

Patuakhali Science and Technology University (PSTU)

Department of Computer Science and Information Technology (CIT)

Mid Term Examination (LAB), July-December - 2018

Program: B. Sc. Engg. in CSE

Session: 2017-18

Course Code : CCE 221 Course Title : Object Oriented Programming Language Sessional

Full Time: 2.00 hours Answer the marked questions Full Marks: 15

- 1.** Write a Java program to add two binary numbers.

Input Data:

Input first binary number: 10

Input second binary number: 11

Expected Output

Sum of two binary numbers: 101

- 2.** Write a Java program to compute the distance between two points on the surface of earth. Distance between the two points [(x1,y1) & (x2,y2)]

 $d = \text{radius} * \arccos(\sin(y1) * \sin(y2) + \cos(y1) * \cos(y2) * \cos(x1 - x2))$

Radius of the earth r = 6371.01 Kilometers

Input Data:

Input the latitude of coordinate 1: 25

Input the longitude of coordinate 1: 35

Input the latitude of coordinate 2: 35.5

Input the longitude of coordinate 2: 25.5

Expected Output

The distance between those points is: 1480.0848451069087 km

- 3.** Write a Java program that takes the user to provide a single character from the alphabet. Print Vowel or Consonant, depending on the character input. If the user input is not a letter (between a - z or A and Z), or if a dot(.) is given, then provide error message. **Test Data**

Input an alphabet: p

Expected Output

Input letter is: Consonant

- 4.** Write a Java program to calculate the average value of array elements.

5.

Write a Java method to display the first 50 pentagonal numbers

Note: A pentagonal number is a figurate number that extends the concept of triangular and square numbers to the pentagon, but, unlike the first two, the patterns involved in the construction of pentagonal numbers are not rotationally symmetrical.

Expected Output:

1	5	12	22	35	51	70	92	117	145
176	210	247	287	330	376	425	477	532	590
651	715	782	852	925	1001	1080	1162	1247	1335
1426	1520	1617	1717	1820	1926	2035	2147	2262	2380
2501	2625	2752	2882	3015	3151	3290	3432	3577	3725

6.

Write a Java method to check whether a string is a valid password.

Password rules:

A password must have at least ten characters.

A password consists of only letters and digits.

A password must contain at least two digits.

Expected Output:

1. A password must have at least eight characters.
2. A password consists of only letters and digits.
3. A password must contain at least two digits

Input a password (You are agreeing to the above Terms and Conditions.):

abcd1234

Password is valid: abcd1234

7.

4.35, 4.36, 4.37(a, b, c, d), 5.12, 5.13, 5.14, 5.15(a, b, c, d), 5.20, 5.24, 6.23, 6.24, 6.25, 6.26, 6.27, 7.29, 7.14, 7.17

```
int n, i,
```

```
Scanner input = new Scanner(System.in)
```

```
s.out.println("Enter the nth term")
```

```
n = input.nextInt();
```

```
s.out.println("Fibonacci series of 1st n terms")
```

```
for (i = 0, i < n; i++)
```

```
{ s.out.print(fib(i) + " ") }
```

```
static int fibo(int val)
```

```
{ if (val == 0)
```

```
return 0;
```

```
else if (val == 1)
```

```
return 1;
```

```
else
```

```
return(fibo(val - 1) + fibo(val - 2))
```

Patuakhali Science and Technology University (PSTU)
Department of Computer Science and Information Technology (CSIT)
Department of Computer and Communication Engineering (CCE)

Midterm Examination: July-December-2019

Program: B. Sc. Engg.(CSE)

Session: 2018-19

Course Code : CCE-122

Full Time: 1 Hour 30 Minutes

Course Title : Object Oriented Programming Sessional

Full Marks: 15

Part A

1. **(Employee Class)** Create a class called Employee that includes three instance variables—a first name (type String), a last name (type String) and a monthly salary (double). Provide a constructor that initializes the three instance variables. Provide a *set* and a *get* method for each instance variable. If the monthly salary is not positive, do not set its value. Write a test app named EmployeeTest that demonstrates class Employee's capabilities. Create two Employee objects and display each object's *yearly* salary. Then give each Employee a 10% raise and display each Employee's yearly salary again. 7.5
2. **(Computer-Assisted Instruction)** The use of computers in education is referred to as *computer-assisted instruction (CAI)*. Write a program that will help an elementary school student learn multiplication. Use a SecureRandom object to produce two positive one-digit integers. The program should then prompt the user with a question, such as How much is 6 times 7? The student then inputs the answer. Next, the program checks the student's answer. If it's correct, display the message "Very good!" and ask another multiplication question. If the answer is wrong, display the message "No. Please try again." and let the student try the same question repeatedly until the student finally gets it right. A separate method should be used to generate each new question. This method should be called once when the application begins execution and each time the user answers the question correctly. 7.5
3. **(Date Class)** Create class Date with the following capabilities:
 - a) Output the date in multiple formats, such as
MM/DD/YYYY
June 14, 1992
DDD YYYY
 - b) Use overloaded constructors to create Date objects initialized with dates of the formats in part (a). In the first case the constructor should receive three integer values. In the second case it should receive a String and two integer values. In the third case it should receive two integer values, the first of which represents the day number in the year.
[Hint: To convert the String representation of the month to a numeric value, compare Strings using the equals method. For example, if s1 and s2 are Strings, the method call s1.equals(s2) returns true if the Strings are identical and otherwise returns false.]7.5
4. **(Rectangle Class)** Create a class Rectangle with attributes length and width, each of which defaults to 1. Provide methods that calculate the rectangle's perimeter and area. It has *set* and *get* methods for both length and width. The *set* methods should verify that length and width are each floating-point numbers larger than 0.0 and less than 20.0. Write a program to test class Rectangle. 7.5



Patuakhali Science and Technology University (PSTU)

Department of Computer Science and Information Technology(CSE)

Mid-Term Examination, July-December -2018-19

Program: B. Sc. in CSE

Session : 2017-18

Course Title : Object Oriented Programming Language

Full Marks: 15

Course Code : CCE-121
Full Time: 1 hour

Answer the questions

1. Why java is called machine independent language? 01

2. Develop a Java application that determines whether any of several department-store customers has exceeded the credit limit on a charge account. For each customer, the following facts are available:

- a) account number
- b) balance at the beginning of the month
- c) total of all items charged by the customer this month
- d) total of all credits applied to the customer's account this month
- e) allowed credit limit.

The program should input all these facts as integers, calculate the new balance (= beginning balance + charges - credits), display the new balance and determine whether the new balance exceeds the customer's credit limit. For those customers whose credit limit is exceeded, the program should display the message "Credit limit exceeded".

3. What is the difference between a local variable and an instance variable? 01

4. Where does array stored in memory? 01

5. What is ArrayIndexOutOfBoundsException? 01

01

6. Factorials are used frequently in probability problems. The factorial of a positive integer n (written $n!$) and pronounced " n factorial" is equal to the product of the positive integers from 1 to n . Write an application that calculates the factorials of 1 through 20. Use type **long**. Display the results in tabular format. What difficulty might prevent you from calculating the factorial of 100? 02

7. Explain the purpose of a method parameter. What is the difference between a parameter and an argument? 01

8. (*Temperature Conversions*) Implement the following integer methods:

- a) Method **celsius** returns the Celsius equivalent of a Fahrenheit temperature, using the calculation
 $celsius = 5.0 / 9.0 * (\text{fahrenheit} - 32);$

- b) Method **fahrenheit** returns the Fahrenheit equivalent of a Celsius temperature, using the calculation
 $\text{fahrenheit} = 9.0 / 5.0 * \text{celsius} + 32;$

Use the methods from parts (a) and (b) to write an application that enables the user either to enter a Fahrenheit temperature and display the Celsius equivalent or to enter a Celsius temperature and display the Fahrenheit equivalent.

9. What does the following program segment do?

-for (i = 1; i <= 5; i++)

```
{  
    for (j = 1; j <= 3; j++)  
    {  
        for (k = 1; k <= 4; k++)  
            System.out.print(i * k);  
        System.out.println();  
    } // end inner for  
System.out.println();  
}/ end outer for
```

10. Identify and correct the errors in each of the following sets of code:

a) while (c <= 5)
{
 product *= c;
 ~~c += c;~~
}
b) if (gender == 1)
 System.out.println("Woman");
else
 System.out.println("Man");

01

01

03

[Figures in the right margin indicate full marks. Split answering of any question is not recommended. Write the full question number e.g. 4(B) before the answer paragraph]

Answer any 5 of the following questions

A What are the principles of Object Oriented Programming (OOP)? Discuss with example. 3

B Write a full java program that will read a person's weight (kg) and height (meter) and will calculate the Body Mass Index (BMI).
 $BMI = \frac{\text{weight}}{\text{height}^2}$
 If BMI is < 18, display "You are underweight", if BMI>25 display "You are overweight" else show "Good. You are fit".

C Write an application that calculates the product of the odd integers from 1 to 15. 6

2 A class recursion) 3
 {
 int func(int n)
 {
 int result;
 result = func(n-1);
 return result;
 }
 } Class Output
 {
 public static void main(String args[]){
 recursion obj = new recursion();
 System.out.print(obj.func(12));
 }
 }

9x(1,1,2,1,=0)

Write the output of the above code with explanation.

B

```

class Teacher{
    String designation = " Teacher";
    String collegeName= " PSTU";
}
void does(){
    System.out.println(" Teaching");
}

public class PhysicsTeacher extends Teacher{
    String mainSubject = "Physics";
    public static void main(String args[]){
        PhysicsTeacher obj = new PhysicsTeacher();
        System.out.println(obj.collegeName);
        System.out.println(obj.designation);
        System.out.println(obj.mainSubject);
    }
}

```

Physics Teacher
 PSTU
 Teacher
 Teacher

obj.does();
}

}
Write the output of the above code with explanation.

2 C Write the difference between method overloading and method overriding with example. 6

3 A Describe the meaning of polymorphism in java with example. Differentiate between compile time polymorphism and run time polymorphism in java. 4

3 B Compare and contrast abstract classes and interfaces. Why would you use an abstract class? Why would you use an interface? 5

3 C How multithreading help to increase parallelism in java? Explain with an example. 5

4 A Explain the purpose of a method parameter. What is the difference between a parameter and an argument? 3

B One of the world's most common objects is a wrist watch. Discuss how each of the following terms and concepts applies to the notion of a watch: object, attributes, behaviors, class, inheritance (consider, for example, an alarm clock), modeling, messages, encapsulation, interface and information hiding. 4

C Write method distance to calculate the distance between two points (x_1, y_1) and (x_2, y_2). All numbers and return values should be of type double. Incorporate this method into an application that enables the user to enter the coordinates of the points. 3

D An integer number is said to be a perfect number if its factors, including 1 (but not the number itself), sum to the number. For example, 6 is a perfect number, because $6 = 1 + 2 + 3$. Write a method isPerfect that determines whether parameter number is a perfect number. Use this method in an application that displays all the perfect numbers between 1 and 1000. Display the factors of each perfect number to confirm that the number is indeed perfect. Challenge the computing power of your computer by testing numbers much larger than 1000. 4

5 A Define Constructor. What happens when a return type, even void, is specified for a constructor? How garbage collector works in JAVA?

3

B What are overloaded constructors? Describe with an example.

4

C Create class SavingsAccount. Use a static variable annualInterestRate to store the annual interest rate for all account holders. Each object of the class contains a private instance variable savingsBalance indicating the amount the saver currently has on deposit. Provide method calculateMonthlyInterest to calculate the monthly interest by multiplying the savingsBalance by annualInterestRate divided by 12—this interest should be added to savingsBalance. Provide a static method modifyInterestRate that sets the annualInterestRate to a new value. Write a program to test class SavingsAccount. Instantiate two SavingsAccount objects, saver1 and saver2, with balances of \$2000.00 and \$3000.00, respectively. Set annualInterestRate to 4%, then calculate the monthly interest for each of 12 months and print the new balances for both savers. Next, set the annualInterestRate to 5%, calculate the next month's interest and print the new balances for both savers.

6 A Why are exceptions particularly appropriate for dealing with errors produced by methods of classes in the Java API? If no exceptions are thrown in a try block, where does control proceed to when the try block completes execution?

3

B What is the key reason for using finally blocks? Write java code to create a java file and perform read-write to that file?

4

C Write short note about a) iterator b) autoboxing c) ArrayList d) auto-unboxing e) set f) collection.

3

D Define a data-manipulation application for the books database. The user should be able to edit existing data and add new data to the database (obeying referential and entity integrity constraints). Allow the user to edit the database in the following ways:

- a) Add a new author.
- b) Edit the existing information for an author.
- c) Add a new title for an author. (Remember that the book must have an entry in the AuthorISBN table.)
- d) Add a new entry in the AuthorISBN table to link authors with titles.

4

Patuakhali Science and Technology University

B.Sc. Engg. (CSE) Level-I, Semester-II, Final Examination Jul-Dec/14, Session: 2013-14

Course code: CCE-121

Credit hour: 3.00

Full marks: 70

Duration: 3 hours

[Figures in the right margin indicate full marks.]

Answer any 4 from questions 1 to 5. Answering question no. 6 is must. Split answering is not recommended.

1. (a) Define procedural programming language. What are the benefits of Object Oriented Programming? 4

When do we use private, protected and public keywords? Discuss in short with example. 4

c. Define: constructor, encapsulation, inheritance and polymorphism. 6

2. a.. Declare a class named Student with 3 private member variables for name, ID and marks obtained. The class should have a default constructor which sets name to empty string, id to 0(zero) and marks obtained to 0.0. The class should also contain a 3 parameter constructor to set the member variables. 5

b. Write 3 get methods for the class Student you have just written in question 2.a. 4

c. Write another class Grade which has a member variable for grade and an object of Student class. Write the default constructor which sets grade to "F" and creates the student object with Student's default constructor. Finally write a member function to calculate the grade using PSTU grading rule. 5

3. (a) What is method overloading? How can the constructor be overloaded? Explain with example. 6

b. What is an interface? How does polymorphism work in interfaces? 5

c. What are this and super keywords? Give examples. 3

4. Write a program in Java which should take an integer number (*n*) as input first. Then the program should ask to input *n* integer numbers. Then your program will ask for another number (*x*). Now your program should be able to find *x* from those *n* numbers and count how many times *x* was present in the array. The array of integers should be dynamically bound. The program should be in object-oriented way and the functions should be small in size. 5

5. (a) Write a class named Employee with 3 member variables for first name, last name and basic salary. These variables should be accessible by its subclasses. Now, write a 3 parameter constructor for the class which initialises the names and the basic salary. 5

b. Write a class named Teacher which should inherit the Employee class of question 3.a. The Teacher class should have 3 private member variables for his number of increment, amount of each increment and salary. This class should have a 5 parameter constructor which calls the constructor of the super class using super keyword. Write a method to calculate the salary which is the sum of basic salary and the increment multiplied by the number of increments. 5

c. Write another class named TestDriver which should have only the main function. In the main function, instantiate an object of the Teacher class of question 3.b, which should be initialized with 5 parameters. (You may choose any name, basic salary and increment for this). Call the method to calculate the salary of the Teacher object. 4

Find and point out the errors in the following program.

14

```
public class ErrorChecker {  
    private int x;  
    private String str;  
    ErrorCheck()  
    {  
        x = 0;  
        str = "";  
    }  
    public static void main(String[] args) {  
        ErrorChecker myClass = new ErrorChecker();  
        myClass.x = 50;  
        myClass.str = "Hello!";  
        ErrorChecker myAnotherClass = new ErrorChecker(5, "HelloWorld!");  
        myAnotherClass.print();  
        myAnotherClass.print(x,str);  
    }  
}
```

Patuakhali Science and Technology University

Final Examination of B.Sc. Engineering in CSE Level: I Semester: II Session: 2016-17

Course Code CCE-121	Course Title Object Oriented Programming	July-December 2017	Credit: 03 Time: 03 Hr
			Marks: 70

Answer any 05 out of 06 Questions (Split answers are highly discouraged and write the full question number e.g. 1(a) before the answer paragraph)

- 1 (a)** What is Java Virtual Machine and how it is considered in the context of Java's platform-independent feature? 2

- b5** Classify and explain Java programming error with example. 3

- c7** What are the naming conventions for class names, method names, constants, and variables? Which of the following items can be a constant, a method, a variable, or a class according to the Java naming conventions? 4

MAX_VALUE, Test, read, readDouble

- d** Write a program that prompts the user to enter the minutes (e.g., 1 billion), and displays the number of years and days for the minutes. For simplicity, assume a year has 365 days. Here is a sample run:
Enter the number of minutes: 1000000000
1000000000 minutes is approximately 1902 years and 214 days 3

- e9** Suppose x = 2 and y = 3. Show the output, if any, of the following code. What is the output if x = 3 and y = 2? What is the output if x = 3 and y = 3?
if(x > 2)
if(y > 2){
int z = x + y;
System.out.println("z is " + z);
}
else
System.out.println("x is " + x); 3

- 2 (a)** Suppose you want to develop a program for a first-grader to practice subtraction. The program randomly generates two single-digit integers, number1 and number2, with number1 >= number2, and it displays to the student a question such as “What is $9 - 2?$ ” After the student enters the answer, the program displays a message indicating whether it is correct. Here is a sample run:
What is 6 - 6? 0 Enter
You are correct! 4

What is 9 - 2? 5

Your answer is wrong

9 - 2 is 7

- b** What is y after the following switch statement is executed? Rewrite the code using an If-else statement. 3

x = 3; y = 3;

switch (x + 3){

case 6: y = 1;

default: y += 1;

}

- c** Write a program that prompts the user to enter a three-digit integer and determines whether it is a palindrome number. A number is a palindrome if it reads the same from right to left and from left to right. Here is a sample run of this program:
Enter a three-digit integer: 121
121 is a palindrome 3

Enter a three-digit integer: 123
123 is not a palindrome

- d** What are the three parts of a for loop control? Convert the following for loop statement to a while loop and to a do-while loop:
long sum = 0;
for (int i = 0; i <= 1000; i++)
sum = sum + i; 4

long sum = 0;
for (int i = 0; i <= 1000; i++)
sum = sum + i;



/ **3** (a) Design a client-server program for primality testing using connection-oriented service in Java 6 programming language. 5

- (b) What are the disadvantages of connectionless service? Briefly, describe the server creation steps using stream socket. 3

(c) Write the differences between constructor and method.

4 (a) What do you mean by synchronization? Suppose you want to read final marks of 50 students stored in an array called "studentResultArray" using five threads. Now design the program using Java programming language and in that case, you must ensure synchronization among threads such that each thread performs the same amount of task without overlapping. 6

- (b) Why are two different methods used to create a thread in Java? Create and test a thread named "DownloadSong" which inherit properties from "PlaySong" class. 5

(c) "Composition" is has-a relationship". Justify this statement with example. 3

5 (a) Differentiate between checked and unchecked exception. Write sample code to create and test a user-defined checked exception called "NameNotFoundException" which return the message "Name not found in database". 6

(b) Design a class "Account" containing the public method "GetAccountInfo" and another class "Test" which will use the "GetAccountInfo" method. You must ensure that your "GetAccountInfo" method will force the developer to handle "FileNotFoundException" in "Test" class. 5

(c) What is the difference between termination and resumption model of exception handling? Explain 3 stack unwinding with sample code.

6 (a) Differentiate among class, interface, and abstract class with example. Why do you think the abstract class is important for software design? Explain with sample code. 6

(b) Create a class "Shape" which will be inherited by class "Circle" and "Rectangle". Design another class "ShapeUtility" consists of method "PrintShapeInfo" with an argument of "Shape" object. This method will print information according to object type, for example, in case of "Circle" type object, the method will print "Shape is Circle" and so on. Write sample code using the concept of object upcasting and downcasting in Java. 5

7 Why subclass constructor call superclass constructor explicitly or implicitly? 3

```
public class A extends B {
```

```
public A() {
```

```
String Name = null;
```

```
super(" name is null");
```

```
Dog d = new Dog();
```

```
Animal a = (Animal)d;
```

```
Animal / Animal
```

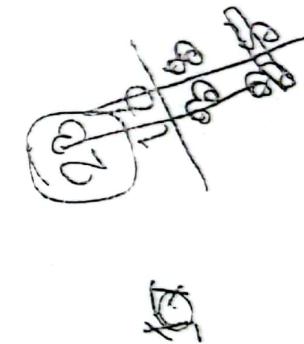
```
public class Test {
```

```
/ Animal
```


4. Write a while, a do-while and a for loop that will count backwards from 20 to 10.
- Shortly explain different types of inheritance.
- Differentiate between method overriding and method overloading?
- d) Describe two ways of creating thread with code in java. Why java supports two different ways of thread creation.
- e) Write a class named TestClass and add a String data field called data1. The data field should be private to the class.
- Now, add a constructor that accepts a starting value for data1 as its single parameter, and public methods for setting and retrieving the value of data1. Call these methods setData() and getData().

5. Differentiate among instance variable, class variable and local variable.
- What is the difference between a class and a structure?
- i) Is it possible for a class to inherit the constructor of its base class?
- ii) Can you inherit private members of a class? → ~~public, protected~~
- j) What is exception in java? Distinguish between checked exception and unchecked exception.
- 5 Write a java program to calculate sum of following series. Where the value of n is given by user.
- $$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \dots + \frac{1}{n}$$

6. A complete Java program may use the same name for several different methods or variables. Java has a number of features that allow the user to prevent such re-use of names from causing chaos. Describe these under the headings:
- (a) Scope rules within individual functions.
- (b) Visibility of method names within classes, and the effects of inheritance.
- b) Explain how to set up a 2-dimensional array in Java.
- c) What are collections and generics in java?
- d) Write a Java program that will write a list of double numbers into a file. Your program will then read the content of the file and find the summation of the numbers.



Patuakhali Science and Technology University

B.Sc. Engg. (CSE) Level-I, Semester-II Final Examination-2016 (July-Dec)

Course Code: CCE-121 Course Title : Object Oriented Programming

Credit Hour : 3.00 Full Marks:70 Duration: 3 Hours

[Figure in the right margin indicates full marks. Split answering of any question is not recommended.]

Answer any 5 of the following questions.

Q. (a) What are the differences between process and thread? Depicts the life cycle of a thread. [2+2]

(b) Write down the sample code of thread creation using Java in two different ways. [5]

c) What is deadlock? Explain deadlock situation using synchronized method and synchronized object. [1+4]

Q. (a) What is the difference between class and interface? You know that all classes in java are inherited from java.lang.Object class. Are interfaces also inherited from Object class? [2+1]

b) Can a class extend more than one classes or does java support multiple inheritances? If not, why? How do you implement multiple inheritances in java? Answer with java sample code. [3+4]

c) How do you restrict a member of a class from inheriting to it's sub classes? Are constructors and initializers also inherited to sub classes? What happens if both, super class and sub class, have a field with the same name? *Object vs. Java inheritance confusion* [2+1+1]

X. (a) What is an exception? Draw the exception hierarchy. Differentiate between checked and unchecked exception with an example. [1+1+2]

b) Write down five keywords using in java exception handling with their purpose. How to create custom Exception with Java? [5+3]

c) "All catch blocks must be ordered from superclass exception to subclass exception"-Justify this statement with Java code. [4]

d) Create an overload and override version of a method named DISPLAY and overload method must be defined by changing the number of method parameters. Method overloading is not possible by changing the return type of method. Why? [2.5+2.5]

b) What is the abstract method? Write a practical scenario where the abstract method can help to [1+4] design the software.

f) Briefly describe object upcasting and downcasting. Sample code is appreciated. [4]

Q. (a) Create a java class using following attribute (instance variable should be public and method should be private.) [3]

Class name: Account

Instance Variable: account_holder_name, amount

Method: WithdrawMoney, Deposit

Q. (b) What are the differences between method and constructor? [2]

d) What is UML? Draw the UML of following java class

UML

```
class Human
{
    String s1, s2, name;
    public Human()
    {
        s1 = "Super class";
        s2 = "Parent class";
    }
    public Human(String str)
    {
        s1 = str;
        s2 = str;
    }
    private void SetName(String str)
    {
        name = str;
    }
    private String GetName()
    {
        return name;
    }
}
```

e) Write the output of following programs

```
try
{
    int x = 0;
    int y = 5 / x;
}
catch (Exception e)
{
    System.out.println("Exception");
}
catch (ArithmaticException ae)
{
    System.out.println("Arithmatic
Exception");
}
System.out.println("Finished");
```

[3]

Ans: Finally

Briefly describe access modifiers of Java? How do you achieve encapsulation property of object oriented programming in your code?

b) Why do you need synchronization in multithreaded program? How do you achieve synchronization in your multithreaded program? Explain with code.

Consider following condition write a sample java code of inheritance

[5]

- Super class : Animal
- Super class contain parameterized constructor
- Sub class: Mammal
- Sub class contain default constructor

Patuakhali Science and Technology University

2nd Semester (Level-1, Semester-II), Final Examination of B.Sc. Engg.in (CSE)

July-December: 2019, Session: 2018-19

Course Code: CIT-121 Course Title: Discrete Mathematics

Credit Hour: 3.00 Full Marks: 70 Duration: 03 Hours

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

Answer any 7 of the following questions.

4. a) Rewrite the following statements using set notation: 2

- (i) The element 1 is not a member of A.
- (ii) The element 5 is a member of B.
- (iii) A is a subset of C.
- (iv) A is not a subset of D.
- (v) F contains all the elements of G.
- (vi) E and F contain the same elements.

- b) List the elements of the following sets; here $z = (\text{integers})$. 3

- (i) $A = \{x: x \in Z, 3 < x < 9\}$
- (ii) $B = \{x: x \in Z, x^2 + 1 = 10\}$
- (iii) $C = \{x: x \in Z, x \text{ is odd}, -5 < x < 5\}$

- c) Given that $U = N = (\text{positive integers})$, identify which of the following sets are identical to {2,4}: 2

$$A = \{\text{even numbers less than } 6\}, B = \{x: x < 5\}, C = \{x: (x-2)(x-4)(x+2) = 0\}$$

- d) Define the set operations of: 2

- (i) absolute complement or, simply, complement of a set, (ii) the relative complement or difference of two sets.

- Q) Describe a situation where the universal set U may be empty. 1

- a) Find the number of elements in each finite set: 3

- (i) $A = \{2, 4, 6, 8, 10\}$ (iv) $D = \{x: x \text{ is a positive integer, } x \text{ is a divisor of } 15\}$
- (ii) $B = \{x: x^2 = 4\}$ (v) $E = \{\text{letters in the alphabet preceding the letter } m\}$
- (iii) $C = \{x: x > x + 2\}$ (vi) $F = \{x: x \text{ is a solution to } x^3 = 27\}$

- (b) In a survey of 60 people, it was found that 25 read Newsweek magazine, 26 read Time, and 26 read Fortune. Also 9 read both Newsweek and Fortune, 11 read both Newsweek and Time, 8 read both Time and Fortune, and 8 read no magazine at all. 7

- (i) Find the number of people who read all three magazines.

- (ii) Fill in the correct number of people in each of the eight regions of the Venn diagram of Fig. 1-1(x). Here N, T, and F denote the set of people who read Newsweek, Time and Fortune respectively.

- (iii) Determine the number of people who read exactly one magazine.

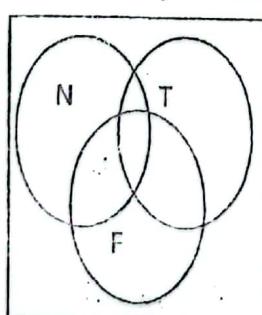


Fig. 1-1(x).

1, 3, 5
2, 4, 6
3, 5, 6
4, 6

$n > x^2$
 $\frac{x}{3}$
3, 4

37

5. a) Prove Theorem $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$. 2

- (b) One hundred students were asked whether they had taken courses in any of the three areas, sociology, anthropology, and history. The results were: 8

45 had taken sociology 18 had taken sociology and anthropology

38 had taken anthropology 9 had taken sociology and history

21 had taken history 4 had taken history and anthropology

And 23 had taken no courses in any of the areas.

- (i) Draw a Venn diagram that will show the results of survey.

- (ii) Determine the number k of students who had taken classes in exactly (1) one of the areas, and (2) two of the areas

4. a) Find the power set $P(A)$ of $A = \{1, 2, 3, 4, 5\}$.

b) Prove the following propositions: $P(n): \frac{1}{1(3)} + \frac{1}{3(5)} + \frac{1}{5(7)} + \dots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$

c) Determine the validity of the argument:

S_1 : All red meat contains cholesterol.

S_2 : No expensive food contains cholesterol.



S : Read meat is not expensive.

d) Given $A = \{1, 2\}$, $B = \{x, y, z\}$, and $C = \{3, 4\}$. Find $A \times B \times C$ and $n(A \times B \times C)$.
(tree diagram)

5. a) Let $A = \{1, 2, 3\}$ and $R =$

$\{(1, 1), (2, 1), (3, 2), (1, 3)\}$ be a relation on A (i.e., a relation from A to A).

Determine whether each of the following is true or false:

(i) $1R1$, (ii) $1R2$, (iii) $2R3$, (iv) $2R1$, (v) $3R2$, (vi) $3R1$.

b) Let S be the relation on $X = \{a, b, c, d, e, f\}$ defined by

$S = \{(a, b), (b, b), (b, c), (c, f), (d, b), (e, a), (e, b), (e, f)\}$ Draw the directed graph of S

c) Let R and S be the relations on $X = \{a, b, c\}$ defined by

$R = \{(a, b), (a, c), (b, a)\}$ and $S = \{(a, c), (b, a), (b, b), (c, a)\}$

Find the matrices M_R and M_S representing R and S respectively.

d) Consider functions $f: A \rightarrow B$ and $g: B \rightarrow C$;

that is, where the codomain of f is the domain of g . Define the composition function of f and g .

6. a) Sketch the graph of the function $g(x) = x^2 + x - 6$.

b) Define an one-to-one (or injective) function and an onto (or surjective) function.

c) Let $A = \{a, b, c, d, e\}$ and let B be the set of letters in the alphabet. Let the function f, g and h from A into B be defined as follows:

$$\begin{array}{lll} (i) a \xrightarrow{f} r & (ii) a \xrightarrow{g} z & (iii) a \xrightarrow{h} a \\ b \rightarrow a & b \rightarrow y & b \rightarrow c \\ c \rightarrow s & c \rightarrow x & c \rightarrow e \\ d \rightarrow r & d \rightarrow y & d \rightarrow r \\ e \rightarrow e & e \rightarrow z & e \rightarrow s \end{array}$$

7. a) Define a graph and a multigraph.

b) Draw the complete graphs K_5, K_6 and also draw the complete bipartite graphs $K_{2,3}, K_{3,3}$ and $K_{2,4}$.

c) Define a Hamiltonian graph and draw a graph with six vertices which is Hamiltonian but not Eulerian.

8. a) What does logically equivalent of two compound propositions mean?

b) Verify that the proposition $(p \wedge q) \wedge \sim(p \vee q)$ is a contradiction.

c) Prove that disjunction distributes over conjunction: that is, prove the distributive law

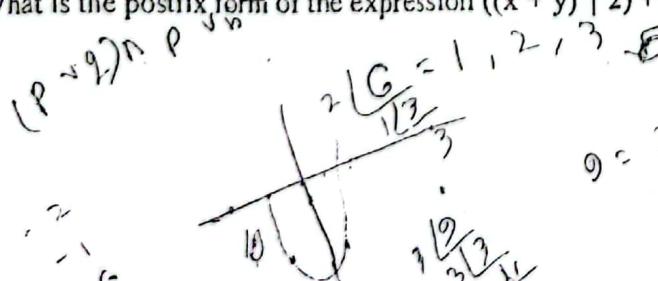
$$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r).$$

d) Prove the theorem "If n is a composite integer, then n has a prime divisor less than or equal to \sqrt{n} ".

9. a) Define the terminologies with example: (i) Rooted tree (ii) Ancestors of vertices
(iii) Full m-ary tree.

b) Prove that a full m-ary tree with i internal vertices contain $n = mi + 1$ vertices.

c) What is the postfix form of the expression $((x + y) \uparrow 2) + ((x - 4) / 3)$?



Patuakhali Science and Technology University

2nd Semester (Level-I, Semester-II) Final Examination of B.Sc. Engg. (CSE) July-Dec.: 2017, Session 2016-17

Course Code: CIT-121 Course Title: Discrete Mathematics

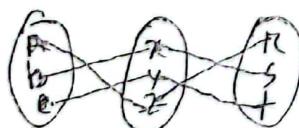
Credit Hour: 3.0 Full Marks: 70 Duration: 3 Hours

[Figures in the right margin indicate full marks. Split answering of any question is prohibited]

Answer any 5 of the following questions.

1. (a) List the elements of each set where $N = \{1, 2, 3, \dots\}$. 2
 (i) $A = \{x \in N \mid 2 \leq x \leq 7\}$ (ii) $B = \{x \in N \mid x \text{ is odd, } x \leq 11\}$
 (iii) $C = \{x \in N \mid 5 + x = 4\}$ (iv) $D = \{x \in N \mid x \text{ is even, } 2 + x = 4\}$
- (b) Explain the partitioning of a set. $P(N \cap T)$ 2
- (c) In a survey of 120 people, it was found that: 65 read Newsweek magazine, 20 read both Newsweek and Time, 45 read Time, 25 read both Newsweek and Fortune, 42 read Fortune, 15 read both Time and Fortune, 8 read all three magazines. $\rightarrow P(A \cap B \cap C)$ 4
- (d) Draw a Venn diagram and fill in the correct number of people in each region.
 (e) Find the number of people who read at least one of the three magazines. $P(A \cup B \cup C)$
 (f) Find the number of people who read exactly one magazine.
- (g) Briefly describe various types of sets. 6
2. (a) Let $A = \{a, b, c\}$, $B = \{x, y, z\}$, $C = \{r, s, t\}$. Let $f: A \rightarrow B$ and $g: B \rightarrow C$ be defined by:
 $f = \{(a, z), (b, x), (c, y)\}$ and $g = \{(x, s), (y, t), (z, r)\}$. Find composition function $gof: A \rightarrow C$. 2
 (b) Given $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Let R be the following relation from A to B :
 $R = \{(1, y), (1, z), (3, y), (4, x), (4, z)\}$.
 (i) Find the inverse relation R^{-1} of R . (ii) Determine the domain and range of R .
- (c) Given: $A = \{1, 2\}$, $B = \{x, y, z\}$, and $C = \{3, 4\}$. Find: $A \times B \times C$. 4
 (d) Distinguish between function and relation. Explain One-to-one function, Onto function and Inverse of a Function with example. 6
3. (a) Let p be "It is cold" and let q be "It is raining". For each of the following statements make simple verbal sentence: (a) $\neg p$; (b) $p \wedge q$; (c) $p \vee q$; (d) $q \vee \neg p$. 2
 (b) Verify that the proposition $(A \vee B) \wedge [(\neg A) \wedge (\neg B)]$ is a contradiction. 2
 (c) Briefly describe Normal Forms. 4
 (d) State and explain the following rules of inference with example: 4
 (i) Modus ponens, (ii) Hypothetical Syllogism, (iii) Destructive Dilemma and (iv) Conjunction.
4. (a) In how ways can the letters of the word 'ORANGE' be arranged so that the consonants occupy only the even positions? 2
 (b) A box contains 8 blue socks and 6 red socks. Find the number of ways two socks can be drawn from the box if: (a) They can be any color. (b) They must be the same color. 2
 (c) In a certain college town, 25% of the students failed mathematics (M), 15% failed chemistry (C), and 10% failed both mathematics and chemistry. A student is selected at random.
 (i) If he failed chemistry, find the probability that he also failed mathematics.
 (ii) If he failed mathematics, find the probability that he also failed chemistry.
 (iii) Find the probability that he failed mathematics or chemistry. $M \cup C$
 (iv) Find the probability that he failed neither mathematics nor chemistry. $(M \cup C)^c$ 4
 (d) State and prove Pascal's Identity. 3
 (e) A history class contains 8 male students and 6 female students. Find the number n of ways that the class can elect: (a) 1 class representative; (b) 2 class representatives, 1 male and 1 female; (c) 1 president and 1 vice president. 3
5. (a) Explain BFS algorithm for graph traversal with example. 4
 (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?
 (c) Minimize the following Boolean expression using Boolean identities:

$$F(A, B, C) = A'B + BC' + AB'C'$$
 6
6. (a) Explain Euler graph. 2
 (b) Discuss representation of graphs. 2
 (c) What is minimum spanning tree? State and explain Kruskal's algorithm with example. 4



$$\begin{aligned} g \circ f(P) &= g(f(P)) \\ &= g(f(Q)) \\ &= g(R) \end{aligned}$$

Patuakhali Science and Technology University

Faculty of Computer Science and Engineering

2nd Semester (Level-I, Semester-II) Final Examination of B.Sc.Engg.(CSE) July-December- 2015

Session: 2014-2015, Course Code: CIT-121, Course Title: Discrete Mathematics

Credit Hour: 03

Full Marks: 70

Duration: 3 Hours

[Figure in the right margin indicates full marks. Split answering of any questions is not recommended.] Answer any 7 of the following question.

Q. 1. (a) Re-write the following statements using set notation: 3

- (i) The element 2 is not a member of G.
- (ii) The element 7 is a member of F.
- (iii) B is a subset of C.
- (iv) D is not a subset of C.
- (v) A contains all the elements of H.
- (vi) J and F contain the same elements.

(b) List the elements of the following sets; 3

- (i) $A = \{x : x \in \mathbb{N}, 3 < x < 9\}$
- (ii) $B = \{x : x \in \mathbb{N}, x^2 + 1 = 10\}$
- (iii) $C = \{x : x \in \mathbb{N}, x \text{ is odd, } -5 < x < 5\}$

(c) Define the set operation of: (i) Union and (ii) intersection 2

(d) $U = \{1, 2, 3, \dots, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$, $C = \{3, 4, 5, 6\}$

Find: (i) $(A \cap B) \setminus C$ and (ii) $(A \setminus B)^c$ 2

Q. 2. (a) Find the number of elements in each finite set: 4

- | | |
|--|--|
| (i) $A = \{2, 4, 6, 8, 10, 12, 14\}$ | (ii) $B = \{x : x^2 = 16\}$ |
| (iii) $C = \{x : x > x+2\}$ | (iv) $D = \{x : x \text{ is a positive integer, } x \text{ is a divisor of } 16\}$ |
| (v) $E = \{\text{Letters in the alphabet preceding the letter } n\}$ (vi) $F = \{x : x \text{ is a solution to } x^3 = 27\}$ | |

(b) Prove $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$ 2

(c) State the set $(A \cup B) \cap (A \cup C)$. 4

Q. 3. a) Consider the following assumptions: 2

S_1 : All dictionaries are useful.

S_2 : Mary owns only romance novels.

S_3 : No romance novel is useful.

Determine the validity of each of the following conclusions:

(x) Romance novels are not dictionaries.

(y) Mary does not own a dictionary.

(z) All useful books are dictionaries.

b) One hundred students were asked whether they had taken courses in any of the three areas, Sociology, Anthropology, and History. The results were: 8

45 had taken sociology

18 had taken sociology and anthropology

38 had taken anthropology

9 had taken sociology and history

21 had taken history

4 had taken history and anthropology

and 23 had taken no courses in any of the areas.

(x) Draw a Venn diagram that will show the results of the survey.

(y) Determine the number of students who had taken classes in exactly (1) one of the areas, and

(2) two of the areas.

Q

(a) Define the composition of relations and give examples with diagram.

(b) Let $A = \{a, b, c, d, e\}$, and let B be the set of letters in the alphabet. Let the functions f, g and h from A into B be defined as follows:

(i)	$a \xrightarrow{f} r$ $b \rightarrow a$ $c \rightarrow s$ $d \rightarrow r$ $e \rightarrow e$	(ii)	$a \xrightarrow{g} z$ $b \rightarrow y$ $c \rightarrow x$ $d \rightarrow y$ $e \rightarrow z$	(iii)	$a \xrightarrow{h} a$ $b \rightarrow c$ $c \rightarrow e$ $d \rightarrow r$ $e \rightarrow s$
-----	---	------	---	-------	---

Are any of these functions one-to-one?

5. (a) What is meant by a recursively defined function? Calculate $8!$ Using the recursive definition.
(b) Let a and b denote positive integers. Suppose a function Q is defined recursively as follows:

$$Q(a, b) = \begin{cases} 0 & \text{if } a < b \\ Q(a - b, b) + 1 & \text{if } b \leq a \end{cases}$$

- (i) Find the value of $Q(2, 3)$ and $Q(14, 3)$.
(ii) What does this function do? Find $Q(5861, 7)$.

6. (a) Give two methods to find the truth table of the proposition $\sim(p \wedge \sim q)$.

(b) Prove that disjunction distributes over conjunction; that is, prove the distributive law

$$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$$

7. (a) Define the truth table of the biconditional $p \leftrightarrow q$, that is "p if and only if q" and also define the truth value of the compound statement $p \rightarrow q$, that is "if p then q".

(b) Prove that the conditional operation distributes over conjunction; that is,

$$p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$$

8. (a) Define a Hamiltonian graph. Draw a graph with six vertices which is Hamiltonian but not Eulerian.

(b) What is a complete graph and regular graph? Draw the complete bipartite graph $K_{2,3}, K_{3,3}, K_{2,4}, K_{2,5}$ and draw all trees with six vertices.

[Figures in the right margin indicate full marks.]

Answer any 7 of the following questions. Split answering is not recommended.

1. Define finite set and infinite set with examples. 2
- Compare ϕ and $\{\phi\}$ with an example from a computer. 2
- Determine whether the following functions are one-to-one or onto or both or none. 1+1
 - i. To each person on the earth assign the number corresponding his/her age
 - ii. To each country of the world assign the latitude and longitude of its capital

Justify your answer with some sample/hypothetical values.
- d. Consider the following number of students of a class taking different languages. 2

65 study French	20 study French and German	1.17
45 study German	25 study French and Russian	
42 study Russian	15 study German and Russian	

8 study all three languages.

Now find out the number of students taking at least one the above languages.

- Draw the Venn Diagram for the question 1.d. showing the numbers of student inside the diagram. 2

2. Find out the Cartesian product of $A \times B \times C$ where $A = \{1, 2, 3\}$, $B = \{a, b, c\}$, $C = \{\text{क, ख}\}$ 2
- b. Consider the following SQL command for students of a university taking Computer Science and Mathematics major.

```
select * from csMajor, mathMajor
      where csMajor.studentID = mathMajor.studentID
```

hint: `select *` means selecting all students, `csMajor` is the table of students who takes Computer Science as their major and `mathMajor` is the table of students who takes Mathematics as their major.

Now, interpret this using set theory.

- Let $A = \{2, 3, 4\}$ and $B = \{3, 2, 4, 3, 2, 3, 2, 4, 2\}$ are two sets. Are they equal? Justify your answer. 2
- Determine which of the following declarative sentences are proposition. 0.5x8
 - i. $x=2$ is the solution of $x^2=4$
 - ii. $1+1=2$
 - iii. $2+2=3$
 - iv. London is in Denmark
 - v. Where are you going?
 - vi. $9 < 6$
 - vii. Do your Homework.
 - viii. Paris is in France

3. Consider the propositions p such that "Roses are red" and q such that "violets are blue". What will be the declarative sentence for $\neg(p \wedge q)$? 1

- Prove that $\neg(p \wedge q) \equiv \neg p \vee \neg q$ using a truth table. What will be the declarative sentence for $\neg p \vee \neg q$ where p and q mean the same as stated in 3.a. 2+1

c. Write the following sentences in propositional symbolic form

- i. If I am not in a good mood or I am busy, do not disturb me.
- ii. A program is readable only if it is well structured.
- iii. There will be no exam tomorrow if the professor is out of the town or there is a strike.
- iv. If the user enters a wrong password, his access is not granted even though he has paid his fees.
- v. Driving over 65 miles per hour is sufficient for getting a speeding ticket.
- vi. If berries are ripe in the trail, hiking is safe if and only if grizzly bears have not been seen in the area.

4. There are two signboards in front of a shopping mall. One says, "Good items are not cheap". The other one says, "Cheap items are not good". Do the signboards say the same proposition? Justify your answer using truth tables. 3

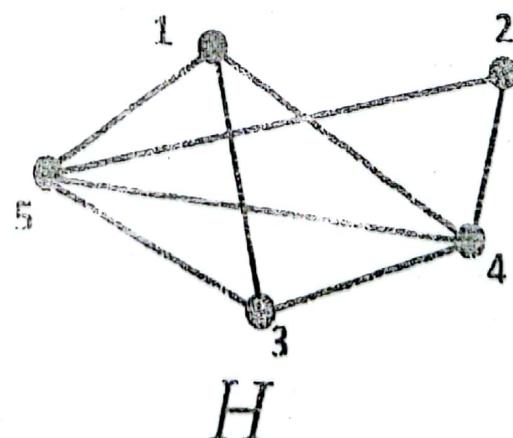
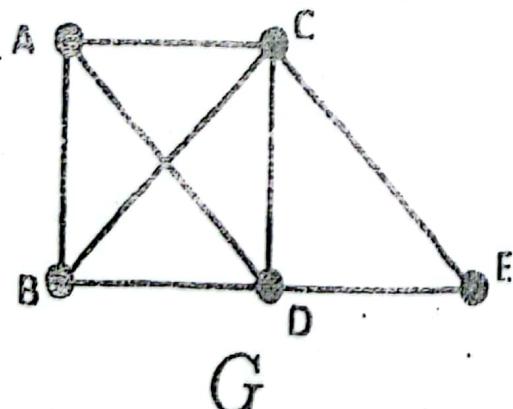
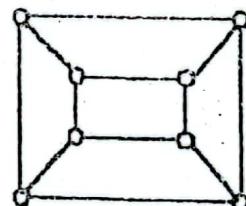
- Use De Morgan's law to find the negation of the statement "Kim studies well and obtained good grades". 2

- Which rules of inference is used in each argument below? 5

- i. Alice is a Math major. Therefore, Alice is either a Math major or a CSE major.
- ii. Jerry is a Math major and a CSI major. Therefore, Jerry is a Math major.
- iii. If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed.
- iv. If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today.

v. I go swimming or eat an ice cream. I did not go swimming. Therefore, I eat an ice cream

5. a/ Use rules of inference to prove the conclusion from the premises below. If I go swimming, then I will stay in the sun too long. If I stay in the sun too long, then I will sunburn. Therefore, if I go swimming, then I will sunburn.
- b/ Test the validity of the following argument using rules of inference. If two sides of a triangle are equal, then the opposite angles are equal. Two sides of a triangle are not equal. Therefore, the opposite angles are not equal.
- c/ Consider the statement: "If two angles are congruent, then they have the same measure." Write the propositional symbolic form for this statement. Find the converse, contrapositive and inverse for this statement both in symbolic form and English statement.
6. a. Find the value of $F(A,B,C)$ where $A = 101101$, $B = 100101$, $C = 111000$ for the following
i. $F(A,B,C) = ABC$ ii. $F(A,B,C) = A+B+C$ iii. $F(A,B,C) = A(B+C)$
- b. What values of A, B, C, D satisfy the following simultaneous Boolean equations?
 $\bar{A} + AB = 0$, $AB = AC$, $A\bar{C} + AB + CD = \bar{CD}$
- c. What do sum-of-product and product-of-sum mean? Explain with example.
7. a/ Define simple graph, multigraph and pseudo-graph with realistic examples.
- b. Relate directed graphs with computer networks between different cities.
- c. What is Handshaking theorem? Explain with an example.
- d. Is it possible to construct a graph with 102 vertices such that exactly 49 vertices have degree 5 and the remaining 53 vertices have degree 6? Justify your answer.
8. a/ Determine if the graph on the right hand side is bipartite or not using graph coloring.
Label the nodes with numbers starting from the top left node.
- b. Represent the graph of 8.a. using adjacency list, adjacency matrix and incidence matrix
9. a/ Discuss the trade-offs between adjacency lists and adjacency matrices.
- b/ Show step by step whether the two graphs shown in the following figure are isomorphic or not using adjacency matrices.



- Q. Compare BFS and DFS using example.

3

Patuakhali Science and Technology University

B.Sc.Engg.(CSE) Level-1 Semester-II Final Examination-2019 (July-December)

Course Code: EEE 121 Course Title: Electronic Devices and Circuits

Credit Hour: 3.0 Full Marks: 70 Duration: 3 Hours.

[Figures in the right margin indicate full marks. Split answering of any question is not recommended.]

Answer any 5 of the following questions.

- ✓ 1 (a) "A full-wave rectifier is twice as effective as a half-wave rectifier". Justify the statement. 06
 (b) What do you meant by *crystal diode*? How does a crystal diode work as a switch? 04
 (c) An a.c. supply of 250 V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10:1. Find (i) the output d.c. voltage and (ii) the peak inverse voltage. Consider the diode to be ideal. 04
- ✓ 2 (a) How does the full-wave bridge rectifier work? Write down the pros and cons of full-wave bridge rectifier circuit. 05
 (b) Describe the action of the following filter circuits: (i) capacitor filter (ii) choke input filter (iii) capacitor input filter. 04
 (c) What is *ripple factor*? "The ripple factor of full-wave rectification is less than that of the half-wave rectification". Explain the statement. 03
 (d) Write down the advantages and disadvantages of crystal diode over vacuum diodes. 02
- ✓ 3 (a) Define *photo-diode*. Write down the operating principle and applications of photo-diode. 05
 (b) What is *transistor*? Derive the expression for the collector-current in common collector connection of transistor. 04
 (c) The collector leakage current in a transistor is $250 \mu A$ in CE arrangement. If the transistor is connected in CB arrangement, what will be the leakage current? Given that $\beta=100$. 03
 (d) Compare the characteristics of three transistor connections. 02
- ✓ 4 (a) Define *faithful amplification*. Analyze the base resistor circuit for transistor biasing. Write down the advantages and disadvantages of base resistor method. 05
 (b) What is *oscillatory circuit*? Describe the construction and circuit operation of the *Colpitt's oscillator*. 04
 (c) A germanium transistor is to be operated at zero signal $I_c = 1 mA$. If the collector supply $V_{cc} = 15 V$, what is the value of R_B in the base resistor method. Given that $\beta=120$. 03
 (d) Write down the limitations of *LC* and *RC* oscillators. 02
- 5 (a) Define *JFET*. Describe the construction and working principle of JFET. 05
 (b) Differentiate between *JFET* and *bipolar transistor*. 03
 (c) What is *MOSFET*? Compare the characteristics of *D-MOSFET* and *E-MOSFET*. 03
 (d) A $1 pF$ capacitor is available. Choose the inductor values in a Hartley oscillator so that $f = 1 MHz$ and $m_v = 0.2$. 03
- ✓ 6 (a) What do you meant by *SCR*? How does SCR act as a mechanical switch? 03
 (b) Define *diac*. How does a diac work as lamp dimmer? 03
 (c) What is *triac*? Describe the construction and operation of triac circuit. 03
 (d) Which value of β to be used for transistor biasing? What are the requirements for biasing the transistor circuit? 03
 (e) Derive the expression for finding *stability factor*. 02

$$S = \frac{I_{SC}}{I_{SDQ}}$$

$$V_{BE} = I_{BRB} R_B + V_{CC}$$

$$I_{BRB} =$$

$$V_{CC} = I_{DRB} R_B + V_{BE}$$

$$I_{DRB} = \frac{V_{CC} - V_{BE}}{R_B}$$

$$I_C = \beta I_{DRB} + I_{CO}$$

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

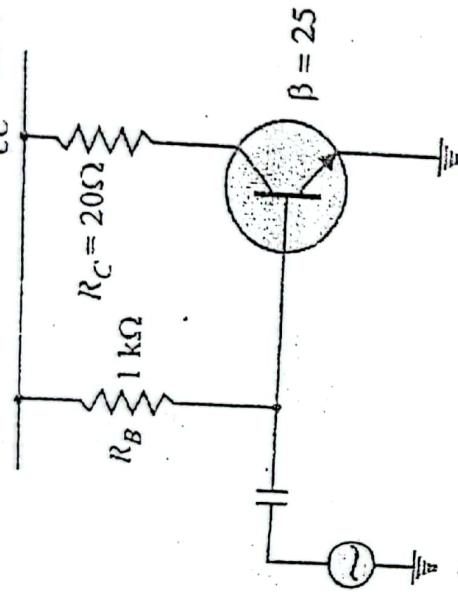
Answer any 5 of the following questions

- 1** a) What is stabilization? Describe the reasons for which stabilization is necessary. 3
b) A transistor employs a $4\text{k}\Omega$ load and $V_{cc} = 13\text{ V}$. What is the maximum input signal if $\beta = 100$? Given $V_{hre}=1\text{V}$ and a change of 1V in V_{BE} causes a change of 5mA in collector current.
c) Discuss intrinsic and extrinsic semiconductor.
d) What is a zener diode? Explain how zener diode maintains constant voltage across the load.
- X ✓ X X
- 2** a) Discuss the mechanism of hole current flow in semiconductor. 3
b) Draw and discuss the equivalent circuits of a crystal diode. 3
c) A half wave rectifier uses a transformer turns ratio 5:2. If the primary voltage is 250 V(r.m.s.) , find (i) d.c output voltage (ii) peak inverse voltage. Assume the diode to be ideal.
- X X X
- 3** a) Derive the expression for collector current of common emitter connection. Discuss input and output characteristics of CE connection. 5
b) Describe voltage divider bias method. State advantages and disadvantages of voltage divider bias method.
- X X X
- 4** a) Find the value of I_c for potential divider method if $V_{cc}=12\text{V}$, $R_E=1\text{K}\Omega$, $R_I=39\text{K}\Omega$, $R_2=10\text{K}\Omega$, $R_c=2.7\text{K}\Omega$, $V_{BE}=0.15\text{V}$ and $\beta=50$. 3
b) Write short notes on stabilization of operating point. 2
- X X X
- 5** a) What is phase reversal? For the voltage divider transistor amplifier circuit, $R_I = 10\text{k}\Omega$, $R_2 = 5\text{k}\Omega$, $R_C = 2\text{k}\Omega$ and $R_E = 1\text{k}\Omega$. 7
b) i) Draw d. c. load line X ✓ X
ii) Determine the operating point X X
iii) Draw a.c. load line. Assume $V_{BE}=0.7\text{V}$ X X
- b) "The power gain of transistor amplifier is the product of current and voltage gain". Justify the statement. 3
c) Draw the block diagram of transistor audio power amplifier. Write down the role of capacitors in transistor amplifiers. 4
- 6** a) Draw direct coupled amplifier circuit. Why does transformer coupling give poor frequency response? 3
b) Explain the push-pull amplifier with a neat diagram. 3
c) Write down the operation of Colpitt's Oscillator with necessary diagram. 3

$$V_{CE} + V_{RE} + V_{BE} = V_{CC}$$

- d) The base current of a Class A amplifier is 10mA peak. Calculate the (i) output power (ii) input power (iii) collector efficiency of the amplifier circuit shown in fig. 5(d)

$$+ V_{CC} = 20 \text{ V}$$



Q) Why FET is better than BJT?

- 6 a) Why JFET is called constant current source? Explain with working principle. 2
 b) What are the differences between JFET and MOSFET? Show that "CMOS works as an inverter". 3
 c) Why is SCR always turned on by gate current? Suppose a SCR is turned ON condition, if the gate voltage is removed at this moment. What will be happened? 3
 d) Discuss working principle of a DIAC with VI curve. 3
 e) Show the construction and equivalent circuit of a TRAIC. 3

Fig. 5(d)

$$V_{PM} = \sqrt{2} \cdot 12.5 = 0$$

$\frac{V}{I}$

TUTORIAL

Patnaik Hall Science and Technology University
B.Sc. Engg (CSE) Level-I, Semester-II Final Examination, 2015 (July, December)

Course Code: EEE 121 Course Title: Electronic Devices and Circuits
Credit Hour: 3.00 Full Marks: 70 Duration: 3 Hours.

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

Answer any 5 of the following questions

- Ques. 1** Discuss the behavior of a p-n junction under forward and reverse biasing. 04
- Ques. 2** a. Discuss intrinsic and extrinsic semiconductor. 04
 b. Define an expression for the efficiency of a full-wave rectifier. 02
- Ques. 3** Why amplifier circuit is necessary in an oscillator? 01
- Ques. 4** a. Write down the formation or construction of Silicon Controlled Rectifier (SCR). Explain its working procedure with an equivalent circuit of SCR. 05
 b. What is TRIAC and why it is used instead of SCR in a circuit? Briefly explain TRIAC's working procedure with its I-V characteristics. 04
- Ques. 5** Show that the output voltage of a single stage common emitter transistor amplifier is 180° out of phase with the input voltage. 04
- Ques. 6** Describe common base transistor connection for finding current amplification factor and collector current. 04
- Ques. 7** A transistor is connected in common emitter configuration in which collector supply is 8V and the voltage drop across resistance R_C connected in the collector circuit is 0.5V. The value of $R_E = 800\Omega$. If $\alpha = 0.96$, determine: (i) collector-emitter voltage (ii) base current 03
- Ques. 8** What is a zener diode? Draw and describe the equivalent circuit of a zener diode in the breakdown region. 04
- Ques. 9** A transistor employs a $4k\Omega$ load and $V_{CE} = 13$ V. What is the maximum input signal if $\beta = 100$? Given $V_{BE} = 1$ V and a change of 1 V in V_{BE} causes a change of 5mA in collector current. 03
- Ques. 10** a. What is stabilization? Describe the reasons for which stabilization is necessary. 03
 b. Describe biasing with collector feedback resistor. What are the advantages and disadvantages of this method? 03
- Ques. 11** It is desired to set the operating point at 2V, I_{CQ} by biasing a silicon transistor with collector feedback resistor R_B . If $\beta = 100$, find the value of R_B . 02
- Ques. 12** Describe the action of the following filter circuits: i) Capacitor filter ii) Choke input filter 04
- Ques. 13** a. Define multistage transistor amplifier circuit. Classify types of coupling and types of multistage amplifier. 02
 b. Define sinusoidal oscillator. Write down the advantages of sinusoidal oscillator. 03
- Ques. 14** a. Draw and describe the operation of a tuned collector oscillator. 04
 b. What do you understand by damped and undamped electrical oscillations? 03
- Ques. 15** a. Describe the role of capacitors in transistor amplifiers. 04
 b. Define FET. Describe construction and working of JFET. 04
- Ques. 16** a. What are the differences between JFET and BJT? 03
 b. What is a LED? Explain the working principle of a LED. 02

Patuakhali Science and Technology University

B.Sc.Engg.(CSE) Level-I, Semester-II Final Examination-2016 (July-December)

Course Code: EEE 121 Course Title: Electronic Devices and Circuits

Credit Hour: 3.0 Full Marks: 70 Duration: 3 Hours.

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

Answer any 5 of the following questions

- [1] a. Discuss the circuit operation of Hartley oscillator. 03
- b. Design a tank circuit that produce oscillation. Deduce operation of the circuit. 03
- c. Why is an amplifier circuit necessary in an oscillator? 02
- [2] a. Define the JFET parameters and establish the relationship between them. 03
- b. Explain the construction and working of MOSFET. 03
- c. Distinguish between MOSFET and JFET. 02
- d. Why SCR cannot be used as a bidirectional switch? How does SCR control the power fed to the load? 02+03=5
- e. Explain the terms: breakdown voltage, holding current and forward current rating as used in connection with SCR analysis. 03
- f. Explain the construction and working of UJT. Draw and describe the characteristics of UJT. 02+02=4
- [3] a. Why power electronics is so important? 02
- b. If an amplifier, the maximum voltage gain is 2500 and occurs at 2.3 kHz. If falls to 1765.5 at 10 kHz and 50 Hz. Find: (i) Bandwidth (ii) Lower cut-off frequency (iii) Upper cut-off frequency. 03
- c. With a neat circuit diagram, explain the working principle of transformer coupled transistor amplifier. Why does transformer coupling give poor frequency response? 03+02=5
- d. Draw the circuit of a practical single stage transistor amplifier. Explain the function of each component. 04
- [4] a. Find the operating point of a voltage divider biasing circuit if $V_{CC} = 30V$, $R_L = 20k\Omega$, $R_2 = 10k\Omega$, $R_E = 4k\Omega$, $R_E = 5k\Omega$. 03
- b. What is the importance of load line analysis? 02
- c. What is stabilization? Describe the reasons for which stabilization is necessary. 03
- d. It is desired to set the operating point at 2V, 1mA by biasing a silicon transistor with feedback resistor R_A . If $\beta = 100$, find the value of R_A . 02
- e. Describe common base transistor connection for finding current amplification factor and collector current. 04
- [5] a. Why have transistors inherent variations of parameters? Establish the following relation: (i) $\beta = \frac{\alpha}{1-\alpha}$ (ii) $I_C = \beta I_B + I_{CBO}$ 02
- b. Explain the V-I characteristics of a tunnel diode. 04
- c. How do we protect LED from large reverse voltage? 03
- d. Draw the equivalent circuit of an ideal zener in the breakdown region. Explain how zener diode maintain constant voltage across the load. 02
- e. Derive an expression for the efficiency of a full wave rectifier. 04
- [6] a. A full-wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 30Ω . The transformer r.m.s secondary voltage from centre tap to each end of secondary is 50V and load resistance is 980Ω . Find: (i) the mean load current (ii) the r.m.s value of load current. 03
- b. Define semiconductor. Give the energy band description of semiconductors 04
- c. Discuss the behavior of a p-n junction under forward and reverse biasing. 04

Patuakhali Science and Technology University

2nd Semester I-I S-II Final Examination of B.Sc. Engg. (CSE) July-December, 2019

Course Title: Communicative English Duration: 2 Hours

Credit Hour: 2.0 Full Marks: 70

[Figures in the right margin indicate full marks. (Split answering of any question is not recommended)]

Answer any 5 of the following questions.

1. a) Read the passage and answer the following questions:

A computer virus is an illegal and potentially damaging computer program designed to infect other software by attaching itself to any software it contacts. In many cases, virus programs are designed to damage computer systems maliciously by destroying or corrupting data. If the infected software is transferred to or accessed by another computer system, the virus spreads to the other system. Viruses have become a serious problem in recent years, and currently, thousands of known virus programs exist. Viruses can be categorized as boot sector viruses, file viruses, and Trojan horse viruses. A boot sector virus infects the boot program used to start the system. When the infected boot program executes, the virus is loaded into the computer's memory. Once a virus is in the memory, it can spread to any floppy disk inserted into the computer. The second type of virus, a file virus, inserts viral code into program files. The virus then spreads to any program that accesses the infected file. A Trojan horse virus (named after a Greek myth) hides within or is designed to look like a legitimate program. Some viruses interrupt processing by freezing a computer system temporarily and then displaying sounds or messages. Other viruses contain time bombs or logic bombs. A time bomb is a program that performs an activity on a particular date. A logic bomb is a program that performs an activity when a certain action occurs, such as an employee being terminated. A worm, which is similar to a virus, copies itself repeatedly until no memory or disc space remains. To detect computer viruses, anti-virus programs have been developed. Besides detecting viruses, anti-virus programs also have utilities to remove or repair infected programs and files. Some damaged files cannot be repaired and must be replaced with uninfected backup files. Computers can best be protected by installing a virus protection software. In order to be effective, it is imperative to develop a regular plan for copying and storing important data and program files. Prior to running the virus protection software, floppy disks should be scanned using a virus scan. Since one of the most vulnerable points of entry for viruses is the internet, all programs and email messages downloaded from the internet should be checked to make sure they are virus free.

- i. How will you define the word "illegal" of the very first sentence of the passage?

- ii. According to the passage, what is a worm?

- iii. How does the boot sector virus function?

- iv. What are the differences between a time bomb and a logic bomb?

- v. How can we save our computers from the viruses?

- b) Construct sentences using Prefixes with the following words:
Infected. Developed. Virus. Known. Code.

- c) Illustrate the terms: Skimming. Inference.

2. a) Fill in the blanks with appropriate prepositions.

You could have a room (i) _____ Monday (ii) _____ Friday, but we are booked over the weekend. So, if you require it, please make a reservation (iii) _____ calling our 333 number. Each room has its own thermostat (iv) _____ controlling the temperature. Besides this, we have CB radios in all our transports (v) _____ emergencies.

- b) Elucidate briefly the various modes of oral presentation.

- c) Do you think that IPA symbols are important to learn English well? Give some examples to justify your answer. How does a dictionary help to learn them?

5.0

5.0

5.0

5.0

4.0

Q. a) Amend the statements if there is any error. 5.0

- i. They are going to have their car fix before they go to Dhaka.
- ii. This handout should help you understanding the lecture.
- iii. When Salam was learning driving, his father let him to use his Corolla.
- iv. They had their lawyer to change their will.

b) Put the words in brackets in the appropriate form (use suffixes): 5.0

- i. He was acting in a very way (child)
- ii. The team that he supported was able to win the. (champion)
- iii. You need a of motivation, organization and hard work to realize your dreams. (combine)
- iv. The road was too narrow, so they had to it. (wide)
- v. There were only a of people at the match. (hand)

c) Mention the guidelines of preparing and presenting a seminar. 4.0

A. a) Define communication. Explain the communication flow in an organization. 7.0
b) Patuakhali Science and Technology University is going to recruit some lecturers in the faculty of CSE. Now prepare a resume as an interested candidate for the post of a lecturer in the faculty 7.0

A. a) Write short notes on the following: 7.0

- i. E-Tutoring and your recommendation.
 - ii. Face to face communication Vs Visual Communication.
- b) Invite your colleague to attend a dinner at your residence. 7.0

A. Write an essay on any of the following topics: 14

- a. Students' Politics; Problems and Prospects
- b. E-Governance in Bangladesh
- ✓ Ragging Culture in the University. Causes, Effects and Control

Patuakhali Science and Technology University

Second Semester (L-1, S-11) Final Examination of CSE – 2017 (July- December)

Course Code: LCM 121, Course Title: Communicative English

Credit Hours: 2 Full Marks: 70 Duration: 2 Hours

[Figures in the right margin indicate full marks. Split answering of any question is not recommended]

Answer any 5 of the following questions

1. a. "The best way to use your English dictionary effectively is to read its introductory section where you'll find out how the entries are arranged; the introductory section of your dictionary will explain important information such as the abbreviations and pronunciation symbols used throughout the entries." Justify this statement.

- b. Grammatically correct the following sentences if require:

- i. Father loves to read, and so is his son.
- ii. Your English teacher wants to have his lecture understand.
- iii. She hasn't done the duty yet, and neither I have done.
- iv. Please do not insist me on do redundant task.
- v. The regular students deserved in having an excellent grade.

- c. What are the logical approaches to effective speaking? Mention the golden rules of body language during an oral interaction.

2. a. Discuss the various steps of the "Communication Model" Do you agree that the basic objective of all human communications is to obtain an understanding response? How can this be applied to the objectives of CSE?

- b. Convert the following English texts into phonetic transcription:

- i. theatre
- ii. asian
- iii. machiavellian
- iv. scorching
- v. confusion

- c. How nonverbal communication aside from the words themselves can transmit meaning?
3. a. What do you think can be the major barriers to communication? How could you overcome the psychological and semantic barriers to effective communication?

- b. Turn the following phonetic transcription into English text:

- i. /aut'reɪdʒəs/
- ii. /ʃætəʊn/
- iii. /mju'ʃən/
- iv. /ju:'neskəʊ/
- v. /fju:zələ:ʒ/

- c. Describe the various Modes of Oral Presentation with examples.

4

Gutthor

Levij

- 4 a. Answer questions (i-v) based on the following passage:
To prepare for a career in engineering, a student must begin planning in high school. Mathematics and science should form the core curriculum. For example, in a school where sixteen credit hours are required for high school graduation, four should be in mathematics, one each in chemistry, biology, and physics. The remaining credits should include four in English and at least three the humanities and social sciences. The average entering freshman in engineering should have achieved at least a 2.5 grade point on a 4.00 scale in his or her high school. Although deficiencies can be corrected during the first year, the student who needs additional work should expect to spend five instead of four years to complete a degree.
- i. What is the average credit hour for entering a freshman in engineering?
 - ii. When should a student begin planning for a career in engineering?
 - iii. What is meant by the term 'deficiency'?
 - iv. How many credits should a student have in English?
 - v. Who is expected to have more time to *avail the degree*?
- b. Use appropriate prefixes to form new words and make sentences with it.
- i.logue ii.hoard iii.distinct iv.chamber v.evitable
- c. 'Brevity is good but not at the cost of clarity' in case of attempting a précis. Explain.
- a. How can you prepare and present a seminar paper? Include some effective tools of Communication
- 5
b. Write down twelve (12) Vowels and eight (8) diphthongs with examples.
- c. What are the fundamental elements of Good Beginning, Good Explanation and Good Ending in Essay-writing?
6. a. Illustrate Visual Communication with examples. Write down the characteristics of Horizontal Communication.
- b. Write about the threats of using Face-book fanatically with the proposals to stop this ill practice.
- c. Draft a sample for your Personal Resume.
- 7
a. Suppose, your university is going to admit some new students at the department of English in the forthcoming session 2017-2018. Now produce a dialogue between two friends on "the importance of studying English."
- b. Make an application to the Dean asking for developing your Computer Lab of the faculty.
- c. Write a paragraph about "International attention on the Refugee Problem in Bangladesh".

Patuakhali Science and Technology University

Faculty of Computer Science and Engineering

2nd Semester (L-1, S-2) Final Examination of B.Sc. Engg.(CSE) July- December-2017, Session:2016-17

Course Code: MAT-121 Course title: Mathematics-II

Credit Hour:3.0

Full marks:70 Time: 3.0 hours

[Figure in the right margin indicates full marks. Split answering of any question is not recommended]

Answer any 5 of the following questions

Q1 a) Explain the following terms with examples.

Upper and lower triangular matrix, symmetric and skew symmetric matrix

b) If A and B are idempotent matrices, then $A+B$ will be idempotent if and only if $AB=BA=0$

c) Find the inverse of the matrix $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 0 & -1 \\ 3 & 3 & 2 \end{bmatrix}$

Also find the symmetric and skew symmetric parts of the above matrix A .

d) Discuss about the canonical form of matrix and the rank of a matrix

e) Find the rank of the matrix $A = \begin{bmatrix} 6 & 2 & 0 & 4 \\ -2 & -1 & 3 & 4 \\ -1 & -1 & 6 & 10 \end{bmatrix}$

f) Show that the vectors $(2, -1, 4), (3, 6, 2), (2, 10, 4)$ are linearly independent.

3. a) Define basis and dimension for homogeneous linear system

b) Determine a basis and the dimension for the solution space of the following linear system

$$x - 3y + z = 0 \quad 5$$

$$2x - 6y + 2z = 0 \quad 2$$

$$3x - 9y + 3z = 0 \quad 4$$

Q2 a) Give the definition of characteristic equation of a matrix. Find the eigen values for the

matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ 2 & -8 & -2 \\ 1 & 2 & 2 \end{bmatrix}$

b) Using the Cayley-Hamilton theorem find the inverse of the matrix A where

$$A = \begin{bmatrix} 1 & 0 & 1 \\ -1 & 1 & -3 \\ 2 & 2 & 4 \end{bmatrix} \quad 4$$

4. a) Find the angle between the straight lines represented by the equation $ax^2 + 2hxy + by^2 = 0$

Also find the condition that the two lines will be coincident and are at right angles

b) Prove that the lines joining the origin to the intersections of $ax^2 + 2hxy + by^2 + 2gx = 0$ and $dx^2 + 2h'xy + b'y^2 + 2g'x = 0$ are at right angles if $\frac{a+b}{g} = \frac{a'+b'}{g'}$

c) Find the equation of the circle passing through the intersection of the circles $x^2 + y^2 - 2ax$

and $x^2 + y^2 = 2by$ and having its centre on the line $\frac{x}{a} - \frac{y}{b} = 2$

d) Define rectangular hyperbola and conjugate hyperbola

e) Obtain the equation of the asymptotes of the hyperbola $3x^2 + 2xy + 4x - 9 = 0$. Also find the

equation of the conjugate hyperbola

f) Reduce the equation $4x^2 - 24xy - 6y^2 + 4x - 12y + 1 = 0$ to its standard form

g) Give the definition of plane, direction cosines and direction ratios

h) Find the distance of the point $A(1, -2, 3)$ from the line PQ through $P(2, -3, 5)$ which makes

equal angles with the axes

i) Find the length and equation of the shortest distance between the lines

$$\frac{x+1}{2} = \frac{y-2}{4} = \frac{z-3}{3} \quad \text{and} \quad \frac{x-2}{3} = \frac{y-4}{5} = \frac{z-5}{5} \quad 4$$

Find also where the shortest distance intersects the given lines.

Q3 a) Define rectangular hyperbola and conjugate hyperbola

b) Obtain the equation of the asymptotes of the hyperbola $3x^2 + 2xy + 4x - 9 = 0$. Also find the

equation of the conjugate hyperbola

c) Reduce the equation $4x^2 - 24xy - 6y^2 + 4x - 12y + 1 = 0$ to its standard form

d) Give the definition of plane, direction cosines and direction ratios

e) Find the distance of the point $A(1, -2, 3)$ from the line PQ through $P(2, -3, 5)$ which makes

equal angles with the axes

f) Find the length and equation of the shortest distance between the lines

$$\frac{x+1}{2} = \frac{y-2}{4} = \frac{z-3}{3} \quad \text{and} \quad \frac{x-2}{3} = \frac{y-4}{5} = \frac{z-5}{5} \quad 4$$

Find also where the shortest distance intersects the given lines.

Q4 a) Define rectangular hyperbola and conjugate hyperbola

b) Obtain the equation of the asymptotes of the hyperbola $3x^2 + 2xy + 4x - 9 = 0$. Also find the

equation of the conjugate hyperbola

c) Reduce the equation $4x^2 - 24xy - 6y^2 + 4x - 12y + 1 = 0$ to its standard form

d) Give the definition of plane, direction cosines and direction ratios

e) Find the distance of the point $A(1, -2, 3)$ from the line PQ through $P(2, -3, 5)$ which makes

equal angles with the axes

f) Find the length and equation of the shortest distance between the lines

$$\frac{x+1}{2} = \frac{y-2}{4} = \frac{z-3}{3} \quad \text{and} \quad \frac{x-2}{3} = \frac{y-4}{5} = \frac{z-5}{5} \quad 4$$

Find also where the shortest distance intersects the given lines.

Patuakhali Science and Technology University

Faculty of Computer Science and Engineering

2nd Semester (I-I, S-2) Final Examination of B.Sc. Engg.(CSE) July- December-2015.Session:2014-15.

Course Code: MAT-121

Course title: Mathematics-II

Credit Hour:3.0

Full marks:70

Time: 3.0 hours

(Figure in the right margin indicates full marks. Split answering of any question is not recommended.)

Answer any 5 of the following questions

- ~~1.~~ (a) Prove that every square matrix satisfied its characteristic equation
 (b) Verify the Cayley Hamilton theorem for the following.

432 (Sec)

$$A = \begin{bmatrix} -1 & 2 & -3 \\ 2 & 1 & 0 \\ 4 & -2 & 5 \end{bmatrix}$$

basis time 6
5

- (c) Find the inverse from the characteristic equation

115

3

- ~~2.~~ (a) Define Adjoined matrix, null matrix, Square matrix.
 (b) Find the inverse of the matrix

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 0 & -1 \\ 0 & 0 & 0 \end{bmatrix}$$

139

3

5

- ~~3.~~ Solve the following system of linear equation

$$\begin{aligned} x + y + z &= 6 \\ x - y + z &= 2 \\ 2x + y - z &= 1 \end{aligned}$$

1, 2, 3

6

eigen values

3. (a) Define eigen values and eigen vectors of a matrix

3

- (b) Explain the following terms:

403

3

Characteristic matrix, Characteristic polynomial, Characteristic equation

404

8

- b) Determine the Eigen values and all associated Eigen vectors of the following

$$A = \begin{bmatrix} 5 & -6 & 4 \\ 7 & 4 & -3 \\ 2 & 1 & 6 \end{bmatrix}$$

$\lambda I = A$

3

3

pair of straight line

Derive the equation of bisectors of the angles between the straight lines represented by the equation $ax^2 + 2hxy + by^2 = 0$

7

Transform the equation $9x^2 + 15xy + y^2 + 12x - 11y - 15 = 0$ so as to remove the terms in

7

x, y and xy. Transformation (ex) $24, \pi/4$ page 90, 8, 11, 12

5. a) Find the equation of the circle passing through the intersection of the circles $x^2 + y^2 = 2ax$ and $x^2 + y^2 = 2by$ and having its centre on the line $\frac{x}{a} - \frac{y}{b} = 2$ circle(ex) 109 page

6

- b) Define asymptotes to a curve. Obtain the equation of the asymptotes of the hyperbola $3x^2 + 2xy + 4x - 9 = 0$. Also find the equation of the conjugate hyperbola

8

5

5

$$-9 \pm \frac{D}{C}$$

0

21110221007 mm 2 D

straight line and
the plane part-II

30

11 page

- b. (a) Give the definition of plane, direction cosines and direction ratios
(b) Find the angle between the lines whose direction ratios are $[2, -1, 3]$ and $[-1, 3, 4]$ 3
(c) Show that the lines $\frac{x+1}{2} = \frac{y-2}{2} = z$ and $\frac{x-1}{6} = y+1 = \frac{z-3}{5}$ are coplanar. Also find their point of intersection and the equation of the plane containing them. 6

96

[Figure in the right margin indicates full marks. Split answering of any question is not recommended.]

Answer any 5 of the following questions

1. (a) Define upper triangular and lower triangular matrices, symmetric and skew-symmetric matrices and orthogonal matrix. 99-100 4
 (b) Prove that every square matrix can be uniquely expressed as the sum of a symmetric and a skew-symmetric matrix. 107 4
 (c) Find the symmetric and skew-symmetric parts and also the inverse of the following matrix 6

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 0 & -1 \\ 3 & 3 & 2 \end{bmatrix}$$

132 page

2. (a) Define echelon matrix, canonical matrix and rank of a matrix 153, 154, 158 $A^T = A$ 6
 (b) Write down any process to find the rank of a matrix 159 3
 (c) Determine the rank of the matrix 5

$$A = \begin{bmatrix} 1 & 3 & -2 & -1 \\ 2 & 6 & -4 & -2 \\ 1 & 3 & -2 & 1 \\ 2 & 6 & 1 & -1 \end{bmatrix}$$

185
186 page

$$\begin{array}{l} R_1 + R_2 \\ R_2 + R_3 \\ R_3 + R_4 \\ R_4 + R_2 \end{array}$$

42

3. (a) Explain the following terms:
 Eigenvalues, Eigenvectors, Characteristic polynomial and Characteristic equation of a matrix. 103 4
 (b) Determine the Eigenvalues and all associated Eigenvectors of the following matrix 5

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$$

415
421

- (c) Find the characteristic equation of the matrix

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

93 / page

5

~~1-3-3~~

and verify the Cayley-Hamilton theorem for the above matrix.

4. (a) Find the effect of transformation of coordinates upon the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ 17 6

- (b) Define the invariants of transformations ~~147, 21~~ 147, 25 2

- (c) Transform the equation $x^2 - y^2 - 2ax + 2by + c^2 = 0$ to axes through the point (a, b) inclined at an angle $\frac{\pi}{4}$ to the original axes. ~~147, 21~~, 29 6

28

5. (a) Prove that a homogeneous equation of the second degree always represents a pair of straight lines through the origin. 9 4

- (b) Show that the straight lines represented by the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ will be equidistant from the origin if $f^2 - g^2 = c(bf^2 - ag^2)$. 72, 27, 29 5

- (c) Find the equation of the circle passing through the intersection of the lines A-98 $x^2 + y^2 - 2x - 2y - 2 = 0$ and $x^2 + y^2 - 4x - 4y - 12 = 0$. 72, 27, 29 5

Patuakhali Science and Technology University

2nd Semester (L-1, S-2) Final Examination of B.Sc. (Engg.) in CSE, July-December: 2019, Session: 2018-2019

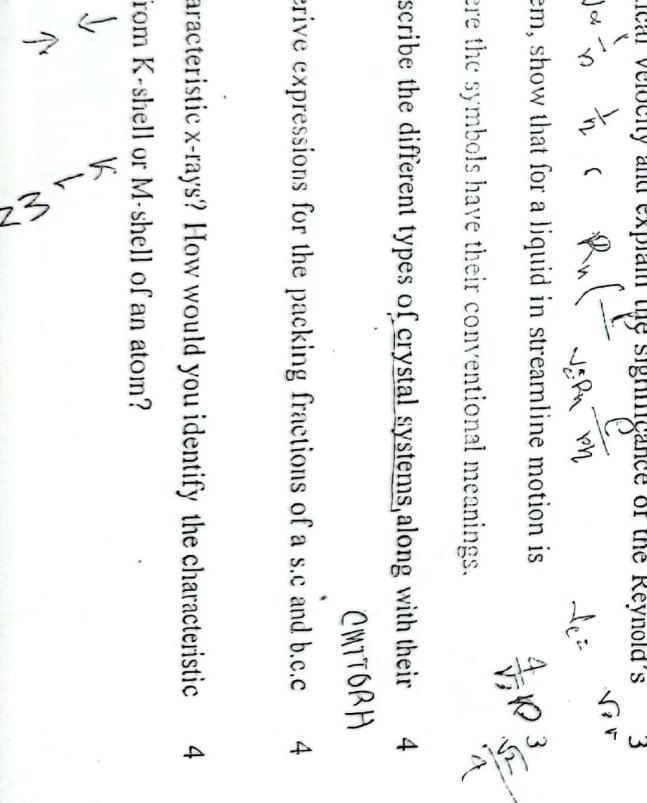
Course Code: PHY 121, Course Title: Physics-II

Credit Hour: 3.0, Full Marks: 70, Total Time: 3 Hours

[Figures in the right margin indicate full marks. Split answering of any question is not recommended.]

Answer any five (05) from the following questions

1. (a) Define the terms neutral surface and bending moment. 2
- (b) If a thin light beam clamped horizontally at one end and loaded at the other, then how can we determine the depression of the beam? 4
- (c) Deduce an expression for the couple required to twist a uniform solid cylinder by an angle. 5
- (d) What couple must be applied to a wire 1 meter long, 1 mm in diameter in order to twist one end of it, through 90° , the other end remaining fixed. Rigidity of material of the wire is $2.8 \times 10^{10} \text{ Nm}^{-2}$. 3
2. (a) Explain clearly from where the energy comes when the liquid rises against gravity in the capillary tube and the liquid meniscus is plane, concave or convex. Why? 5
- (b) Apply the capillary action and find the expression for the height h to which a liquid of surface tension T may rise in a capillary tube of radius r . 3
3. (c) What is equation of continuity? Derive an expression for the equation of continuity. 4
- (d) Using Poiseuille's equations, how can you describe the several mechanism of blood flow in our body? 2
4. (a) Discuss briefly the idea of critical velocity and explain the significance of the Reynold's number. 3
- (b) According to Bernoulli's theorem, show that for a liquid in streamline motion is $\frac{P}{\rho} + gh + \frac{V^2}{2} = \text{constant}$, where the symbols have their conventional meanings. 4
- (c) What are Bravais lattices? Describe the different types of crystal systems along with their characteristics. 4
- (d) Prescribe packing fraction. Derive expressions for the packing fractions of a.s.c and b.c.c crystal structure. 4
5. (a) What do you understand by characteristic x-rays? How would you identify the characteristic x-rays whether it is emitted from K-shell or M-shell of an atom? 4



(b) What

(c) What

(b) What is LASER? Define stimulated absorption and spontaneous emission of a photon.

3

(c) Write down the mechanism of LASER. Give the practical applications of LASER.

4

(d) Estimate the energy and wavelength of the characteristic x-ray emitted from a tungsten target when an electron drops from an M shell ($n = 3$ state) to a vacancy in the K_{shell} ($n = 1$ state).

3

5. (a) Define (i) Interference, (ii) Diffraction, and (iii) Polarization of light.

3

(b) Explain polarization of light by selective absorption, and hence the Malus's law.

4

(c) State and explain the Brewster's law.

4

(d) The polarizers are rotated so that the second polarizer has a transmission axis of 40.0° with respect to the first polarizer and the third polarizer has an angle of 90.0° with respect to the first. If I_b is the intensity of the original unpolarized light, what is the intensity of the beam after it passes through (i) the second polarizer, and (ii) the third polarizer?, and (iii) What is the final transmitted intensity if the second polarizer is removed?

6. (a) What is meant by radioactive decay? Identify that it is a random process.

3

(b) Show that the number of radioactive nuclei is given as a function of time by

5

$$N = N_0 e^{-\lambda t}, \text{ where the symbols have their conventional meanings.}$$

(c) Identify the two types of beta particles and how they produce?

3

(d) Of the 600 mg of potassium in a large banana, 0.0117 % is radioactive ^{40}K , which has a half-life $T_{1/2}$ of 1.25×10^9 year. What is the activity of the banana?

$$\text{Activity} = N \cdot \lambda = N_0 e^{-\lambda t} = N_0 e^{-\frac{\ln 2}{T_{1/2}} \cdot t}$$

7. (a) What is fission reactions? How does fission reactions occurs.

2

(b) Define prompt neutrons, and delayed neutrons.

2

(c) What is nuclear reactors? Write down the types of nuclear reactors. Briefly discuss the boiling water reactor with schematic diagram.

7

(d) A 200 MW fission reactor consumes half its fuel in 3.00 y. How much ^{235}U did it contain initially? Assume that all the energy generated arises from the fission of ^{235}U and that this nuclide is consumed only by the fission process.

$$\frac{200}{\frac{1}{2} \cdot 3.00}$$

$$\frac{\lambda N^2}{T_1}$$

Patuakhali Science and Technology University

B.Sc. Engg.(CSE) Level-I Semester-II Final Examination-2017(Session:2016-2017)

Course Code: PHY 121

Course Title: Physics-II

Credit Hour: 3.0

Full Marks: 70

Time: 3 hours

[Answer any 5(five) of the following questions. Numbers on the right margin indicate full marks.]

Q1 (a) Distinguish between angle of twist and angle of shear.

(b) Prove that the couple required per unit twist in the case of a cylinder is $C = \pi m a^4 / 2l$.

(c) Conclude as such medium which have the same properties at all points and in all directions with examples.

(d) For the case of modulus of rigidity; show that a shear is equivalent to an elongation and an equal compression at right angles to each other.

Q2

(a) How is the surface tension of a liquid explained on the basis of intermolecular forces?

(b) Prove that the surface energy per unit area of a surface is numerically equal to the surface tension. $\epsilon = \sigma T$

(c) Show that the excess pressure acting on the curved surface of a curved membrane is given by $P = 2T(\frac{1}{r_1} + \frac{1}{r_2})$, where r_1 and r_2 are the radii of curvature and T is the surface tension of the membrane.

Q3

(a) In a fluid mechanics write down the importance of the equation of continuity.

(b) Discuss briefly the idea of critical velocity and explain the significance of the Reynold's number.

(c) Define mass flow rate and discharge (Q). If you know the mass flow is 1.5 kg/s, how long will it take to fill a container with 8 kg of fluid?

(d) How can we determine the various mechanism of blood flow in our body using Poiseuill's equation?

$$2 \frac{\epsilon P}{\eta l}$$

Q4 (a) State and explain the radioactive decay law.

(b) Establish a relation between half-life and radioactive disintegration constant.

(c) Sketch the curve of the binding energy per nucleon versus mass number. Qualitatively show that there is a possibility of release of energy on fusion of light elements and fission of heavy elements.

Q5

(a) Sketch the different series in the hydrogen spectrum and discuss the various characteristics on the basis of Bohr's theory.

(b) The wavelength of the second line of the Balmer series in the hydrogen spectrum is 4861 Å^0 . Calculate the wavelength of the first line.

(c) Show that for very large quantum number with frequency of rotation of electron and frequency of radiation emitted when the quantum number changes by unity approaches to the same value.

1+

2+

6. (a) Discuss the conditions to be satisfied by the waves to interfere with each other. 2
 (b) Describe Young's experiment and derive an expression for (i) intensity at a point on the screen, (ii) fringe width. 3
 (c) Two coherent sources of light being 0.23 mm apart are contributing to make an interference pattern on a screen which is 45cm away from them. The wavelength of the emitted light by the sources is 275Å^0 . On the screen, what would be the order of the bright fringe that is found 0.16 mm away from the central bright fringe? 3
 (d) Write short notes on any two of the following topics:
 i) Polarization by selective absorption; ii) Polarization by refraction

3

3+3

Tutor

Patuakhali Science And Technology University

B.Sc. Engg. (CS) I Level, II Semester, II Final Examination-2015 (July-December), Session 2014-15

Course Code: PHY 121 Course Title: Physics-II

Credit hour: 3.0 Total Marks: 70 Time: 3 hours

[Answer any six of the following questions. Numbers on the right margin indicate full marks.]

- (a) Derive an expression for the energy of hydrogen atom when the electron is in the n th orbit. 5
 (b) Explain the various series in the hydrogen spectrum on the basis of Bohr's theory. 6
 (c) The wavelength of the second line of the Balmer series in the hydrogen spectrum is 3
 $4861\text{ }A^0$. Calculate the wavelength of the first line.

- (a) State the laws of radioactive disintegration. 2
 (b) Establish a relation between half-life and radioactive disintegration constant. 7
 (c) Draw a comparative study on alpha, beta and gamma rays. 5
- (a) Define-(i)Atomic mass unit, (ii)Binding energy, (iii)Mass defect and (iv)Mirror nuclei. 1.5 4=6
 (b) Sketch the curve of the binding energy per nucleon versus mass number. Qualitatively show that there is a possibility of release of energy on fusion of light elements and fission of heavy elements. 6
 (c) What do you mean by Q-value of a reaction? 2

- (a) Distinguish between angle of twist and angle of shear. Show that the couple required per unit twist in the case of a cylinder is $C = \pi m^3 l/2l$. 3+6
 (b) For the case of modulus of rigidity, show that a shear is equivalent to an elongation and an equal compression at right angles to each other. 5

- (a) How is the surface tension of a liquid explained on the basis of intermolecular forces? KAT 4
 (b) Show that the excess pressure acting on the curved surface of a curved membrane is given by $P = 2T(\frac{1}{r_1} + \frac{1}{r_2})$, where r_1 and r_2 are the radii of curvature and T is the surface tension of the membrane. 5

- (a) Calculate the excess of pressure between the inside and outside of a soap bubble of radius 1cm. Surface tension of soap solution is 3.0×10^{-2} N/m. 7

$$\frac{\Delta P}{2} = \frac{4T}{R}$$
 ✓

- (a) Define critical velocity. Distinguish between streamline and turbulent flow of a liquid. 1+1
 (b) State and prove Bernoulli's theorem for a liquid along a stream line. 1+5
 (c) Water flows through a horizontal pipe line of varying cross-section. At a point where the pressure of water is $6664 \times 10^3 \text{ N/m}^2$, the velocity of flow is 0.25 ms^{-1} . Calculate the pressure at another point where velocity of flow is 0.4 ms^{-1} . Density of water 10^3 kg m^{-3} . 4

$$P_1 + \frac{1}{2}\rho V_1^2 + \rho gh_1 = P_2 + \frac{1}{2}\rho V_2^2 + \rho gh_2$$
 ✓

- (a) What is plane diffraction grating? Briefly explain dispersive and resolving power of a grating. 2+3
 (b) Define coherent sources. Explain the importance of such sources in interference phenomenon. 1+2
 (c) What is polarization of light? Describe two methods for the formation of polarized light. 1+5

Tulsi

Patwakhal Science and Technology University

Faculty of Computer Science and Engineering

2nd Semester (Level-1, Semester-II) Final Examination of B.Sc. Engg.(CSE) July-December- 2015

Session: 2014-2015, Course Code: CT-121, Course Title: Discrete Mathematics

Credit Hour: 03

Full Marks: 70

Figure in the right margin indicates full marks. Split answering of any questions is not recommended./ Answer any 7 of the following question.

1. (a) Re-write the following statements using set notation:

- (i) The element 2 is not a member of G.
- (ii) The element 7 is a member of F.
- (iii) B is a subset of C.
- (iv) D is not a subset of C.

(v) A contains all the elements of H.

(vi) J and F contain the same elements.

(b) List the elements of the following sets;

(i) $A = \{x : x \in N, 3 < x < 9\}$

(ii) $B = \{x : x \in N, x^2 + 1 = 10\}$

(iii) $C = \{x : x \in N, x \text{ is odd}, -5 < x < 5\}$

(c) Define the set operation of : (i) Union and (ii) intersection

(d) $U = \{1, 2, 3, \dots, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$, $C = \{3, 4, 5, 6\}$

Find: (i) $(A \cap B) \setminus C$ and (ii) $(A \setminus B)^c$

2. (a) Find the number of elements in each finite set:

(i) $A = \{2, 4, 6, 8, 10, 12, 14\}$

(ii) $B = \{x : x^2 = 16\}$

(iii) $C = \{x : x > \sqrt{2}\}$

(iv) $D = \{x : x \text{ is a positive integer, } x \text{ is a divisor of } 16\}$

(v) $E = \{\text{Letters in the alphabet preceding the letter } n\}$ if $F = \{x : x \text{ is a solution to } x^3 = 27\}$

(b) Prove $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$

(c) Shade the set $(A \cup B) \cap (A \cup C)$.

3. (a) Consider the following assumptions:

S_1 : All dictionaries are useful.

S_2 : Mary owns only romance novels.

S_3 : No romance novel is useful.

S_4 : Romance novels are not dictionaries.

(y) Mary does not own a dictionary.

(z) All useful books are dictionaries.

b) One hundred students were asked whether they had taken courses in any of the three areas, Sociology, Anthropology, and History. The results were,

45 had taken sociology

38 had taken anthropology

21 had taken history

and 23 had taken no courses in any of the areas.

(x) Draw a Venn diagram that will show the results of the survey.

(y) Determine the number k of students who had taken classes in exactly (1) one of the areas, and (2) two of the areas.

(a) Define the composition of relations and give examples with diagram.

(b) Let $A = \{a, b, c, d, e\}$, and let B be the set of letters in the alphabet. Let the functions f, g and h from A into B be defined as follows:

$$\begin{array}{ll} f & \begin{array}{l} (i) a \rightarrow r \\ b \rightarrow a \\ c \rightarrow s \\ d \rightarrow r \\ e \rightarrow c \end{array} \quad \text{(iii)} \quad \begin{array}{l} a \xrightarrow{y} z \\ b \rightarrow y \\ c \rightarrow x \\ d \rightarrow y \\ e \rightarrow z \end{array} \quad \begin{array}{l} u \xrightarrow{h} a \\ b \rightarrow c \\ c \rightarrow e \\ d \rightarrow r \\ e \rightarrow s \end{array} \end{array}$$

Are any of these functions one-to-one?

5. (a) What is meant by a recursively defined function? Calculate $8!$ using the recursive definition.

(b) Let a and b denote positive integers. Suppose a function Q is defined recursively as follows:

$$Q(a, b) = \begin{cases} 0 & \text{if } a < b \\ Q(a - b, b) + 1 & \text{if } b \leq a \end{cases}$$

Find the value of $Q(2, 3)$ and $Q(14, 3)$.

- (i) Find the value of $Q(2, 3)$ and $Q(14, 3)$.
- (ii) What does this function do? Find $Q(5861, 7)$.

6. Give two methods to find the truth table of the proposition $\sim(p \wedge \sim q)$.

(a) Prove that disjunction distributes over conjunction; that is, prove the distributive law

$$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$$

7. (a) Define the truth table of the biconditional $p \leftrightarrow q$, that is "p if and only if q" and also define the

truth value of the compound statement $p \rightarrow q$, that is "if p then q".

(b) Prove that the conditional operation distributes over conjunction; that is,

$$p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$$

8. (a) Define a Hamiltonian graph. Draw a graph with six vertices which is Hamiltonian but not Eulerian.

- (i) What is a complete graph and regular graph? Draw the complete bipartite graph $K_{2,3}, K_{3,3}, K_{2,4}$, $K_{2,5}$ and draw all trees with six vertices.
- (ii) What is a complete graph and regular graph? Draw the complete bipartite graph $K_{2,3}, K_{3,3}, K_{2,4}$, $K_{2,5}$ and draw all trees with six vertices.

Patuakhali Science and Technology University

B.Sc.Engg (CSE) Level-I Semester-II Final Examination-2016(July-December), Session:2015-2016

Course Title: Physics-II

Course Code: PHY 121

Full Marks:70

Credit Hour: 3.0

[Answer any 5(five) of the following questions. Numbers on the right margin indicate full marks.]

- Q. 1.** What is the difference between angle of twist and angle of shear? 3
 Deduce an expression for the couple required to twist a uniform solid cylinder by an angle. 3
Conclude as such medium which have the same properties at all points and in all directions with examples. 3
Young's modulus of elasticity, if Poisson's ratio 1
Show that for a homogeneous isotropic medium $y = 2\eta(1 + \sigma)$, where letters have their usual meaning. 1

- Q. 2.** When the area of a liquid surface is increased work is done against surface tension-why? 1
 Prove that the surface energy per unit area of a surface is numerically equal to the surface tension. 1
 Explain clearly from where the energy comes when the liquid rises against gravity in the capillary tube and the liquid meniscus is plane, concave or convex. Why? 1.5
 Apply the capillary action and find the expression for the height h to which a liquid of surface tension T may rise in a capillary tube of radius r . 1.5

- Q. 3.** Distinguish between streamline and turbulent flow of a liquid. 3
 Discuss briefly the idea of critical velocity and explain the significance of the Reynold's number. 3
 Give with necessary theory Poiseuill's method of determining the coefficient of viscosity of a liquid. 1.5
 (d) How can we determine the various mechanism of blood flow in our body using Poiseuill's equation? 2

- Q. 4.** Define mass flow rate and discharge (Q). If you know the mass flow is 1.5 kg/s, how long will it take to fill a container with 8 kg of fluid? 3+2
 In a fluid mechanics write down the importance of the equation of continuity. 3
 (c) Show that the total energy of a small amount of an incompressible liquid flowing from one point to another remains constant throughout the displacement. 3
 (d) Bernoulli's principle 2

- Q. 5.** (a) Sketch the different series in the hydrogen spectrum and discuss the various characteristics on the basis of Bohr's theory. 3
 (b) The wavelength of the second line of the Balmer series in the hydrogen spectrum is 4861 Å^0 . Calculate the wavelength of the first line. 3
 (c) Describe the nature and properties of the charged particles emitted from radioactive substance. 3
 (d) What results are obtained in alpha particles scattering experiment? 3

- Q. 6.** (a) How does polycrystalline material differs from single crystal? State the differences. 3
 (b) Reduce Bragg's law and its application to X-Ray diffraction. Justify the importance of using X-Ray in case of crystallographic analysis? 2
 (c) With appropriate illustration, explain all types of point defects that are found in crystals. 3

- Q. 7.** (a) Discuss the conditions to be satisfied by the waves to interfere with each other. 2
 (b) Two coherent sources of light being 0.23 mm apart are contributing to make an interference pattern on a screen which is 45cm away from them. The wavelength of the emitted light by the sources is 275A° . On the screen, what would be the order of the bright fringe that is found 0.16 mm away from the central bright fringe? 3
 (c) Differentiate between Fresnel and Fraunhofer diffraction. Develop a general equation for getting minima or dark points in case of Fraunhofer diffraction. 4
 (d) Write short notes on any two of the following topics:
 i) Brewster's Law; ii) Polarization by selective absorption; iii) Polarization by refraction

2+2
2.5 + 2.5