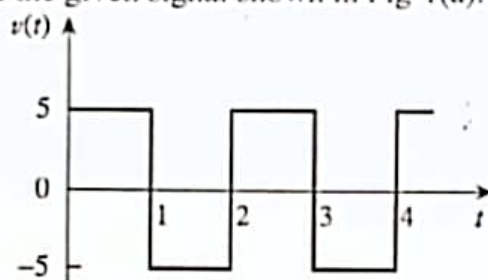


Fig-1(a)

OR

Consider a sine wave signal with an amplitude of 5 volts, varying from 0V to 5V over a cycle. Calculate the average and RMS values of this sine wave signal.

1. b) Dissect the diagrams of the signals $V_1 = 4 \sin(\omega t - 30^\circ)$ and $V_2 = 10 \cos(\omega t + 20^\circ)$ and find out the leading signal. CLO3 An 05

2. a) Given a load that initially operates at 4 kW with a lagging power factor of 0.8 when connected to a 120-V (rms), 60-Hz power line, analyze how much capacitance is needed to increase the power factor to 0.95. CLO3 An 05

2. b) In the circuit of Fig-2(b), calculate the average power absorbed by the resistor and capacitor. Find the average power supplied by the voltage source. CLO3 Ap 05

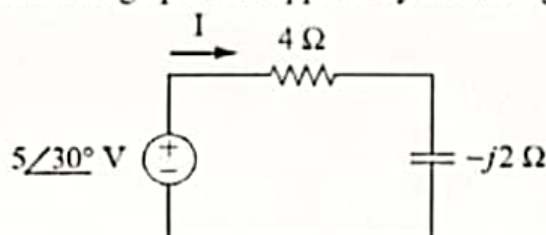


Fig-2(b)

OR

- b) For a load, $V_{rms} = 110 \angle 85^\circ$, $I_{rms} = 3 \angle 15^\circ$ Determine:
 (i) the complex and apparent powers
 (ii) the real and reactive powers, and
 (iii) the power factor.

Group-B

3. a) Briefly explain leading and lagging quantities of RC and RL circuits. Draw the phasor diagrams of inductive and capacitive circuits. CLO1 An 05

OR

Use Phasor to find:

i) $3 \cos(20t - 10^\circ) - 5 \cos(20t - 30^\circ)$

ii) $40 \sin 50t + 30 \cos(50t - 45^\circ)$

3. b) You are given the voltage and current equation for a black box shown in Fig. 3(b). Find whether the element involved is a capacitor, an inductor or a resistor also determine the Value of C, L, or R. CLO3 Ap 05

i) $v = 300 \sin(155t + 30^\circ)$

ii) $i = 40 \sin(155t + 120^\circ)$

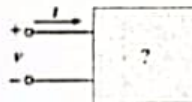


Fig. 3(b)

4. a) What is Cut-off frequency of a waveform in the context of filters? Design a high pass filter with cut off frequency of 200Hz if $R = 20 \Omega$ with waveshapes. CLO3 An 05
4. b) Discuss the behavior of low-pass and high-pass filters concerning their response to different frequencies. Also design band pass and band stop filter using low-pass and high pass filter. CLO3 E 05
5. a) What are the advantages of three phase balanced system? Find out the phase sequence of the following voltages. If $V_{an} = 200 \angle 10^\circ$, $V_{bn} = 200 \angle -230^\circ$, $V_{cn} = 200 \angle -110^\circ$ CLO3 An 05
5. b) A Balanced Δ -connected load having an impedance $20 - j15 \text{ ohm}$ is connected to a Δ -connected positive-sequence generator having ($V_{ab} = 200 \angle 0^\circ \text{ V}$). Calculate the phase currents of the load and the line currents. CLO3 Ap 05

OR

Obtain the line currents of the three phase circuits of Fig-5(b).

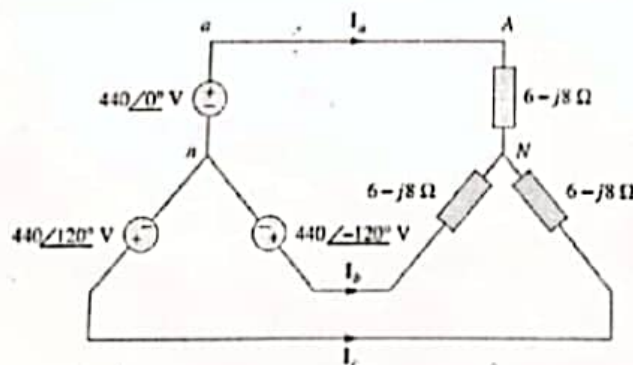


Fig-5(b)

International Islamic University Chittagong
Morality Development Program (MDP)
Semester End Examination
Autumn -2023
Course Code: MDP-1202
2nd Semester
Tajweedul Qur'aan -II



Marks: 50

Duration: 2:30 hours

Answer the following questions:

5 x 10 = 50

1. Write the meaning of following Surahs. (Any tow) 10
 - a) Suratul Humazah
 - b) Suratut Takasur
 - c) Suratul Feel
2. Write a brief explanation on Salah and its impact on human life. 10
3. Write down the different types of women rights in Islam. 10
4. Write the rules of time of Salah in details. 10

Or

How to perform Salatut Vit'r
5. Explain Halaal, Haraam, Farj, Wajib and Sunnah. 10

Or

Write the definition of Aqeedah, Ibaadah and Muamalah.

Bismillahir Rahmanir Rahim
International Islamic University Chittagong
 Department of Computer Science & Engineering
B. Sc. In CSE Semester Final Examination, Autumn 2023
 Course Code: MATH-1207 Course Title: Mathematics-II
 Total Marks: 50 Time: 2 Hours 30 Minutes



[Answer *all* the questions. Figures in the right hand margin indicate full marks.
 Separate answer script must be used for Group A and Group

Group – A

		Marks	CLO	DL
		5	CLO2	U
1.	a) Define order and degree of a differential equation with example. Form the differential equation of which $y = p \cos(q - mx)$			
	b) Solve the differential equation $x \cos \frac{y}{x} (y dx + x dy) = y \sin \frac{y}{x} (x dy - y dx)$	5	CLO2	U
	Or) Solve the differential equation $(2x - 2y + 5) \frac{dy}{dx} = (x - y + 3)$			
2.	a) Define Bernoulli's differential equation. Solve the Bernoulli's differential equation, $\frac{dy}{dx} + xy = x^3 y^3$	5	CLO2	U
	b) Is the differential equation $\left(1 + e^{\frac{x}{y}}\right) dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right) dy = 0$ exact? Solve this equation.	5	CLO2	U
	Or) Define linear differential equation with constant coefficients. Solve the equation, $\frac{d^3 y}{dx^3} - \frac{dy}{dx} = e^{-x} + \cos 2x$			

Group – B

3.	a) Show that, (i) $\frac{d}{dx}[J_0(x)] = -J_1(x)$ and (ii) $J_{-n}(x) = (-1)^n J_n(x)$	5	CLO2	U
	b) Define Legendre's equation. Using the Rodrigue's formula evaluate the values of $P_2(x)$	5	CLO2	U
4.	a) Solve the linear differential equation by the method of Variation of parameters $(D^2 + 1)y = \operatorname{cosec} x$	5	CLO2	U

Or) Using the method of undetermined coefficients to solve the differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3y = x^3 + \sin x$.

b) Define partial differential equation. Solve the linear partial differential equations by Lagrange's method, $yzp + xzq = xy$

5

CLO2

U

Or) Apply the Charpit's method to solve the non-linear partial differential equation $2xz - px^2 - 2qxy + pq = 0$.

5

CLO2

U

5.

a) The body of a murder victim was discovered at 11:00 pm. The doctor took the temperature of the body at 11:30 p.m. which was 94.6° F. He again took temperature after one hour when showed 93.4° F and noticed that the temperature of the room was 70° F. Form a differential equation and by solving it estimate the time of death. [Normal temperature of human body is 98.6° F]

5

CLO3

Ap

b) A generator having emf 100V is connected in series with a 10Ω resistor and an induction of 2H. If the switch k is closed at time $t = 0$, obtain a differential equation for the current and determine the current at time t.

5

CLO3

Ap



International Islamic University Chittagong
Department of Computer Science and Engineering
Final Examination [Special Sections], Autumn 2023

Course Code: CSE 1121 Course Title: Computer Programming I

Total marks: 50

Time: 2 hours 30 minutes

[Answer *all* the questions; in some questions, there are options; you will solve any one of them; Figures in the right-hand margin indicates full marks. Separate answer script must be used for Group-A and Group-B]

Group-A

1) What will be the output of the following code if $a = X$ [Here X is the last digit of your ID] and $n = 30$? How the output will be changed if **continue** statement is replaced with a **break** statement? 2 CO1 U

```
sum = 0;
for (i = a; i <= n; i = i+5)
{
    if (i % 3 == 0)
    {
        sum = 0;
        continue;
    }
    sum = sum + i;
    printf("sum = %d\n", sum);
}
```

b) Write C code segment that reads two positive integers N and M and prints the following pattern for N rows and M Columns. 3 CO3 A

Sample Input	Sample Output
4 5	<pre>1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4</pre>
5 4	<pre>1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5</pre>

OR

Write C code segment for printing the following pattern for any input N . The given pattern is for $N = 3$.

```
*
**
***
**
*
```


- c) A **prime number** (or a **prime**) is a natural number greater than 1 that is not a product of two smaller natural numbers. Write a C program that will read a positive integer T the number of test cases. Each test case consists of one line containing a single nonnegative integer N. For each test case, print **Prime number** if the number N is a prime number. Otherwise, print **Not a prime number**.

Sample Input	Sample Output
2	Prime number
11	Not a prime number
12	

- 2 a) What are the differences between *local* and *global* variable? Explain with suitable examples. 2 CO2 U
- b) What will be the output of the following programs? Here N is the last digit of your ID. Suppose your ID is C233201, then the value of N should be 1. Explain the outputs with all the calculations. 4 CO2 U

```
i)
#include<stdio.h>
int x = N;
int fun1( )
{ x = x + 25; return x; }
int fun2( )
{ int x = 15; return x; }
int fun3( )
{ x = x - 5; return x; }
int main( )
{
    int x = 10;
    printf("x = %d\n", x);
    printf("x = %d\n", fun1( ));
    printf("x = %d\n", fun2( ));
    printf("x = %d\n", fun3( ));
    return 0;
}
```

```
ii)
#include<stdio.h>
void fun(int x, int y)
{
    if(x > y) return;
    printf("Before: %d %d\n", x,
y);
    fun(x + 2, y - 2);
    printf("After: %d %d\n", x,
y);
}
int main()
{
    int x = N;
    fun(x, 7 + x);
    return 0;
}
```

- c) Write a function named **multiple** that determines, for a pair of integers, whether the second integer is a multiple of the first. The function should take two integer arguments and return 1 (true) if the second integer is a multiple of the first and 0 (false) otherwise. Demonstrate your function in a complete C program. 4 CO3 A

OR

In mathematics, a **perfect number** is a positive integer that is equal to the sum of its positive divisors, **excluding the number itself**. For example, 6 is a perfect number that is completely divisible by sum of its positive divisors 1, 2, and 3. Write a function named **checkPerfect** which takes an integer number as the parameter. The function returns 1 if the number is perfect, otherwise it returns 0. Demonstrate your function in a complete C program.

Group-B

a) Write an appropriate array definition for each of the following situations.

2 CO1 U

- Define a *one dimensional*, 8 element integer array called **point**. Assign the value 10, 20, 30 to the first three-array elements and assign 0 for rest elements.
- Define a two-dimensional, 3 X 4 integer array called **table**. Assign the following values to the array elements.

```
10 12 14 0
0 20 22 0
0 30 32 0
```

b) What is the output of the following program? Explain the outputs with all the calculations.

3 CO2 U

```
#include <stdio.h>
int n = 5;
float list[5] = {3.1, -2.3, 12.7, 4.9, 3.6};
int main( )
{
    int count;
    float avg, d, sum = 0;
    for ( count = 0 ; count < n ; ++count )
        sum += list[count];
    avg = sum / n;
    printf ("\nThe average is %5.2f \n\n", avg);
    for ( count = 0 ; count < n ; ++count ) {
        d = list[count] - avg;
        printf("i = %d: ", count+1);
        printf("x = %5.2f, d = %5.2f \n", list[count], d);
    }
    return 0;
}
```

c) Write a C program to take two numbers N and X. Then take N numbers as input and store them in an array. Now, print all those numbers which are larger than X in a single line. In the next line, print all those numbers which are smaller than X.

5 CO3 A

Sample Input	Sample Output
5 6 8 4 7 6 2	8 7 4 2

OR

You will be given a matrix of $N \times N$ ($0 < N < 10$) dimension and an integer Q. Write a C program to find the sum of the Q-th row and Q-th column.

Sample Input	Sample Output
5 1 2 3 4 5 7 8 4 5 6 9 8 7 6 5 5 4 3 2 1 1 3 5 7 9	Row Sum = 35 Col Sum = 22

- 4 a) Briefly explain the syntax and purpose of the following functions in C- 2 CO2 U
 i) `strcat ()` ii) `strcpy ()` iii) `strcmp ()` iv) `strchr ()`
 b) When passing an argument to a function, what are the differences between *passing by value* and *passing by reference*? Explain with a simple C program. 3 CO2 U
 c) You are given a string S which might contain some space characters **in front** of it (leading spaces) and **at the end** of it (trailing spaces). Write a C Program to print the string after removing these leading and trailing extra spaces. Please make sure that your program only removes the leading and the trailing spaces and not the others. 5 CO3 A

Sample Input	Sample Output
abc def	abc def
Hello world	Hello world

OR

Write a C program that reads *n* numbers from keyboard, *store* in an array and *rearrange* the numbers in *ascending* order and then *display* the list. Use *dynamic memory allocation* to store the numbers.

- a) Write a C program to create a structure **Player** that contains the fields. 4 CO3 A
 name - a string of size 24
 country - a string of size 16
 runs - an integer
 average - a double precision floating point number
 Declare an array of **Player** and input *N* players' data in it.
 Print the **name** of the player who has the highest **average**.
 b) Write a C program that will read the content of a file named **copy.txt** and write this content in *reverse* order in another file named **clone.txt**. 4 CO3 A

OR

Write a C program to open a file and write *N* numbers taken from keyboard. Next, close the file and open it again in read mode. Now, read the numbers from the file and print them in *reverse* order.

- c) Write the advantages and disadvantages of using *macro* over *function*. 2 CO1 U

OR

Suppose *X* and *Y* are unsigned 16-bit integer quantity whose hexadecimal value is 0XB7A3 and 0XD2C5 respectively. Evaluate each of the bitwise expression:

- i) $X \& Y$ ii) $X \wedge Y$ iii) $\sim X$ v) $X \ll 3$

International Islamic University Chittagong
Department of Computer Science & Engineering
 B. Sc. in CSE Semester Final Examination, Autumn-2023
Course Code: CSE-1223 Course Title: Discrete Mathematics
Total marks: 50 Time: 2 hours 30 minutes

[Answer **all** the questions. Figures in the right hand margin indicate full marks.
 Separate answer script must be used for Group A and Group B]

GROUP-A

1. a) Suppose you are given N numbers, $a_1, a_2, a_3, \dots, a_N$ where $N \leq 10^5$ and $1 \leq a_i \leq 10^5$. You want to find their product modulo M where $M \leq 10^9$ i.e. $(a_1 * a_2 * a_3 * \dots * a_N) \bmod M$. Write a C program/algorithm to calculate the final result. 3 CO1 U
- b) Simulate steps of sieve of Eratosthenes algorithm to find all the primes not exceeding 50. 3 CO1 U

OR

Find GCD(1000, 625) and LCM(1000, 625) using *Euclidean algorithm*.

- c) Show step by step process of finding $5^{51} \bmod 100$ using *Modular Exponentiation algorithm*. 4 CO2 Ap

OR

Find the value of x using the *Chinese remainder theorem*

$$x \equiv 2 \pmod{3}$$

$$x \equiv 1 \pmod{4}$$

$$x \equiv 3 \pmod{5}$$

2. a) Prove that $1 \cdot 1! + 2 \cdot 2! + \dots + n \cdot n! = (n+1)! - 1$ whenever n is a positive integer. 3 CO2 Ap

OR

Give a *direct proof* of the theorem "If n is an odd integer, then show that $n^2 - 1$ is divisible by 8".

- b) Suppose you have an infinite number of 2 taka and 5 taka notes and you have to pay some amount of money. Use *mathematical induction* to prove that any amount greater than or equal to 4 taka can be paid with a combination of 2 taka and 5 taka notes. 4 CO2 Ap
- c) Find $f(3)$ and $f(7)$ if $f(n)$ is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$, and for $n \geq 1$. 3 CO2 Ap

GROUP-B

3. a) The DNA code is made up of four letters: A, C, G, and T. How many 5-element DNA sequences
- end with A?
 - start with T and end with G?
 - contain only A and T?
 - do not contain C?
- 4 CO2 Ap

- b) How many ways are there for 3 penguins and 6 puffins to stand in a line so that
 i) all puffins stand together?
 ii) all penguins stand together?
 OR

On each of the 22 work days in a particular month, every employee of a start-up venture was sent a company communication. If a total of 4642 total company communications were sent, how many employees does the company have, assuming that no staffing changes were made that month?

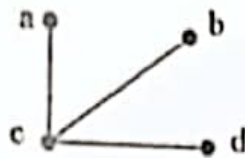
- c) State the *pigeonhole principle*. Use pigeon hole principle to show that among any group of 20 people (where any two people are either friends or enemies), there are either four mutual friends or four mutual enemies.

OR

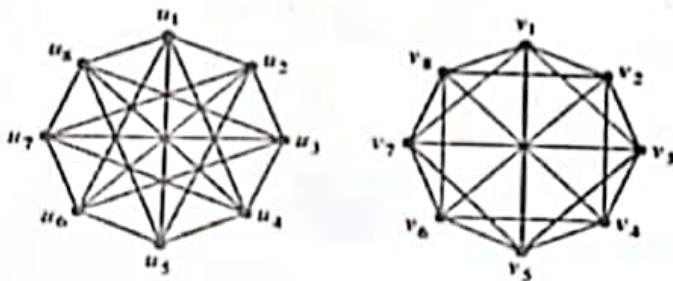
How many positive integers between 5 and 31

- i) are divisible by 3? Which integers are these?
 ii) are divisible by 4? Which integers are these?
 iii) are divisible by 3 and by 4? Which integers are these?

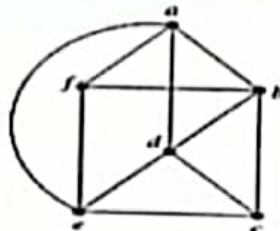
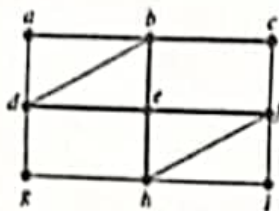
4. a) State the *Handshaking theorem*. Verify the Handshaking theorem for the following figure.



- b) Are the graphs *isomorphic* or not? Please justify your answer.

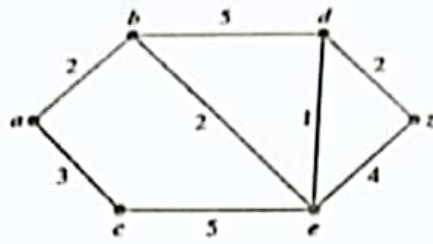


- c) Determine whether the given graph has a *Euler circuit*. Construct such a circuit when one exists. If no Euler-circuit exists, determine whether the graph has a *Euler path* and construct such a path if one exists.



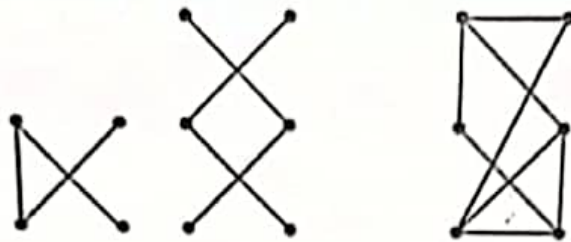
OR

Apply Dijkstra's algorithm for finding the shortest paths between a to z.



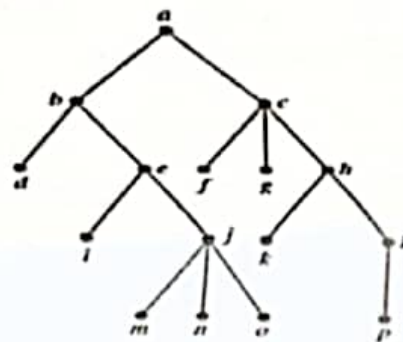
5. a) Which of this graph is *tree*? Justify your answer.

3 CO1 U



- b) Find *inorder*, *preorder*, and *postorder* traversal of the following tree T.

3 CO1 U



- c) Define *minimum spanning tree*. Use *Kruskal's* or *Prim's* algorithm to find a *minimum spanning tree* for the given weighted graph

4 CO2 Ap

