

*Nepal College of Information  
Technology*

*(Balkumari Lalitpur)*

*(Affiliated to Pokhara University)*



*OLD QUESTIONS COLLECTION*

*FOR 4<sup>TH</sup> SEMESTER IT (2019)*

*Sugam Stationary Suppliers & Photocopy*

*Service Ph. No. 9841599592*

*(NCIT College)*

# POKHARA UNIVERSITY,

Level: Bachelor

Semester: Spring

Year : 2013

Programme: BE

Full Marks: 100

Course: Software Engineering Fundamentals

Pass Marks: 45

Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Why do you need a process model to be followed in order to develop a software? Explain spiral model. 8  
b) Compute the function point value for a project with the following information domain characteristics.  
Number of user input: 32  
Number of user output: 60  
Number of user inquiries: 24  
Number of files: 8  
Number of external interface: 2
2. a) What do you mean by Quality of Conformance and Quality of Design? Elaborate the Activities of the SQA Group. 8  
b) "If you do not actively attack the risk, the risk will attack you", Justify your statement. Differentiate between predictable and unpredictable risks. 7
3. a) Why is SQA needed? Explain the components of the OO analysis model. 8  
b) Why is Software Designing an important job? Explain Modularity Concept along with the five criteria for effective modular system. 7
4. a) What are analysis model elements? 8  
b) Explain the transform mapping and transaction mapping. How they are related for software? 7
5. a) Differentiate between white-box testing and black box testing. 8  
b) Using Basis path testing approach draw the Flow graph and find out the Cyclomatic complexity of the following code fragment:

If ( $x > y$ )

सुवाम स्टेशनरी सप्लाईर्स एण्ड फोटोकपी सर्विस

बालकुमारी, ललितपुर ९८४९५९५९२

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Min = xi  
Else  
Min = yi  
End if

6. a) "Message passing is the way through which objects Communicate to each other". Is it true, if then validate your answer. 8
- b) Describe transformation from OOA model to OOD model. 7
7. Write short notes on: (Any two) 2x5
- Software Requirements Specification (SRS)
  - Domain Analysis
  - Software Architecture.

2

24 Aug  
POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Software Engineering Fundamentals

Semester - Fall

Year : 2013

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) What is evolutionary software process model? Explain. Also show that as you move outward along the process flow path of an evolutionary model. What can you say about the software that is being developed or maintained? 7
- b) What are the qualities that should be considered while measuring software? Explain Function Point metrics with example. 8
- a) How might the completion time and costs be estimate for a new software engineering contract? Explain two estimating techniques. 8
- b) What is the purpose of clean room engineering in software quality assurance? Explain in detail 7
- a) Software requirements analysis is unquestionably the most communication intensive step in the software engineering process. What causes the communication path to break down? Also explain how a system analyst will address the issue of job security in requirement gathering phase due to implementation of an automated software system. List all the possible solutions that will be of help to minimize the problem 8
- b) What do you understand by the term SCM? Which components of software can undergo configuration management? What is the role of a baseline and SCIs in SCM process? Explain with necessary figure. 7
- a) A program reads three integer values. The three values are interpreted as representing the lengths of sides of triangle. The program prints a message the states whether the triangle is scalene, isosceles or equilateral. Derive a flow graph for the program and apply basis path testing to develop test cases that will guarantee that all the statements in the program have been tested. Execute all the cases and show your 8

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Level: Bachelor	Semester: Spring	Year : 2014
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Software Engineering Fundamentals	Time : 3 hrs.	

- b) Using Basis path testing approach draw the Flow graph and find out the Cyclomatic complexity of the following code fragment: 7
- ```

x=10
y=5
z=2
if x>y and x>z
max=x
else if y>z
max=y
else max=z
    
```
6. a) Describe the different characteristics of object oriented program. 7  
 b) What are the various components required for object oriented analysis model? 8
7. Write short notes on: (Any two) 2×5
- a) ER Diagram  
 b) Object Oriented Design  
 c) SRS.

2

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Explain the terms people, product, process and project. What do you mean by umbrella activity in software process? 7
  - b) An Air Line Reservation System is to be developed in which the lines of codes is calculated to be 37,000 and a review of the historic data reveals that the average productivity for this type of system is 500(LOC/pm) and the labor rate is Rs. 8,500 per month. What would be the estimated project cost and the estimated effort for this software package? 8
  2. a) What are the software risks? Explain different categories of risks associated with software projects. 8
  - b) As a project manager, how can you ensure customer that your software product has quality? Explain FTR as a measure to maintain the quality of a software project. 7
  3. a) What is the need of SCM activities? Why is Configuration audit essential during software development process? 8
  - b) "Analysis starts with data modeling". Describe the concept of data modeling. 7
  4. a) Explain the transition from Analysis to Design model with necessary figure. Illustrate all the necessary components of an analysis model and their equivalent state in the design model. 7
  - b) Using Basis path testing approach draw the Flow graph and find out the Cyclomatic complexity of the following code fragment: 8
- ```

if {x<10}
print "x is less than 10"
else if x<20
    
```

1

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Fall	Year : 2015
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Software Engineering Fundamentals		Time : 3 hrs.

print "greater than 30"

- Q. a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects?

- b) Explain the various components required for object oriented analysis model

- c) What are the test cases? Give the different way to design test-cases.

Are they related to system testing? Justify your answer.

- d) Why is design process important? Briefly explain the different levels of design?

- e) Write short notes on: (Any two)

- a) Version Control and Change Control.

- b) Quality Standard.

- c) Facilitated Action Specification Technique.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Attempt all the questions.*

1. a) What is evolutionary software process model? Explain. Also show that as you move outward along the process flow path of an evolutionary model, what can you say about the software that is being developed or maintained?

- b) Given data for a Web based social networking site developed by RBN Software Developers:

Numbers of User Input : 97

Numbers of User Outputs: 52

Numbers of User Inquiries: 48

Numbers of External Interfaces: 30

Numbers of Logical Files: 60

Assuming that the complexity of the given website development is average, compute the function point. If the productivity of the RBN S/W Developers is 32FP/PM, and their salary structure is Rs.15000 per months on average, estimate total cost of the software.

2. a) What do you understand by the term SCM? Which components of software can undergo configuration management? What is the role of a baseline and SCIs in SCM process? Explain with necessary figure.
- b) Quality and reliability are related concepts but are fundamentally different in a number of ways. Discuss them.
3. a) A Country Bus Company owns a number of busses. Each bus is allocated to a particular route, although some routes may have several busses. Each route passes through a number of towns. One or more drivers are allocated to each stage of a route, which corresponds to a journey through some or all of the towns on a route. Some of the towns have a garage where busses are kept and each of the busses are identified by the registration number and can carry different numbers of passengers, since

the vehicles vary in size and can be single or double-decked. Each route is identified by a route number and information is available on the average number of passengers carried per day for each route. Drivers have an employee number, address and sometimes a telephone number.

- Identify the entities from the above problem and model it into a ER-diagram.

- What do you mean by dynamic estimation model? Is "Software Equation" a dynamic estimation model? Justify your answer.

- Consider the following piece of program, which assumes a large integer C and an array A [0 .. C]. It is intended to assign the maximum of A to the variable max.

```
Max = A [0];
```

```
I = 1;
```

```
While (I < C) {
```

```
I = I +1;
```

```
If (A [I] > Max)
```

```
{
```

```
    Max = A [I];
```

```
}
```

For the above program design a test case and recommend a testing technique. Justify your recommendation.

- What are the various types of software risks? Discuss risk mitigation strategies.

- Explain why encapsulation, inheritance, and polymorphism are three important characteristics of object-oriented systems.

- How do you identify the elements of an object oriented model? Discuss about the generic steps that a software engineer should perform during object oriented design.

- Differentiate between white-box testing and black box testing. What are the attributes of good test? Explain.

- Explain the translation of OOA model to OOD model.

- Write short notes on: (Any two)
  - Data dictionary.
  - Design Notations.
  - Granularity in software design.

Level: Bachelor  
Programme: BE  
Course: Software Engineering Fundamentals

Semester: Spring  
Year : 2015  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*  
*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- What are the characteristics of software? Which model would you use for risk driven software development? Explain.

- What are metrics, measures and indicators? Compute the function point value for a project with the following information domain characteristics :
- |                            |      |
|----------------------------|------|
| No. of user inputs         | : 39 |
| No. of user outputs        | : 53 |
| No. of user inquiries      | : 30 |
| No. of files               | : 12 |
| No. of external interfaces | : 5  |

Assume that the complexity adjustment values are average.  
 मुख्य संस्कृती मालायस एक पोटेनशियल सर्किप  
 द्वारा बनायी गयी अवधारणा १५३४५९५९२  
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- Discuss, with respect to a software project, the need for risk analysis and management and the steps involved in this activity.

- Why are software reviews important? What are the guidelines for conducting FTR?

- What do you mean by version control? Explain the steps involved. Why is configuration audit essential during software development process?

- What do you mean by Analysis modeling? What is its importance? Explain the Elements of analysis model.

- What is a software design? Why are design principles important in software design? Explain the design principles.

- Why is software testing an integral part of software development? Explain the significance of white box testing and black box testing during SDLC.

5. a) Discuss the importance of software architecture. What is Transform mapping? Explain each step involved in Transform mapping.

b) Explain about the Boundary Value Analysis and Equivalence partitioning in software testing.

6. a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects?

b) How do you identify the elements of an object oriented model? Discuss about the generic steps that a software engineer should perform during object oriented design.

7. Write short notes on: (Any two)

a) Cost of Quality

b) Verification and Validation

c) RMMM plan

2×5

7. a) Discuss the importance of software architecture. What is Transform mapping? Explain each step involved in Transform mapping.

b) Explain about the Boundary Value Analysis and Equivalence partitioning in software testing.

8. a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects?

b) How do you identify the elements of an object oriented model? Discuss about the generic steps that a software engineer should perform during object oriented design.

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b) How do you identify the elements of an object oriented model? Discuss about the generic steps that a software engineer should perform during object oriented design.

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a) Cost of Quality

b) Verification and Validation

c) RMMM plan

2×5

## POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2016  
Programme: BE Full Marks: 100  
Course: Software Engineering Fundamentals Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Can evolutionary model be satisfactorily used for development of all types of project? Describe the phases of the prototyping model.

b) With the given data for an online shopping site developed by ABC software developers,

Numbers of User Input	:	98
Numbers of User Output	:	51
Numbers of User Inquiries	:	47
Numbers of External Interfaces	:	32
Numbers of Logical Files	:	61

Assuming that the complexity of the given website development is average, compute the function point, if the productivity of the ABC S/W Developers is 35 FPP-M, and their salary structure is Rs. 15000 per month on average, estimate total cost of the software.

2. a) Why is it necessary to do software project planning? What are the different types of software risks? Explain.

b) What is SQA? Discuss the activities involved as a part of SQA plan.

3. a) "Quality and Reliability are related concepts but are fundamentally different". Justify this statement with a suitable example.

b) What is software configuration management? Describe the change control process in brief.

4. a) Obtain a level-1 DFD and design data dictionary for any one data from the given scenario.

A travel agency arranges holidays for customers. Bookings are made directly by customers. When a customer makes an approach, the

8

5. a) Discuss the importance of software architecture. What is Transform mapping? Explain each step involved in Transform mapping. 7

b) Explain about the Boundary Value Analysis and Equivalence Partitioning in software testing. 8

6. a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects? 8

b) How do you identify the elements of an object oriented model? 7

Discuss about the generic steps that a software engineer should perform during object oriented design. 8

7. Write short notes on: (Any two) 2×5

a) Cost of Quality 7

b) Verification and Validation

c) RMM plan

**POKHARA UNIVERSITY**  
Level: Bachelor Semester: Fall Year : 2016  
Programme: BE Full Marks: 100  
Course: Software Engineering Fundamentals Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.  
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Attempt all the questions.

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Assuming that the complexity of the given website development is average, compute the function point, if the productivity of the ABC SW Developers is 35 FP/P-M, and their salary structure is Rs. 15000 per month on average, estimate total cost of the software.

2. a) Why is it necessary to do software project planning? What are the different types of software risks? Explain. 7

b) What is SQA? Discuss the activities involved as a part of SQA plan. 8

3. a) "Quality and Reliability are related concepts but are fundamentally different". Justify this statement with a suitable example. 7

b) What is software configuration management? Describe the change control process in brief. 8

4. a) Obtain a level-1 DFD and design data dictionary for any one data from the given scenario. 8

A travel agency arranges holidays for customers. Bookings are made directly by customers. When a customer makes an approach, the

reservation clerk select appropriate flight detail & hotel detail from list which are regularly updated. The details are entered onto a provisional detail file. The customer must confirm this booking within 3 days by sending a deposit, reservation transfers the details from provisional booking file to confirm booking file. Four week before the flight is due, account send an invoice to the customer for the remaining costs. Accounts notify customer service when the full payment is received and customer services then send tickets and joining instructions to the customer.

- b) "Requirement Analysis acts as the bridge between software Engineering and Software Design". Explain? 7
5. a) What is software design? Explain different elements of design model. 8  
b) Explain basis path testing? Compute cyclomatic complexity from given piece of program. 7

- ```
large = x[0];
for (i=1, i<=n-1; i++)
{
    if(x[i]>large)
        large = x[i];
}
```
6. a) What do you mean by domain analysis? What are the different components of object oriented analysis model? 8  
b) What are Class, Object, Attributes' and Methods? Explain with appropriate examples. 7
7. Write short notes on: (Any two) 2×5
- White Box Testing & Black Box Testing
  - Data dictionary
  - Transform Mapping versus Transaction Mapping

#### POKHARA UNIVERSITY

|                                           |                  |             |
|-------------------------------------------|------------------|-------------|
| Level: Bachelor                           | Semester: Spring | Year : 2016 |
| Programme: BE                             | Full Marks: 100  |             |
| Course: Software Engineering Fundamentals | Pass Marks: 45   |             |
|                                           | Time : 3 hrs.    |             |

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- a) List out some characteristics of software. Compare and contrast Prototyping Model with Spiral Model giving a suitable example. 8
- b) Compute the function point value for a project with the following information domain characteristics.  
Number of user input: 32  
Number of user output: 60  
Number of user inquiries: 24  
Number of files: 8  
Number of external interface: 2
- a) "If you do not actively attack the risk, the risk will attack you", Justify your statement. Differentiate between predictable and unpredictable risks. 7  
b) Explain software reliability? Explain the guidelines for conducting formal technical review (FTR). 8
- a) What do you mean by ISO standards for software? Explain format approaches to SQA (Software Quality Assurance). 7  
b) What is the role of a baseline and SCI's in SCM process? Explain SCM process with necessary diagram. 8
- a) Obtain a level 1 DFD and design data dictionary from any one data from the given scenario. Sajha Bus Company owns a number of buses. Each bus is allocated to a particular route, there are several buses for the same route. One or more drivers are allocated to each bus. Each route has one or more stations. One of the station is the garage where buses are kept and each bus is identified by the bus number and route. Drivers and conductors have an employee name, id, address and 8

**POKHARA UNIVERSITY**

|                                           |                 |                |
|-------------------------------------------|-----------------|----------------|
| Level: Bachelor                           | Semester: Fall  | Year : 2017    |
| Programme: BE                             | Full Marks: 100 | Pass Marks: 45 |
| Course: Software Engineering Fundamentals |                 | Time : 3hrs.   |

- Ques. 1) Define software prototyping and software specification review. 7  
 Explain various elements of analysis model. 5  
 a) Explain the characteristics of object-oriented system with example. 7  
 b) What do you mean by data design in software design process? Explain 8  
 component level design. 5  
 c) Find the cyclomatic complexity  $V(G)$  for the following code. 6  
 not asked.

$d = b^2 - 4 * a * c,$

```

d(d>0)
{
    rval= -b/(2 * a);
    d = -d;
}
rval= -b/(2 * a);
string = sqrt((2 * a));
string = string + "i";
else if(d==0)
{
    rval1=-b/(2 * a);
    rval2=rval1;
}
else if(d<0)
{
    rval1=(-b+sqrt(d))/2 * a;
    rval2=(-b-sqrt(d))/2 * a;
}

```

Ques. 2) Why do we need software testing? Explain Black box and Beta testing. 6  
 Ques. 3) What do you mean by domain analysis? What are the different components of object oriented analysis model? 5  
 a) Define the terms on “**Object Model**” 2 \* 5  
 i) **Object Oriented Model** & **Object Oriented Analysis**  
 ii) **Object Oriented Testing**  
 iii) **Object Oriented Protocols**

Candidates are required to give their answers in their own words as far as practicable.  
 The figures in the margin indicate full marks.

*Attempt all the questions.*

1. a) Is it mandatory to follow any software process model while developing software? Justify. What is the role of people in software? 7  
 b) Compare Size Oriented Metrics and Function Oriented Metrics. A college MIS is to be developed in which the estimated lines of code is calculated to be 58,000 and a review of historical data reveals that the average productivity is 500(LOC/PM) and the labor rate is Rs.20000 per month. Calculate the estimated project cost and estimated effort for the given software? 8
2. a) “Adding People to a late software project makes it later”. Identify the risk and develop a Risk Information Sheet. 8  
 b) You have given the responsibility for improving the quality of software across your organization. What is the first thing that you should do? What’s next? 7
3. a) Assume that you are the manager of a project. What baselines would you define for the project and how would you control them? 7  
 b) What models are created during the analysis phase of a software development process? Explain in brief. 8
4. a) Do you design software when you write a program? What makes software design different from coding? 7  
 b) Define the terms classes, inheritance and polymorphism. Describe the concept of information hiding with respect to software design in your own words. 8
5. a) Illustrate “Object Oriented Paradigm as a new concept in Software” with appropriate example. 7  
 b) Define Cyclomatic Complexity Using Basis path testing approach 8

draw the Flow Graph and find out the Cyclomatic Complexity of the following piece of code.

```
int a=1,b=1,n,c;
for(i=1;i<=n-2;i++)
{
    c=a+b;
    a=b;
    b=c;
    printf("%d",c);
}
```

a=b;  
b=c;  
print("%d",c);

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

6. a) Compare and Contrast Verification and Validation. Do both make use

of test case design methods and testing strategies?

b) "Don't rush through it! Design is worth the effort." Justify the statement with some design principle.

7. Write short notes on: (Any two)

a) Cardinality and Modality

b) ISO Standard

c) Design Patterns

7

8

2x5

1. a) What is a software engineering paradigm? Discuss the RAD model,

stating its advantages and disadvantages.

b) What are the disadvantages of LOC based Estimation. Explain the function Point Metric of Software Project Estimation.

2. a) Why risk analysis is done? Assume that software team defines a

project risk in as follows:

Risk Identification: Only 60 percent of the software components scheduled for reuse will, in fact, be integrated into the application.

The remaining functionality will have to be custom developed.

Risk Probability: 65% (likely)

Risk Impact: 50 reusable software components were planned. If only 60 percent can be used, 10 components would have to be developed from scratch. The average component is 200 LOC and local data indicate that the software engineering cost for each LOC is \$20.00. Find risk exposure.

b) Why are software reviews important? What are the guidelines for conducting FTR?

3. a) What is "configuration audit" and "status reporting"? How it aids in software configuration management?

b) What do you mean by Analysis modeling? What is its importance?

Explain the Elements of analysis model.

4. a) Define software design. Explain architectural and component level design.

b) Explain the purpose of black box and white box testing. Why do we need validation testing?

## POKHARA UNIVERSITY

|                                           |                  |                |
|-------------------------------------------|------------------|----------------|
| Level: Bachelor                           | Semester: Spring | Year : 2017    |
| Programme: BE                             | Full Marks: 100  | Pass Marks: 45 |
| Course: Software Engineering Fundamentals | Time : 3 hrs.    |                |

|    |                                                                                                                                                                      |     |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 5. | a) Explain the use of data dictionary and purpose of SRS?                                                                                                            | 7   |
|    | b) Discuss validation and verification in testing. Explain Control & structure testing.                                                                              | 8   |
| 6. | a) What do you mean by object-oriented paradigm? What are the steps in identifying the elements an object model for management of object-oriented software projects? | 7   |
|    | b) What do you understand by Domain Analysis? What are the different steps involved in it?                                                                           | 8   |
| 7. | Write short notes on: (Any two)                                                                                                                                      | 2x5 |
| a) | Design pattern                                                                                                                                                       |     |
| b) | Version control                                                                                                                                                      |     |
| c) | Cost of Quality                                                                                                                                                      |     |

Level: Bachelor  
Semester: Fall  
Programme: BE  
Course: Software Engineering Fundamentals

POKHARA UNIVERSITY  
Year : 2018  
Full Marks: 100  
Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are the common myths or misconceptions of customers regarding software engineering or development process? "Adding programmers and or project members to a late software project makes it later". Justify this statement.  
b) You are required to develop a Hotel Management System in which the estimated lines of codes (LOC) is calculated to be 85,000, and a review of the historical data reveals that the average productivity for this type of system is 200 LOC/pm and the labor rate is Rs. 7,500 per month. What would be the estimated project cost and the estimated effort for this software package?  
Discuss about objectives, constraints, process and results of Formal Technical review.
2. a) What are the different metrics used for different software life-cycle stages, respectively? Discuss.
3. a) What do you understand by OOA and OOD? Define Inheritance, encapsulation and polymorphism with relevant examples.
4. a) What are various design principles? Describe data-centred and data – flow architecture models.
5. a) Explain the concepts of modularity, cardinality, modality, using a suitable example.  
b) In what cases you would like to conduct "Equivalence partitioning"? Explain. Also list out the guidelines for conducting BVA, with examples for those guidelines.

b) "Spiral Model is in agreement with the fact that technological evolution is inevitable upto infinity." Elucidate this statement. 7

6. a) What are the different stages of risk mitigation and planning? 7  
Explain the role of risk exposure in risk prioritization. 7

b) Assume that you are a project manager. What will be your roles and responsibilities at every stage of project management to ensure timely and efficiently completion of the project? 8

7. Write short notes on: (Any two) 2×5

- a) COCOMO Model
- b) Data dictionary
- c) Boundary Value Analysis

**POKHARA UNIVERSITY**  
Level: Bachelor Semester: Spring Year : 2018  
Programme: BE Full Marks: 100  
Course: Software Engineering Fundamental Pass Marks: 45  
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define software metrics collection process. Explain each step in brief. 7  
b) Given data for a AI based social networking site developed by ABC company. 8

Number of user input : 96

Number of user output: 51

Number of user inquiries: 48

Number of External Interfaces: 37

Number of logical files: 60

Assuming that the complexity of the given website development is average, compute the function point. If the productivity of the ABC software developers is 32 FPPM and their salary structure is Rs 39000 per months on average, Estimate total cost of the software. 8

2. a) What is formal technical review? Describe the procedure of FTR. 8  
b) Explain the elements of the analysis model. 7

3. a) What do you mean by version control? Explain the importance of configuration audit and status reporting while configuration management. 8  
b) Define Cyclomatic Complexity. Using Basic path testing approach draw the flow graph and find the Cyclomatic Complexity for the following code. 7

```
int f1 (int x, int y){  
    while (x!=y){  
        if (x>y) then  
            x=x-y;  
    }  
}
```

else  
y=y-x;  
}  
return x;

4. a) What is software architecture? Why is it important? Explain data centered architecture with necessary diagram. 8
- b) Prepare level 1 DFD for the following doctor appointment system. A potential patient joins the doctor by submitting a patient application form. A new patient record is created and stored in patient record store. A patient makes an appointment by providing their patient details. An appointment card is given to the patient after they have made the appointment. The appointment details are stored in the database. A receptionist makes a telephone appointment for a patient by entering their patient details. A receptionist also cancels appointment for a patient by entering their cancellation details. Both processes update the appointment section of the database. A doctor will see a patient. When they see a patient, a list of appointment and patients records will be sent to the doctor. A doctor may want to issue a prescription by entering prescription details into the system and a prescription is be issued to the patient.
5. a) Define verification and validation. Mention the reasons for conducting black box testing. 8
- b) What do you mean by domain analysis? Explain domain analysis process. 7
6. a) What do you mean by inheritance, encapsulation and polymorphism? Explain how objects interact with each other using messages. 8
- b) Differentiate between object oriented an analysis and object oriented design. 7
7. Write short notes on: (Any two) 2x5
- a) SCRUM process  
b) Cost of quality  
c) Functional Independence

POKHARA UNIVERSITY  
Level: Bachelor Semester: Fall Year : 2019  
Programme: BE Full Marks: 100  
Course: Software Engineering Fundamentals Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are the attributes of good software? Explain RAD model. 7
- b) Calculate the function point value for a project with the following information: 8
- Number of user input: 64  
Number of user output: 120  
Number of user inquiries: 48  
Number of External file:4  
Number of user files: 16
- Given that all complexity adjustment values are average.
2. a) Why it is necessary to estimate the project? Define software risk and explain how you manage them. 7
- b) Define Formal Technical Review. What are the steps of FTR? Explain how do you conduct FTR. 8
3. a) What do you mean by SQA? Explain Statistical quality assurance with example. 7
- b) What is software quality standard for a software? Explain the steps of ISO certification. 8
4. a) What is SCM? Explain the role of baseline and SCI in SCM process with necessary diagram. 8
- b) What is analysis modelling? How can requirement specification be helpful in software development process? Differentiate between data and functional modelling. 7
5. a) Explain software design process and principles. 8

b) Define Test case. Differentiate white box testing and black box testing with examples. 7

6. a) What do you mean by domain analysis in OOA? Different between OOA and OOD. 7

b) Explain OOA process with the help of necessary diagram. 8

7. Write short notes on: (Any two)

a) ISO quality Standards

b) Control Structure Testing

c) Design Patterns

2x5

Level: Bachelor  
Semester -- Fall  
Programme: BE  
Course: Database Management System

Year : 2011  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Discuss the problems in early information processing systems and highlight the role of database management systems in your own word. 7

b) What do you mean Data model? Differentiate the importance in terms of security and accessibility. 8

2. a) By using following schemas write relational algebraic expression and SQL statements. (Underlined attributes represent Primary key attributes) 10

EMPLOYEE(EMPNO, NAME, ADDRESS)

PROJECT(PNO, PNAME)

WORKON(EMPNO, PNO)

PART(PARTNO, PARTNAME, QTY\_ON\_HAND)

USE(EMPNO,PNO,PARTNO,NUMBER)

i. Listing all the employee details who are not working yet.

ii. Listing Part Name and Quantity on hand those were used in DBMS project.

iii. List the Name of the projects that are used by employee from Kathmandu.

b) How does a view differ with relation? Define the role of view in security. 5

3. a) Write SQL statements for the following queries in reference to relation Emp\_time provided. 7

| Eid# | Name    | Start_time | End_time |
|------|---------|------------|----------|
| E101 | Mangale | 10:30      | 18:30    |
| E102 | Malati  | 8:30       | 14:30    |
| E103 | Fulnaya | 9:00       | 18:00    |

- i. Create the table Eid# as primary key and insert the values provided.
- ii. Display the name of the employee whose name start from letter 'M' and who work for more than seven hours.
- iii. Delete the entire contents of the table so that new data can be inserted.
- b) Explain in brief about relational model. Write the 12-E. F. Codd rules formulated for a pure RDBMS. 8
4. a) What is referential integrity? Explain with example about functional dependency and multivalued dependency. 7
- b) What is normalization? How will you make the given table stdmaster with attributes: st\_id, st\_name, instructor\_id, Inst\_name, course\_id, course\_name1, courseid2, coursename2, coursids3, coursename3, in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> normal form. Write the steps. 8
5. a) What is query optimization? Explain the steps involved in query processing. 7
- b) What is file organization? Explain heap file organization stating its advantages and disadvantages over other file organization. 8
6. a) What is remote backup system? Describe shadow page recovery. 8  
b) Why is this recovery technique called no undo/no redo technique?
- b) What is serializability? What is the benefit of allowing concurrency? Explain the problems associated with concurrency? 7
7. Write short notes on any two: 2x5
- a) Spanned versus unspanned record
- b) OODBMS
- c) Advantages of distributed database processing
- d) Data dictionary storage

### POKHARA UNIVERSITY

Level: Bachelor Semester—Spring Year : 2011  
Programme: BE Full Marks: 100  
Course: Database Management System Pass Marks: 45  
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) State the roles of DBA. What qualities should the DBA have to manage a very large database? 7  
b) Define data model. Describe network and hierarchical data model. 8
2. a) What does QBE stands for? What are the different parts of SQL? 8  
b) Enlist different data types used in SQL. 7

customer(cus\_id,cus\_name,cus\_phno)  
employee(cus\_id,emp\_id,emp\_name,emp\_addr)  
works(branch\_id,salary,cus\_id)  
branch(branch\_id,branch\_name)

Write relational algebra notations for following queries for the given schema:

Select names of all employees.

Give a salary raise of 5% to all the employees.

Select names of all employees working for "Manang" branch.

List all branch names.

Delete any record from works table.

List names and phno of all customers.

Select names of all employees dealing with customer having id

**POKHARA UNIVERSITY**

|                                    |                 |                 |
|------------------------------------|-----------------|-----------------|
| Level: Bachelor                    | Semester – Fall | Year : 2012     |
| Programme: BE                      |                 | Full Marks: 100 |
| Course: Database Management System |                 | Pass Marks: 45  |
|                                    |                 | Time : 3 hrs.   |

3. a) What is integrity constraints? In how many categories the integrity constraints can be classified? Explain each.  
 b) How redundancy is reduced in databases? Explain basic three steps giving an example.

**OR**

What do you mean by decomposition of relational schema? Explain lossless and lossless decomposition with example.

4. a) What is cryptography? Explain the type of cryptography system.  
 b) Define equivalence of expression? State steps used for query optimization by algebraic manipulation.

5. a) Explain sequential file organization. What are hash functions explain giving example.  
 b) Explain indexing and B-tree file structure.

**OR**

What is data dictionary storage? Mention the information's which are kept in it by defining the categories.

6. a) What is crash recovery? Explain about shadow paging techniques.  
 b) What is a transaction? Explain concurrency control protocols.

2x5

7. Write short notes on any two:

- a) Multiple granularity  
 b) Distributed database model  
 c) Multi-valued and join dependencies

Candidates are required to give their answers in their own words as far as practicable.  
 The figures in the margin indicate full marks.  
 Attempt all the questions.

1. a) Define information. Explain the statement "DBA has central control over the database system."  
 b) Construct an ER diagram for keeping records for exam section of a college.  
 c) Explain the distinction among the terms primary key, candidate key, super key and foreign key with an example.

2. a) Consider the following database:

Student(sid,name,age)

Has(sid,cid)

College(cid,cname)

Write relational algebra expression to perform the following:

- i. Find average age of student
- ii. Display name of student who studies in "QWERT" college.
- iii. Insert a new student.
- iv. Delete record of "ASDFG" college from college relation.
- v. Display name of students whose name begin from 'S'.

- b) Consider the relational database  
 Employee (empname, street, city)  
 Works ( empname, empname, salary ) Company ( cmpname, city )  
 Manages ( empname, cmpname )

Write SQL statement to:

- i. Modify the database so that Amrit now lives in Naxal
- ii. Delete all tuples in the works-relation for employee of xyz corporation
- iii. Increase salary of all employees of ABC company by 10%
- iv. Display all company name located at city Pokhara or Kathmandu from the company tables.
- v. Display all employee who have salary grater than 5000 from works table

3. a) State and explain about functional dependency. Considering a suitable example.

**OR**

What is normalization? Explain about BCNF and 4th normal forms in detail

by taking example.

- b) Define third normal form. Convert the following 2NF relation into 8  
3NF (consider Name as primary key)

| Name   | Address | Phone  | Salary | Post     |
|--------|---------|--------|--------|----------|
| Gill   | KTM     | 456789 | 20000  | Engineer |
| Van    | BKT     | 654321 | 20000  | Engineer |
| Robert | KTM     | 456789 | 20000  | Engineer |
| Brown  | BKT     | 654321 | 10000  | Overseer |
| Albert | KTM     | 454545 | 10000  | Officer  |

4. a) Is it necessary to manage security at OS level if security in database level is already done? Explain private key cryptosystem.

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### POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2012  
Programme: BE Full Marks: 100  
Course: Database Management System Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) "Database approach is more appropriate than file-processing system for application development". Give reasons in the support of this statement.

- b) Define data model. Explain the different data model.

2. a) Consider the following relations for an order-processing database application in a company.

CUSTOMER (Cust#, Cname, City)  
ORDER(Order#, Odate, Cust#, ord\_Amt)

ITEM(item#, Unit\_Price)

SHIPMENT(Order#, Wavehouse#, Ship\_date)

WAREHOUSE(Warehouse#, City)

Answer the following queries in relational Algebra

- i. List the order# and ship date for all orders shipped from warehouse number "W2"

- ii. List the warehouse information for which the customer named 'Jose Copez' was supplied his orders

- iii. List the orders that were not shipped within 30 days of ordering

- iv. List the order # for orders that were shipped from all warehouses that the company has in network.

- b) What is Integrity constraint? How does data integrity constraint differ with Data Security.

3. a) Consider the following relations:

Employee (emplD, FirstName, LastName, address, DOB, sex,

position, deptNo)

Department (deptNo, deptName, mgr, emplD)

Project (projNo, projName, deptNo)

Work on (emplD, projNo, hours worked)

Write the SQL statements for the following:

i. List the name and addresses of all employees who work for the IT department.

ii. List the total hours worked by each employee, arranged in order of department number and within department,

alphabetically by employee surname.

iii. List the total number of employees in each department for those departments with more than 10 employees.

iv. List the project number, project name and the number of employees who work on that project.

b) What is integrity constraints? Explain with example about BCNF and 5<sup>th</sup> normal form.

4. a) Diagrammatically illustrate and discuss the steps involved in processing a query.

b) Explain the major issues related to Database security.

5. a) What is data dictionary storage? Explain Heap file organization.

b) What is file organization? Explain heap file organization with its advantages and disadvantages over index file organization.

6. a) What do you understand by concurrency control? Discuss two phase locking protocol. How does it guarantee serialization.

b) What is log-based recovery? How is it different from shadow paging.

7. Write short notes on: (Any two)

a) B-tree index file.

b) Distributed DBMS.

c) Natural join.

8

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2013

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) The DBA controls the security aspects of the DBMS implementation. Discuss the software and hardware controls available to the DBA, and how this could fit into a commercial environment.

b) What is super key and candidate key? Explain in brief about the structure of RDBMS.

2. a) What do you mean by relational algebraic operators? Explain all the basic operators with examples.

b) Explain DDL and DML operations with suitable example.

3. a) State and explain in brief about multi-valued and joined dependencies.

b) Explain the structure of Index sequential file with the help of a diagram.

c) What is stable storage? Explain in brief about shadow paging.

d) What is transaction? Describe the dead lock handling mechanism.

e) Explain entity integrity and referential integrity. Also, give an example of each.

8

**POKHARA UNIVERSITY**

Level: Bachelor Semester: Spring Year : 2013  
Programme: BE Full Marks: 100  
Course: Database Management System Pass Marks: 45  
Time : 3hrs.

7. Write short notes on: (Any two) 2x5
- a) Data Dictionary.
  - b) Distributed Model.
  - c) Denormalization.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Why an organization needs DBMS? Explain three levels of data abstractions. 7
- b) Construct an ER diagram for a departmental store that keeps the information about customer, supplier and items. Associate with a log of various selling and purchasing information. The ER diagram should explain Entity name, some appropriate attributes of the entity, relationship among the entity, association and directivity among the entities. 8
2. a) Consider the following schemas of a relational database:  
Employee (emp\_name, street, city)  
WorksIn (emp\_name, company\_name, salary)  
Company (company\_name, city)  
Manages (emp\_name, manager\_name)  
Write relational algebra for
  - i. Find the names and cities of residence of all employers who work for "Nabil Bank".
  - ii. Find the name, street address and cities of residence of all employers who work for "Nabil Bank and earn more than 2,40,000/- per annum".
  - iii. Modify the database so that "Kiran" now lives in "Kathmandu".
  - iv. Give all employees of "Nabil Bank" a 10 percent salary rise. 7
- b) What are Query Languages, explain about its importance in DBMS. Differentiate between DDL and DML. 7
3. a) What do you mean by Functional Dependency, Multivalued Dependency and Transitive Dependency in Normalization process of Database? Why normalization is needed? Assume the un-normalized relation as given below and find the final normalized logical ER 10

**POKHARA UNIVERSITY**

diagram normalizing the un-normalized relation up to 3NF explaining what you are going to check at each normal step.

| Roll No. | Name             | SubID | SubName                    | FeePaid |
|----------|------------------|-------|----------------------------|---------|
| 1        | Hari Man Dangol  | DBMS  | Database Management System | 20000   |
| 2        | Mohan Prasad Sah | DBMS  | Database Management System | 20000   |
| 3        | Indira Rimal     | DBMS  | Database Management System | 30000   |
| 1        | Hari Man Dangol  | CPROG | C Programming              | 20000   |
| 2        | Mohan Prasad Sah | CROG  | C Programming              | 15000   |
| 3        | Indira Rimal     | MATH  | Mathematics                | 30000   |

- b) How you can say that data security concern plays a key factor in DBMS? Discuss about cryptography with its types in brief? List the different types of database failures?

4. a) What is query optimization? Explain the steps involved in query processing.

b) What are the types of file organization techniques? Define hash function and hashing. Explain briefly about bucket overflow mechanism in hash file organization.

5. a) Why database recovery is necessary? Explain log-based recovery and shadows paging.

b) What is serializability? What is the benefit of allowing concurrency? Explain the problems associated with concurrency?

6. a) What do you mean by database integrity? Discuss about the types of integrity in detail.

b) What is transaction? Why concurrency control is needed in Transaction Management? Describe Two Phase Locking Protocol (2PL) over single phase locking mechanism with necessary example explaining its advantages and disadvantages.

7. Write short notes on: (Any two)

a) Butter Management  
 b) Database Administrator  
 c) Data Warehouse.

2×5

Level: Bachelor Semester: Fall Year : 2014  
 Programme: BE Full Marks: 100  
 Course: Database Management System Pass Marks: 45  
 Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) List out the major objectives of DBMS. Differentiate between Data abstraction & Data independence.
- b) Draw an E-R diagram for the database of a hospital with a set of patients and a set of medical doctors. With each patient a log of the various tests conducted is also associated. Make your own assumptions if necessary.
2. a) What is relational algebra? Compare and contrast relational algebra with the relational calculus.
- b) Consider following relations:
- i. employee (emp\_name, street, city)
  - ii. works (emp\_name, company, salary)
  - iii. company (comp\_name, city)
  - iv. manager (emp\_name, manager\_name)
- Write SQL statements for:
- i. Find employee names that live in the city same as the company city.
  - ii. List all employee details who earn more than 25000.
  - iii. Update address of an employee 'Sriyash' to 'Pokhara'.
  - iv. Create a view for which employee earns Rs. 20,000 or more.
  - v. Delete all employees from the table employee.
3. a) Explain BCNF and 3NF with suitable example.
- b) Differentiate between authentication & authorization. How encryption & decryption occurs in Private key & Public key cryptography?
4. a) How the query optimization process is carried out? Explain about cost

**POKHARA UNIVERSITY**

|                                    |                  |                |
|------------------------------------|------------------|----------------|
| Level: Bachelor                    | Semester: Spring | Year : 2014    |
| Programme: BE                      | Full Marks: 100  | Pass Marks: 45 |
| Course: Database Management System | Time : 3 hrs.    |                |

- estimation of query.
- b) When is it preferable to use a dense index rather than a sparse index? 7  
Explain with a suitable example.
5. a) Discuss in detail about the shadow paging technique of crash recovery 7  
with its drawbacks.
- b) Define dead lock and serializability. Illustrate dead lock and conflict 8  
serializability with suitable example.
6. a) Under which situations will be beneficial to have replication or 8  
fragmentation of data? Explain with suitable example.
- b) Define database integrity. Classify the integrity constraints of 7  
database.

7. Write short notes on: (Any two) 2x5

- a) Assertions and Trigger  
2PL  
c) Stored procedure.

*Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What are the major responsibilities of Database Management System? 7  
For each responsibility, explain the problems that would arise if the  
responsibility were not discharged
- b) Compare Hierarchical Model, Network Model and Relational Model 8  
base on operation performed.

2. a) Consider the relational database of Figure below, Where the primary 8  
keys are underlined. Give an expression in the relational algebra to  
express each of the following queries:

Employee (person-name, street, city)

Works (person-name, bank-name, salary)

Bank (bank-name, city)

Manages (person-name, manager-name)

i. Find the total salary sum of all the banks.

ii. Modify the database so that Ram now lives in Kathmandu.

iii. Fine the name, street address, and cities of residence of all  
employees who work for Nepal World Bank Corporation and earn  
more than \$10,000 per annum.

iv. Delete all tuples in works relation for employee of Small Bank  
Corporation

- b) State and explain B+ tree index. Show an example of Insertion on B+ 7  
trees.

3. a) Consider the employee database of figure given below, where primary 10  
keys are underlined. Give an expression in SQL for each of following  
queries.

Employee (employee-name, street, city)

Works (employee-name, company-name, salary)  
 company (company-name, city)

managers (employee-name, manager-name)

- Modify the database so that Ram now lives in Kathmandu.
- Give all employees of First Bank Corporation a 10 percent raise.
- Give all managers of First Bank Corporation a 10 percent raise.
- Delete all tuples in the works relation for employees of small Bank Corporation.

- Find all employees who earn more than the average salary of all employees of their company.
- Explain the need of stored procedures & its application.

- What is referential integrity? Explain the functional dependency and multivalued dependency with suitable example.
- What is Normalization and why it is done? Give an example of a relation schema R and a set of dependencies such that R is not in 3NF and normalize it into 3NF.
- What are the needs of cryptography? How security can be granted using view? Explain?
- Show how to derive the following equivalences by a sequence of transformations using the equivalence rules.

- $\sigma_{\theta_1 \wedge \theta_2 \wedge \theta_3^{\leftarrow}}(E) = \sigma_{\theta_1}(\sigma_{\theta_2}(\sigma_{\theta_3}(E)))$
- $\sigma_{\theta_1, \wedge \theta_2}(E) = \sigma_{\Delta \times E_1 - \theta_1}(\sigma_{\theta_2}(E_2))$ , where  $\theta_2$  involves only attributes from  $E_2$

- What do you mean by shadow paging? Explain Deferred Database modification with an illustration.
- Explain the concept of locking for concurrency control.
- Write short notes on: (Any two)
  - ORM
  - 2PL
  - Hash Index

**POKHARA UNIVERSITY**

|                                    |                 |                |
|------------------------------------|-----------------|----------------|
| Level: Bachelor                    | Semester: Fall  | Year : 2015    |
| Programme: BE                      | Full Marks: 100 | Pass Marks: 45 |
| Course: Database Management System |                 | Time : 3 hrs.  |

Candidates are required to give their answers in their own words as far as practicable.  
*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- Compare & Contrast between file system & Database system. Difference between Schema & Instances.
- Define data model. Explain the different types of data model.
- Consider the relational database of Figure below, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries:  
 employee (person-name, street, city)  
 works (person-name, bank-name, salary)  
 bank (bank-name, city)
- managers (person-name, manager-name)
  - Find the names of all employees who work for Nepal Rastra Bank and Salary greater than \$10,000.
  - Find the names and cities of residence of all employees who work for Nepal Rastra Bank.
  - Find the names, street address, and cities of residence of all employees who work for Nepal Rastra Bank Corporation and earn more than \$10,000 per annum.
  - Delete all tuples in works relation for employee of Nepal Rastra Bank.
- Write SQL statements for the following queries in reference to relation Emp\_time provided.

| Eid* | Name   | Start time | End time |
|------|--------|------------|----------|
| E101 | Hari   | 10:15      | 18:00    |
| E102 | Malati | 8:00       | 15:30    |
| E103 | Kalyan | 9:30       | 17:00    |

- i. Create the table Eid\* as primary key and insert the values provided.

ii. Display the name of the employee whose name start from letter 'M' and who work for more than seven hours.

iii. Delete the entire contents of the table so that new data can be inserted.

3. a) What do you mean by Normalization? Explain the BCNF and 5th normal form with examples 8

b) Differentiate between authentication & authorization. How encryption & decryption occurs in Private key & Public key cryptography? 7

4. a) What are the basic steps in Query Optimization? Explain with suitable diagram. 8

b) List out the major advantages of B+ tree index. Explain the concept of Hashing. 7

5. a) Compare the shadow paging recovery scheme with the log based recovery scheme. 8

b) What do you mean by a schedule? When schedule is called serializable? What are conflict serialization schedules? 7

6. a) Explain the roles of Assertions and Triggers in SQL. When Triggers are not appropriate to use? Give an example. 8

b) Explain the distinction among the terms primary key, candidate key, super key and foreign key with an example. 7

2x5

7. Write short notes on: (Any two)

- a) Applications of Database  
b) Functional Dependency  
c) Distributed Database

2x5

1

### POKHARA UNIVERSITY

|                                     |                  |             |
|-------------------------------------|------------------|-------------|
| Level: Bachelor                     | Semester: Spring | Year : 2015 |
| Programme: BE                       | Full Marks: 100  |             |
| Course: Database Management System. | Pass Marks: 45   |             |
|                                     | Time : 3 hrs.    |             |

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain the importance of DBMS in current world. How is it accessed using various DDL, DML and DCL languages? 8

- b) Suppose you are given the following requirements for a simple database for the National Cricket League (NCL):

- the NCL has many teams
- each team has a name, a city, a coach, a captain, and a set of players
- each player belongs to only one team
- each player has a name, a type (such as batsman or bowler), a skill level, and a set of records
- a team captain is also a player
- each player is sponsored by at least one brand
- a brand has its name, established date, property, multiple contact\_no.

Construct a clean and concise ER diagram for the NCL database. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram.

2. a) Consider the relational database of Figure below, where the primary keys are underlined. Give an expression in the relational algebra to express each of the following queries:

employee (person-name, street, city)  
works (person-name, bank-name, salary)  
bank (bank-name, city)  
manages (person-name, manager-name)

- i. Find the names of all employees in this database who live in

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the same city as the company for which they work.

ii. Give all employees of First Bank Corporation a 10 percent

salary raise.

iii. Modify the database so that Harish now lives in Biratnagar.

iv. Delete all tuples in works relation for employee of First Bank

Corporation.

b) Construct a B+-tree for the following set of key values:

(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)

Assume that the tree is initially empty and values are added in ascending order. Construct B+-trees for the case where the number of pointers that will fit in one node is **Four**. Also show the form of the tree after deletion of 23.

3. Suppose we are given the following table definitions with certain records in each table. (Underline attribute represent primary key attributes.).

```
EMPLOYEE (EID, NAME, POST, AGE)
POST (POST-TITLE, SALARY)
PROJECT (PID, PNAME, DURATION, BUDGET)
WORK-IN (PID, EID, JOIN-DATE)
```

Write the SQL statement for

- i. List the name of employees whose age is greater than the average age of all employees.
  - ii. Display all employee numbers of those employees who are not working in any project
  - iii. List name of employee and their salary who are working in the project "DBMS".
  - iv. Update the database so that "Rishab" now lives in "Butwal".
- b) What is joining in DBMS? Explain different types of join with example.
4. a) What do you mean by integrity constraints? Explain assertion and triggers in SQL with their syntax. 7
- b) Define functional dependency. Consider a table which is in 2NF but not in 3NF. Break the table so that it is now in 3NF with a table example.
5. a) What is cryptography? Explain encryption and decryption technique. 8
- b) What is query processing? Explain the step used in query processing. 7

6. a) In a log based recovery, how does deferred modification scheme differ with immediate modification scheme?

b) What is concurrency control? Describe ACID property of transaction. 8

7. Write short notes on: (Any two) 2x5

a) Data warehouse

b) Schema and Views

c) Data abstraction.

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2016  
Programme: BE Full Marks: 100  
Course: Database Management System Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define RDBMS. Explain the differences between file oriented system and a database oriented system. 7
  - b) Construct E-R model for a car insurance company whose costumer own one or more cars each. Each car has associated with it zero to any number of recorded accidents. Also Design a relational database corresponding to the E-R diagram. 8
  2. a) Consider a student registration database comprising of the below given schema. 6
- Student(CRN, Name, Gender, Address, Telephone)  
Course(CourseID, CourseName, Hour, TeacherID)  
Teacher(TeacherID, TeacherName, Office)  
Registration(CRN, CourseID, Date)
- Write relational algebraic expression for the following tasks:
- i. Count the number of student registered subject in year 2015 gender wise. 6
  - ii. Show student details taught by teacher Rohit Shrestha. 4
  - iii. Delete student information taught by teacher N. Mathema. 2
- b) Consider a relational Schema:  
Teacher(TeacherID, TeacherName, Office) 9
- Write SQL statement for the following task:
- i. To create a table from a table. 1
  - ii. To eliminate duplicate rows. 2
  - iii. To add a new column 'Gender' in the table. 3
  - iv. To sort data in a table. 4
  - v. To delete rows. 5

vi. Count number of rows based on Office.

3. a) State the need for Normalization of a database and explain the 1NF, 9  
2NF and 3NF with suitable example.

b) What is functional dependency? Explain its types in detail.

4. a) Explain sequential file organization. What are hash functions, explain 7  
giving example.

b) Discuss about the Access control mechanisms and cryptography  
methods to secure the database.

5. a) Write a detail description about Query Processing and Optimization. 8

Explain the cost estimation of Query Optimization.

6. a) Compare the Shadow paging recovery scheme with the log based 7  
recovery schema.

b) Explain the conflict and view serializability with suitable example. 8  
Discuss the testing of serializability also.

7. Write short notes on: (Any two) 2x5

a) DDL and DML SQL statement

b) ACID Properties

c) Stored procedure.

**POKHARA UNIVERSITY**

Level: Bachelor

Semester: Spring

Year : 2016

Programme: BE

Full Marks: 100

Pass Marks: 45

Course: Database Management System

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far  
as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Explain the need of DBMS over file system. Explain the various level 7  
of data abstraction with examples.

- b) Construct an ER diagram for a banking enterprise that keeps the 8  
information about employee, customer, loan, account and payment.

2. a) How does a view differ with relation? Define the role of view in 7  
security.

- b) Consider the following schema of a relational database. 8

Branch (branch-name, branch-city, assets)

Account (account-number, branch-name, balance)

Customer (customer-id, customer-name, customer-street, customer-city)

Depositor (customer-id, account-name)

Loan (loan-number, branch-name, amount)

Borrow (customer-id, loan-number)

Write the relational algebra for the following queries:

- i. Find all customer either account or loan  
ii. List the name and city of customer who have their account at  
the branch location 'Butwal'.

- iii. Delete all account in the branch "B1"

- iv. Increase balance by 5% to all branches

3. a) Define stored procedure. List the advantages and disadvantages of 7  
stored procedure. Explain how stored procedure are created with  
example.

- b) Consider a simple relational database of Hospital Management 8  
System. (Underlined attributes represent Primary key attributes)  
Doctors (DoctorID, DoctorName, Department, Address, Salary)

Patients (PatientID, Patient Name, Address, Age, Gender)

Hospitals (PatientID, Doctor ID, HospitalName, Location)

Write Down the SQL statement for the following.

- Display ID of Patient admitted to hospital at Pokhara and whose name ends with 'a'.

- Delete the record of Doctors whose salary is greater than average salary of doctors.

- Increase the salary of doctors by 18.5% who works in OPD department.

- Find the average salary of Doctors for each address who have average salary more than 55K.

- a) What do you mean integrity constraints? Explain assertion and triggers in SQL with their syntax. 7
- b) Define functional dependency. Explain BCNF and 3NF with suitable examples. 8

- a) Construct a B+ tree for the following set of key values: {2, 3, 5, 11, 17, 19, 23, 29, 31} 8

Assume that the tree is initially empty and values are added in ascending order.

- a) What do you mean by query processing? Explain the query optimization process. 7
- b) What is log? Discuss the salient features of deferred database modification and immediate database modification strategies. 7

- a) Differentiate between exclusive lock and shared lock. Discuss the conflict and view serializability with suitable example. 8
- b) Write short notes on: (Any two) 2x5

- a) Remote backup system  
b) Distributed database  
c) Cryptography

## POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE  
Course: Database Management System

Year : 2017  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- a) Describe about Schemas and Instances Write briefly about DDL and DML. 7
- b) Draw an ER diagram for the following scenario. 8

A university contains many faculties. The faculties in turn are divided into several colleges. Each college offers numerous programs and each program contains many courses. Teachers can teach many different courses and even the same course numerous times. Courses can also be taught by many teachers. A student is enrolled in only one program but a program can contain many students. Students can be enrolled in many courses at the same time and the courses have many students enrolled.

- a) Consider the following schema:  
employee (person\_name, street, city)  
works (person\_name, company\_name, salary)  
company (company\_name, city)  
manages (person\_name, manager\_name)  
Give an expression in relational algebra to express each of the following queries:  
a) Find the names of all employees who earn more than their managers 8  
b) Find the names of all employees who live in the same city and on the same street as their managers  
c) Find the names of all employees within the database that do not work for "NBL company"  
d) Find the names of all employees in the database who earn

**POKHARA UNIVERSITY**

- b) Write the SQL statements for the following queries by reference of Liquors\_Info relation: 7

| Serial No | Liquors      | Start year | Bottles | Ready year |
|-----------|--------------|------------|---------|------------|
| 1         | Gokhha       | 1997       | 10      | 1998       |
| 2         | Divine Wine  | 1998       | 5       | 2000       |
| 3         | Old Durbar   | 1997       | 12      | 2001       |
| 4         | Khuokuri Rum | 1991       | 10      | 1992       |
| 5         | Xing         | 1994       | 5       | 1995       |

- i. Create the Liquors\_Info relation.

- ii. Insert the records in Liquors\_Info as above.

- iii. List all the records which were ready by 2000.

- iv. Remove all records from data base that required more than 2 years to get ready.

3. a) How does "GROUP BY" clause work? What is the difference between WHERE and HAVING clause? Explain each with examples. 8
- b) What is a database anomaly? Explain different types of database anomalies with suitable examples. 7
4. a) What do you mean by normalization process? Why is it necessary in RDBMS? Justify. 7
- b) Differentiate between authorization and authentication with brief examples. 8
5. a) Why ACL technique is considered safe-way for database security? How is any user allowed or prevented from accessing a certain resource? Justify technically. 7
- b) What is Query optimization? How can it be achieved? 8
6. a) Explain how records of a file are placed and organized into a secondary storage. 8
- b) What is Remote backup system? How does it help any organization? Clarify. 7
7. Write short notes on: (Any two) 2x5
- a) ACID Properties of transaction  
b) Concurrency control  
c) Distributed Databases

|                                    |                  |                |
|------------------------------------|------------------|----------------|
| Level: Bachelor                    | Semester: Spring | Year : 2017    |
| Programme: BE                      | Full Marks: 100  | Pass Marks: 45 |
| Course: Database Management System | Time : 3hrs.     |                |

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Define database management system (DBMS). Mention the advantages of DBMS. Explain data independence with its importance. 7
- b) What do you mean by data model? What are the basic data modelling components? Briefly explain different types of data models. 8
2. a) Define relation schema and views. Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course:
- ```

STUDENT(SSN, Name, Major, Bdate)
COURSE(Course#, Cname, Dept)
ENROLL(SSN, Course#, Quarter, Grade)
BOOK_ADOPTION(Course#, Quarter, Book_ISBN)
TEXT(Book_ISBN, Book_Title, Publisher, Author)

```
- Draw a relational schema diagram specifying the foreign keys for this schema.
- b) Explain several parts of Structured Query Language (SQL). What are the basic domain types? Describe them. 7
3. a) Describe the basic structure of SQL queries. Considering at least two relations, write SQL for illustrating different types of set operations. 7
- b) Design relational database for the Dept. of Computer Engineering (DoCE) at Pokhara University. Your database should have at least three (3) relations. Describe referential integrity constraint based on the above database of DoCE. 8
4. a) Define normalization in database. Mention its significances. With example, explain requirements to satisfy 1NF, 2NF, and 3NF. 8
- b) Briefly explain encryption techniques to secure application data. 7

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Fall	Year : 2018
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Database Management System	Time : 3hrs.	

5. a) With diagram, briefly explain the basic steps of query processing. 7  
 b) Define indexing in database. With example, describe the structure of a 8  
 B-tree.
6. a) Explain the architecture of remote backup system. Discuss several 8  
 issues that must be addressed while designing it.
- b) Define transaction and explain its ACID properties. Describe the 7  
 two-phase locking protocol for concurrency control. 2x5
7. Write short notes on: (Any two)
- Data Dictionary
  - QBE
  - Functional Dependencies

*Candidates are required to give their answers in their own words as far as practicable.  
 The figures in the margin indicate full marks.*

*Attempt all the questions.*

- a) Explain the difference between physical and logical data independence. List the major steps that you would take in setting up a database for a particular enterprise. 8
  - b) Suppose you are given the following requirements for a simple database for the Employee Management System:
    - An employee may work in up to two departments or may not be assigned to any department.
    - Each department must have one and may have up to three phone numbers.
    - Each department can have anywhere between 1 and 30 employees.
    - Each phone is used by one, and only one, department.
    - Each phone is assigned to at least one, and may be assigned to up to 30 employees.
    - Each employee is assigned at least one, but no more than 5 phones.
  - Construct a clean and concise ER diagram for the database. Clearly indicate the cardinality mappings. 7
2. a) Consider the following relational Schema:
- Department (DepartmentID, DepartmentName)  
 Designation (DesignationID, DesignationName, Salary)  
 Employee (EmpID, EmpName, Gender, DesignationID, DepartmentID)  
 Allowance (AllowanceID, AllowanceName)  
 Allowance Details (DetailID, EmpID, AllowanceID, Amount)

Write the relational algebraic expression for the following task:

- Find the number of employees department-wise.
- List the employee details whose total salary is above Rs. 50000.
- List the employee those who are getting house allowance.

- Consider the following three relations.  
Doctor(Name, age , address)  
Works(Name, Depart\_no, salary)  
Department(Depart no, depname, floor, room)
- Write down the SQL statement for the following.
  - Display the name of doctor who do not work in any department.
  - Modify the database so that Dr. Hari lives in Pokhara.
  - Delete all record of Doctor working in OPD department.
  - Display the name of Doctors who work in at least two departments.

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insertion of 9.

- b) Design an E-R diagram for keeping track of the exploits of your favourite sports team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics should be modeled as derived attributes.

- c) What is conflict serializable? Explain the concept of locking for concurrency control.
- b) What are the various types of failures that can occur in database? Discuss the log based recovery mechanism.
- a) Write short notes on: (Any two)
- ACID property
  - ORM
  - Network Data Model Vs Hierarchical Data Model

6. a) Differentiate between SQL and MYSQL. Why access to database from a general purpose programming language is required? Explain.

7

- b) Define 1NF, 2NF and 3NF. What is the motivation behind normalizing the database?
- a) What are the roles of Assertions and Triggers in SQL? Consider following bank database:  
Branch-schema = (branch-name, branch-city, assets)  
Loan-schema = (loan-number, branch-name, amount)  
Write an assertion for the bank database to ensure that the Assets value for the Koteshwor branch is equal to the sum of all the amounts lent by the Koteshwor branch.

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3. a) Differentiate between SQL and MySQL. Why access to database from a general purpose programming language is required? Explain.
- b) Define 1NF, 2NF and 3NF. What is the motivation behind normalizing the database?
4. a) What are the roles of Assertions and Triggers in SQL? Consider following bank database:  
Branch-schema = (branch-name, branch-city, assets)  
Loan-schema = (loan-number, branch-name, amount)  
Write an assertion for the bank database to ensure that the Assets value for the Koteshwor branch is equal to the sum of all the amounts lent by the Koteshwor branch.
- b) Why security is needed in database? How security can be granted using view explain.
5. a) Construct a B+-tree for the following set of key values: (1, 3, 6, 7, 11, 17, 19, 23, 30, 32). Assume that the tree is initially empty and values are added in ascending order.
- Construct B+-trees for the case where the number of pointers that will fit in one node is Four. Also show the form of the tree after

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Spring	Year : 2018
Programme: BE		Full Marks: 100
Course: Database Management System		Pass Marks: 45
		Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Considering an example, differentiate between data and information. Explain, how DBMS overcome the limitations of traditional file processing system.
  - b) Construct an *ER diagram* for a Metropolitan Bus Park. There are many gates for entering bus park. Different gates are assigned to different routes. A route uses different buses. Bus consists of different seats which are assigned to different passengers. Frequent travelers are also in passenger. Associate a log of reservation date while reserving seats. The passenger name must have two attributes first\_name & last\_name. Each of the entities must have primary key attribute as far as possible. The cardinality mappings should be explained properly.
2. a) Consider the relational database model:
- Users (uid, cname, city)
- Items (itemid, itemname, city, quantity, price)
- Manager (mid, aname, city)
- Query (queryno, uid, mid, itemid, query\_details, hitratio)
- Write the relational algebraic expression for the following tasks:
- i. Find all (queryno, uid) pairs for query with a hitratio value greater than 500.
  - ii. Find all item names of items in Pokhara ordered with query\_deatils as pokhara\_details.
  - iii. Find itemids of items ordered through manager 35 but not through manager 27.
- b) Write SQL statements for following:
- i. Create a table named Vehicle with veh\_number as primary key and following attributes:  
veh\_type, veh\_brand, veh\_year, veh\_mileage, veh\_owner,

**POKHARA UNIVERSITY**

- |                                    |                 |
|------------------------------------|-----------------|
| Level: Bachelor                    | Semester: Fall  |
| Programme: BE                      | Year : 2019     |
| Course: Database Management System |                 |
| Pass Marks: 45                     | Full Marks: 100 |
| Time : 3hrs.                       |                 |

- ii. Enter a full detailed information of a vehicle.
- iii. Increment vehicle's price by 10,000.
- iv. Remove all vehicle's records whose brand contains character 'o' in second position.
- v. Display the total price of all vehicles.
- vi. Create a view from above table.
- vii. Display details of vehicles ordering on descending manner in brand and by mileage when brand matches.
- viii. Change data type of year to datetime.

3. a) How does normalization help in organizing records in database? Justify with examples. 8

- b) Write down the properties of decomposition. Compare & contrast assertion & triggers. 7

4. a) Differentiate between authorization and authentication. Explain about access control and view. 7

- b) What is query optimization? List some strategies for optimization of queries and explain steps in for query processing with necessary diagram. 8

5. a) What is file organization? Explain how you organize files using B+ tree and hash index. 8

- b) What do you mean by crash recovery? Differentiate between deferred database modification and immediate database modification. 7

6. a) Define transaction & schedule. Explain different states in a transaction. 7

- b) Explain about distributed databases with its advantages and disadvantages. 8

7. Write short notes on: (Any two) 2x5

- a) Sequential File Organization
- b) Cascading in referential integrity
- c) Data warehouse & Data mining

- Candidates are required to give their answers in their own words as far as practicable.*  
*The figures in the margin indicate full marks.*
- Attempt all the questions.**
1. a) What do you understand by Data Independence? How is Schema different from Instance? Justify with some suitable examples. 8
- b) How does UML diagram assist during data modeling? Draw an E-R diagram for a Gandaki Auto Vehicle Shop System including primary key, weak entity, composite attribute, derived attribute and multivalued attributes in your ER diagram
2. a) How Relational Algebra is different from Relational Calculus? Define TRC and DRC.
- b) Consider a simple relational database of Hospital Management System. (*Underlined attributes represent Primary key attributes*)  
 Doctors (DoctorID, DoctorName, Department, Address, Salary)  
 Patients (PatientID, Patient Name, Address, Age, Gender)  
 Hospitals (PatientID, Doctor ID, HospitalName, Location)
- Write down the SQL statement for the following:
- i. Display ID of Patient admitted to hospital at Pokhara and whose name ends with 's'. 8
- ii. Delete the record of Doctors whose salary is greater than average salary of doctors. 8
- iii. Increase the salary of doctors by 18.5% who works in OPD department. 8
- iv. Find the average salary of Doctors for each address who have average salary more than 55K. 8
3. a) Define Normalization. Explain about 1NF, 2NF & 3NF. 8
- b) What do you mean by decomposition of relational schema? Suppose we are given Schema R = {A,B,C,G,H,I} and set of functional

dependencies  $F = \{A \rightarrow B, A \rightarrow C, CG \rightarrow H, B \rightarrow H, CG \rightarrow I\}$ . Find the closures of functional dependency  $F$ .

4. a) What is Access control mechanism in database? Explain different types 8

b) Diagrammatically illustrate and discuss the steps involved in 7 processing a query.

5. a) Construct a  $B^+$  tree for the following set of key values: 8  $(2,3,5,7,11,17,19,23,29,31)$  Assume that the tree is initially empty and values are added in ascending order where the pointer number is Four

b) What is Crash Recovery? What are the problems due to crash? How the problems can be avoided, explain any one briefly. 7

6. a) When does deadlock occurs? Explain two-phase commit protocol with example. 7

b) What are data fragmentations? State the various fragmentations with examples. 8

$2 \times 5$

7. Write short notes on: (Any two) 8

a) ACID property

b) QBE

c) Object Relational Model

#### POKHARA UNIVERSITY

Level: Bachelor

Semester – Fall

Year : 2012

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1. a) State Cauchy Riemann equations. Using these equations, show that the function  $f(z) = z^3$  is everywhere analytic. 8

b) Write the wave equation for vibrating circular membrane together with its initial and boundary conditions and solve it. 7

#### OR

State and prove Cauchy's integral theorem. 7

2. a) Obtain the Fourier integral formula from the Fourier series assuming the required conditions. 8

#### OR

Show that:  $\int_0^\infty \left( \frac{1 - \cos \pi w}{w} \right) \sin wx dw = \begin{cases} \pi/2 & \text{if } 0 < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$

b) Find the Fourier transform of  $f(x) = \begin{cases} |x| & \text{if } -1 < x < 1 \\ 0 & \text{otherwise} \end{cases}$  7

3. a) State and prove first shifting theorem of Z – transform and hence find  $Z(\cos at)$  and  $Z(\sin at)$ . 8

b) Solve the difference equation by using Z – transform

$$Y_{n+2} - 4Y_{n+1} + 4Y_n = 2^n$$

where  $Y_0 = 0, Y_1 = 1$

4. a) Derive the one dimensional wave equation 8

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

b) Find the temperature in a laterally insulated bar of length  $L$ , whose ends are kept at temperature 0, assuming that the initial

temperature is

$$f(x) = \begin{cases} x & \text{if } 0 < x < 1/2 \\ L - x & \text{if } \frac{L}{2} < x < L. \end{cases}$$

5. a) Solve the following linear programming problem by using simplex method. 8

Minimize  $z = 4x_1 + 3x_2$  subjected to  $2x_1 + 3x_2 \geq 1$ ,  $3x_1 + x_2 \geq 4$ ,  $x_1 \geq 0$ ,  $x_2 \geq 0$ .

6. a) Using the method of separation of variable find the solution  $u(x, y)$  of the partial differential equation  $xu_{xy} + 2yu = 0$ . 7
- b) Find the tangent vector to the curve  $\vec{r}(t) = 2\cos t \hat{i} + \sin t \hat{j}$  at  $(\sqrt{2}), \sqrt{2}, 0$ . Also find the tangent at the given point. 5
- c) Define Z-transform of a function  $f(t)$  and by using the definition find the Z-transform of (i)  $(-1)^n$  (ii)  $\frac{1}{n!}$  5
- c) Write a short note on Linear Programming. 5

7. Attempt all the questions:

- a) Express  $f(z) = \sin z$  in the form  $u + iv$ . 4
- b) Evaluate  $\oint \frac{dz}{z}$  where  $c$  is the unit disk  $|z| = 1$ . 5
- c) Show that  $\mathcal{F}_s\{af(x) + bg(x)\} = a\mathcal{F}_s\{f(x)\} + b\mathcal{F}_s\{g(x)\}$ , where  $\mathcal{F}_s$  stand for Fourier sine transform. 5
- d) Find the parametric representation of the surface  $x^2 + 4y^2 = 9$ ,  $z = 3$ . 5

Level: Bachelor  
Semester: Spring  
Programme: BE  
Course: Engineering Mathematics IV

POKHARA UNIVERSITY  
Year : 2012  
Full Marks: 100  
Pass Marks: 45  
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define analytic function  $f(z)$ . Show that the necessary condition for analyticity of a function  $f(z) = u + iv$  at  $z = x + iy$  is to satisfy Cauchy Rie-mann equation OR

Show that  $v = 2xy - \frac{y}{x^2 + y^2}$  is a harmonic function find harmonic conjugate  $u$  of  $v$ . 8

- b) State and prove Cauchy integral formula and by using it evaluate the integral

$$\oint \frac{z^2}{z^2 - 1} dz \text{ where } c \text{ is positively oriented circle } |z-1| = 1$$

OR

State the Laurent theorem. If  $f(z) = \frac{1}{z^2 - 1}$ . Expand the function at  $z = 1$  as Laurent series.

2. a) Define z-transform. State and prove second shifting theorem of z-transform then evaluate  $z(na^n)$  and  $z(n^2 - n)$  8

OR

If  $F(z)$  and  $G(z)$  are respectively the z-transform of  $f(t)$  and  $g(t)$  then prove that:  $Z[f(t) \times g(t)] = F(z) \cdot G(z)$

- b) Solve the difference equation by using z-transform  $y_{n+2} - y_n = 2^n$  where  $y_0 = 0$ ,  $y_1 = 1$ . 7

3. a) Solve one dimensional heat equation  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$  with the boundary conditions  $u(0,t) = 0$   $u(l,t)$  and the initial condition  $u(x,0) = f(x)$ . 8

OR

Obtain the Laplacian  $\nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$  in polar co-ordinates.

7

- b) Solve one dimensional wave equation with initial deflection is  $0.01 \sin 3x$  and initial velocity is zero and  $L = \pi$ ,  $c^2 = 1$

7

- a) Using simplex method

$$z = 90x + 50x_2$$

Subject to

$$x_1 + 3x_2 \leq 18$$

$$x_1 + x_2 \leq 10$$

$$3x_1 + x_2 \leq 24$$

8

- b) Using the method of separation of variables find the solution  $u(x, y)$  of the partial differential equation  $u_x + u_y = (x + y)u$

7

- a) Show that  $\int_0^\infty \left[ \frac{\cos xw + w \sin xw}{1 + w^2} \right] dw = \begin{cases} 0 & \text{if } x < 0 \\ \pi/2 & \text{if } x = 0 \\ \pi e^x & \text{if } x > 0 \end{cases}$

8

- b) Find Fourier sine and cosine transform of  $f(x) = 2e^{-x} + 5e^{-2x}$

7

OR

Let  $f(x)$  be continuous on the  $x$ -axis and  $f(x) \rightarrow 0$  as  $|x| \rightarrow \infty$  and  $f'(x)$  is absolutely integrable on  $x$ -axis then prove that

$$F[f(x)] = iwF[f(x)]$$

$$F[f'(x)] = -w^2 F[f(x)]$$

6. a) Find the inverse z-transform of  $\frac{z^2 + z}{(z-1)(z^2+1)}$

8

- b) Define singularity, zeros and poles of a function, Evaluate  $\oint_C f(z) dz$  where  $f(z)$

7

$$= \frac{e^{cz}}{(z+1)^3} \text{ where } c \text{ is the ellipse } 4x^2 + 9y^2 = 16.$$

7

7. Write short notes on:

2.5

- a) Find a tangent vector and the corresponding unit tangent vector

2.5

$$\vec{r}(t) = ti + t^3 \vec{j} \quad \text{at } P(1,1,0)$$

2.5

- b) Represent the curve  $x^2 + y^2 = 16, z = 3 \tan^{-1}(y/x)$  parametrically.

2.5

- c) Write the equation of ellipsoid and draw its rough sketch.

2.5

- d) Show that Fourier cosine transform satisfied linearity property.

2.5

POKHARA UNIVERSITY	
Level: Bachelor	Semester – Fall
Programme: BE	Year : 2013
Course: Engineering Mathematics IV	Full Marks: 100
	Pass Marks: 45
	Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Show that the function  $u(x, y) = 3x^2y + x^2 - y^3 - y^2$  is a harmonic function. Find its harmonic conjugate.

- b) State and prove Cauchy-integral formula and hence evaluate

$$\oint_C \frac{4 - \sin z}{z^2 - 2z} dz, \text{ where } C \text{ is the square with vertices } \pm 1 \text{ and } \pm i$$

OR

- Evaluate  $\oint_C \frac{\cot z}{(z - \pi)^2} dz$ , where  $C$  is the ellipse  $4x^2 + 9y^2 = 36$ .

7

2. a) State and prove Cauchy's Residue theorem.

7

- b) Define Z-transform. State and prove first shifting theorem of Z-transform. And, evaluate Z-transform of  $a^n \cos nt$  and  $\sin nt$ .

8

3. a) Find the inverse Z-transform of the function  $\frac{z+2}{z^2 - 5z + 6}$ .

7

- b) Solve the difference equation

$$y_{n+2} - 8y_{n+1} + 16y_n = 4^n, \text{ where } y_0 = 0 \text{ and } y_1 = 1$$

4. a) Write one-dimensional wave equation and solve it, completely.

- b) Find the solution of one dimensional heat equation  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ , having zero temperature in the end points and initial temperature  $f(x)$ .

5. a) What is Helmholtz's equation on  $F(x, y)$  and solve it subject to  $F(0, y)$ .

- 8

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Spring	Year : 2013
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Engineering Mathematics IV	Time : 3 hrs.	

$$= 0 = F(a, y) = F(x, 0) = F(x, b).$$

b) Define Fourier sine and cosine integrals. Show that

$$\int_0^{\infty} \frac{\cos wx + w \sin wx}{1+w^2} dx = \begin{cases} 0 & \text{if } x < 0 \\ \frac{\pi}{2} & \text{if } x = 0 \\ \pi e^{-x} & \text{if } x > 0 \end{cases}$$

Or

$$\text{Show that: } \int_0^{\pi} \left( \frac{1 - \cos \pi w}{w} \right) \sin wx dw = \begin{cases} \pi/2 & \text{if } 0 < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$$

6. a) Using Simplex method, maximize the function  $z = 4x_1 + x_2 + 2x_3$

Subject to:

$$x_1 + x_2 + x_3 \leq 1$$

$$x_1 + x_2 - x_3 \leq 0$$

$$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$$

- b) Define convolution of the two functions. State and prove convolution theorem on Fourier transform

7. Write Short notes on any two:

- a) Write the equation of hyperboloid of two sheet and then sketch

- b) Find the parametric representation of the surface  $y^2 + (z-3)^2 - 9, x=2$ .

- c) Show that Fourier sine transform is linear operator.

- d) Express  $f(z) = \sin z$  in the form  $u+iv$

2x5.

$$\oint_C \left( \frac{z^2 \sin z}{4z^2 - 1} \right) dz \text{ where } c: |z| = 2, \text{ counter-clockwise.}$$

8. a) Using the method of separation of variable solve the partial differential equation  $u_{xx} + u_{yy} = 0$

- b) Derive the one dimensional heat equation  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$

9. a) Find the deflection function  $u(x, t)$  of the vibrating string of length  $L = \pi$  where  $c^2 = 1$ , the initial velocity is zero and the initial deflection is

$$\begin{cases} 0.01x & \text{if } 0 < x < \frac{\pi}{2} \\ 0.01(\pi - x) & \text{if } \frac{\pi}{2} < x < \pi \end{cases}$$

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define harmonic function. Show that  $u(x, y) = \sin x \cosh y$  is harmonic and find corresponding analytic function.

- b) State and prove Cauchy Integral formula and use it to calculate:

$$\oint_c \frac{\cosh 3z}{5z} dz \text{ where } c: |z| = 1, \text{ counterclockwise.}$$

2. a) Define zeros and pole of a function. State Cauchy residue theorem. Evaluate:

8. a) Define convolution of the two functions. State and prove convolution theorem on Fourier transform

7

- b) Define harmonic function. Show that  $u(x, y) = \sin x \cosh y$  is harmonic and find corresponding analytic function.

7

- c) State and prove Cauchy Integral formula and use it to calculate:

$$\oint_c \frac{\cosh 3z}{5z} dz \text{ where } c: |z| = 1, \text{ counterclockwise.}$$

8

- d) Define zeros and pole of a function. State Cauchy residue theorem. Evaluate:

8

4.

$$\text{a) Show that } \int_0^{\infty} \frac{\cos ax \sin \omega}{\omega} d\omega = \begin{cases} \frac{\pi}{2} & \text{if } 0 \leq x < 1 \\ \frac{\pi}{4} & \text{if } x = 1 \\ 0 & \text{if } x > 1 \end{cases}$$

8

- b) Find the Fourier transform of the function

$$f(x) = \begin{cases} |x| & \text{for } -1 < x < 1 \\ 0 & \text{for otherwise} \end{cases}$$

OR

Find the Fourier Cosine transform of the function  $f(x) = e^{-kx}$  ( $k > 0$ )

5. a) Define Z-transform of a function  $f(t)$  and by using the definition find the Z-transform of

i.  $(-1)^n$

ii.  $n$

- b) Solve the difference equation using z-transform

$$y_{n+2} - 3y_{n+1} + 2y_n = 4^n, y_0 = 0, y_1 = 1$$

7

6. a) Find the inverse Z-transform of the function  $\frac{2z^2 - 5z}{(z-2)(z-3)}$

- b) Find  $u(x, y, t)$  for the rectangular membrane with sides  $a$  and  $b$  with  $c=1$ , if the initial velocity is zero and the initial deflection is

$$\sin \frac{2\pi x}{a} \sin \frac{3\pi y}{b}$$

8

7. Solve the followings:

- a) Find the Z-transform of discrete unit time impulse  $\delta(n)$   
 b) Write down the equation of the ellipsoid and then sketch  
 c) Represent the curve  $y^2 + (z-3)^2 = 9, x=0$  parametrically  
 d) Find the Imaginary part of  $z^2$ .

4x

2

8

## POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2014

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define analyticity of a complex valued function  $f(z)$ . Show that the function  $u = \frac{x}{x^2+y^2}$  is harmonic. Find harmonic conjugate of  $u$  such that  $f(z) = u + iv$  is analytic.

8

- b) State and Prove Cauchy Residue theorem. Evaluate  $\oint_C \frac{dz}{z^6(z+4)}$ , where  $C$  is  $|z+2| = 3$  in anticlockwise direction.

7

2. a) Define conformal mapping. If  $u = 2x^2+y^2$  and  $v = \frac{y^2}{x}$  show that the curves  $u = \text{constant}$  and  $v=\text{constant}$  cut orthogonally at all intersections but the transformation  $w = u+iv$  is not conformal.

7

OR

State and prove Cauchy-integral formula and hence evaluate

$$\oint_C \frac{2x^2 + 4z}{z-2} dz; C: |z|=1$$

8

- b) Define Z transform. State and Prove first shifting theorem on Z transform. Using it find Z transform of cosat and sinat. Also evaluate  $Z(a^n \cos bt)$  and  $Z(a^n \sin bt)$ .

8

3. a) Solve the difference equation:  $y_{n+2} - 3y_{n+1} + 2y_n = 0$ , where  $y_0 = 0$  and  $y_1 = 1$ .

8

- b) Find the temperature in a laterally insulated bar of length  $L$  whose ends are kept at a zero temperature, assuming that the initial

7

$$\text{temperature is } f(x) = \begin{cases} x & \text{if } 0 < x < \frac{L}{2} \\ L-x & \text{if } \frac{L}{2} < x < L \end{cases}$$

4. a) Write one-dimensional wave equation and solve it.

8

- b) Using the method of separation of variable solve the partial

7

1

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Spring	Year : 2014
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Engineering Mathematics IV	Time : 3hrs.	

differential equation  $y^2 u_{xx} - x^2 u_{yy} = 0$ .

5. a) Express Laplacian in polar co-ordinate system from Cartesian co-ordinate system.

OR

- Find  $u(x, y, t)$  for the rectangular membrane with sides  $a$  and  $b$  with  $c = 1$ , if the initial velocity is zero and initial deflection is

$$\sin \frac{2\pi x}{a} \sin \frac{3\pi y}{b}$$

- b) Define Fourier sine and cosine integrals. Show that

$$\int_0^\infty \frac{\cos wx + w \sin wx}{1+w^2} dx = \begin{cases} 0 & \text{if } x < 0 \\ \frac{\pi}{2} & \text{if } x = 0 \\ \pi e^{-x} & \text{if } x > 0 \end{cases}$$

OR

$$\text{Show that: } \int_0^\infty \left( \frac{1 - \cos pw}{w} \right) \sin wx dw = \begin{cases} \pi/2 & \text{if } 0 < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$$

8

6. a) Find the Fourier transform of  $f(x) = xe^{-x^2}$ .

8

- b) State and prove initial and final value theorem on Z transform.

7

7. Answer the followings:

- a) Sketch the paraboloid  $z = x^2 + y^2$

- b) Find the parametric representation of the surface  $y^2 + (z-3)^2 = 9$ ,  $x=2$

- c) Find the unit tangent vector of

$$\vec{r}(t) = \cos t \vec{i} + 2 \sin t \vec{j} \text{ at } \left( \frac{1}{2}, \sqrt{3}, 9 \right)$$

- d) Show that  $\oint_C \frac{dz}{z} = 2\pi i$ , where  $C$  is the circle  $|z| = 1$  in anticlockwise direction.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define analytic function  $f(z)$ . State Cauchy Riemann equation and hence show that it is the necessary condition for the function to be analytic.

- b) State and prove Cauchy's integral formula. Hence using it integrate

$$\int_C \frac{z^2}{(z^4 - 1)} dz \text{ where } C \text{ is the circle } |z+i|=1 \text{ in counter clockwise.}$$

OR

Evaluate  $\int_C \frac{z^3 + \sin z}{c(z-i)^3} dz$ , where 'C' is the boundary of the square with vertices  $\pm 2, \pm 2i$ .

7

2. a) Expand the function  $f(z) = \frac{z+3}{z(z^2-z-2)}$  in the region given by

- i.  $|z| < 1$ ,

- ii.  $1 < |z| < 2$ ,

- iii.  $|z| > 2$ .

- b) Find the deflection  $u(x, t)$  of the vibrating string of length  $L = \pi$ ,  $c^2 = 1$  and its initial velocity is zero and initial deflection is given by

$$f(x) = \begin{cases} 0.1x, & \text{for } 0 < x < \frac{\pi}{2} \\ 0.01(\pi - x), & \text{for } \frac{\pi}{2} < x < \pi \end{cases}$$

3. a) Find the solution of one dimensional wave equation by D'Alembert's

2

1

method.

- b) Express the Laplacian  $\nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$  in polar co-ordinates. 8

4. a) State and prove first shifting theorem for Z-transform. Use it to find  $Z(\cosh at \sin bt)$ . 8

- b) Find the inverse Z-transform of  $\frac{2z}{(z-1)(z^2+1)}$  7

5. a) Show that  $Z(y_{n+k}) = z^k \left[ \bar{y} - y_0 - \frac{y_1}{z} - \dots - \frac{y_{k-1}}{z^{k-1}} \right]$  where  $\bar{y} = Z(y_n)$ . Using it solve  $y_{k+1} + y_k = 1$  if  $y_0 = 0$ . 8

- b) Solve  $u_{xx} + u_{yy} = 0$  by using separation method. 7

6. a) Define convolution of two functions. State and prove convolution theorem on Fourier transform. 7

OR

- Define Fourier transform and evaluate Fourier transform of  $f(x) = e^{-\frac{x^2}{2}}$  8

- b) Derive Fourier integral of  $f(x)$  from Fourier series. Show that. 8

$$\int_0^\infty \left[ \frac{\cos xw + w \sin xw}{1+w^2} \right] dw = \begin{cases} 0 & \text{if } x < 0 \\ \pi/2 & \text{if } x = 0 \\ \pi e^{-x} & \text{if } x > 0 \end{cases}$$

4x2.5

7. Write short notes on:

- a) If  $\mathbf{r}(t) = (a + 2\cos 2t, b - 2\sin 2t, 0)$  be the position vector of any curve, find its equation in Cartesian form. 7

- b) Verify that  $u = x^2 + t^2$  is the solution of one dimensional wave equation. 7

- c) Define the types of singularity of a complex function with examples. 7

- d) Find  $Z(1)$  and  $Z(-1)^n$  7

### POKHARA UNIVERSITY

Level: Bachelor Semester: Fall  
Programme: BE Marks: 100  
Course: Engineering Mathematics IV Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define analytic function  $f(z)$ . State Cauchy Riemann equation and hence show that it is the necessary condition for the function to be analytic. 7

- b) State and prove Cauchy's integral formula. Evaluate where  $c$  is the ellipse  $4x^2 + 9y^2 = 36$ . 8

$$\oint_C \frac{\cot z}{z-\frac{\pi}{2}} dz$$

OR

Evaluate  $\oint_C \frac{z^3 + \sin z}{(z-i)^3} dz$ , where 'c' is the boundary of the square with vertices  $\pm 2, \pm 2i$ . 7

2. a) State Laurent's theorem. Find the Laurent's series for  $f(z) = \frac{1}{(z^2 - z^3)}$  in the region  $0 < |z| < 1$ . 7

- b) Define singularity, zeros and poles of a function. Evaluate  $\oint_C f(z) dz$  where  $f(z) = \frac{e^{2z}}{(z+1)^3}$  where  $c$  is the ellipse  $4x^2 + 9y^2 = 16$ . 8

3. a) State and prove convolution theorem on Z transform. 7

- b) Solve the difference equation:  $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ , where  $y_0 = 0$  and  $y_1 = 0$ . 8

4. a) Find the Fourier integral of the function; 7

$$f(x) = \begin{cases} \frac{\pi}{2} & \text{if } 0 \leq x < 1 \\ \frac{\pi}{4} & \text{if } x = 1 \\ 0 & \text{if } x > 1 \end{cases}$$

method.

- b) Express the Laplacian  $\nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$  in polar co-ordinates. 8  
 4. a) State and prove first shifting theorem for Z-transform. Use it to find  $Z(\cos at \sin bt)$ . 8

- b) Find the inverse Z-transform of  $\frac{2z}{(z-1)(z^2+1)}$  7

5. a) Show that  $Z(y_{n+k}) = z^k \left[ \bar{y} - y_0 - \frac{y_1}{z} - \dots - \frac{y_{k-1}}{z^{k-1}} \right]$  where  $\bar{y} = Z(y_n)$ . Using it solve  $y_{k+1} + y_k = 1$  if  $y_0 = 0$ .  
 b) Solve  $u_{xx} + u_{yy} = 0$  by using separation method. 8  
 6. a) Define convolution of two functions. State and prove convolution theorem on Fourier transform. 7

OR

Define Fourier transform and evaluate Fourier transform of

$$f(x) = e^{-\frac{x^2}{2}}$$

- b) Derive Fourier integral of  $f(x)$  from Fourier series. Show that. 8

$$\int_0^\infty \left[ \frac{\cos xw + w \sin xw}{1+w^2} \right] dw = \begin{cases} 0 & \text{if } x < 0 \\ \pi/2 & \text{if } x = 0 \\ \pi e^{-x} & \text{if } x > 0 \end{cases}$$

7. Write short notes on: 4x2.5

- a) If  $\mathbf{r}(t) = (a + 2\cos 2t, b - 2\sin 2t, 0)$  be the position vector of any curve, find its equation in Cartesian form.  
 b) Verify that  $u = x^2 + t^2$  is the solution of one dimensional wave equation.  
 c) Define the types of singularity of a complex function with examples.  
 d) Find  $Z(1)$  and  $Z(-1)$

### POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2015

Programme: BE

Full Marks: 100

Course: Engineering Mathematics IV

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define analytic function  $f(z)$ . State Cauchy Riemann equation and hence show that it is the necessary condition for the function to be analytics. 7  
 b) State and prove Cauchy's integral formula. Evaluate where  $c$  is the ellipse  $4x^2 + 9y^2 = 36$ . 8

$$\oint_c \frac{\cot z}{\left(z - \frac{\pi}{2}\right)^2} dz$$

OR

Evaluate  $\oint_c \frac{z^3 + \sin z}{(z-i)^3} dz$ , where 'c' is the boundary of the square with vertices  $\pm 2, \pm 2i$ .

2. a) State Laurent's theorem. Find the Laurent's series for  $f(z) = \frac{1}{(z^2 - z^3)}$  in the region  $0 < |z| < 1$ . 7  
 b) Define singularity, zeros and poles of a function. Evaluate  $\oint_c f(z) dz$  where  $f(z) = \frac{e^{2z}}{(z+1)^3}$  where  $c$  is the ellipse  $4x^2 + 9y^2 = 16$ . 8

3. a) State and prove convolution theorem on Z transform. 7  
 b) Solve the difference equation:  $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ , where  $y_0 = 0$  and  $y_1 = 0$ . 8

4. a) Find the Fourier integral of the function; 7

$$f(x) = \begin{cases} \frac{\pi}{2} & \text{if } 0 \leq x < 1 \\ \frac{\pi}{4} & \text{if } x = 1 \\ 0 & \text{if } x > 1 \end{cases}$$

8

- b) Find Fourier cosine transform of  $f(x) = e^{-mx}$  for  $m > 0$ , and then show that  $\int_0^\infty \left( \frac{\cos kx}{1+x^2} \right) dx = \frac{\pi}{2} e^{-k}$

5. a) Derive one dimensional wave equation of a string of length L which is fixed in two end points with required assumptions.

OR

Find the solution of one dimensional heat equation  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ , with initial temperature  $f(x)$  and boundary conditions is  $u(0,t)=0=u(L,t)$ .

- b) Derive two dimensional heat equations with necessary assumptions.

6. a) Find  $Z^{-1} \left[ \frac{2z^2 + 3z}{(z+2)(z-4)} \right]$

- b) A homogeneous rod of conducting material of length 100 cm has its end kept at zero temperature and temperature initially is

$$f(x) = \begin{cases} x, & 0 \leq x \leq 50 \\ 100-x, & 50 \leq x \leq 100. \end{cases}$$

4=10

7. Write short notes on: (Any two)

- a) Find z-transform of  $na^{n-1}$

- b) Evaluate  $\int_C \frac{z^3}{2z-i} dz$  where  $|z|=1$ .

- c) Solve the partial differential equation:  $u_x + u_y = 0$ , by separation of variables method.

- d) Write equation of ellipsoid. Sketch it with center and axes of symmetry.

### POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2015  
 Programme: BE Full Marks: 100  
 Course: Engineering Mathematics IV Pass Marks: 45  
 Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.  
*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Show that the necessary condition for analyticity of  $f(z) = u+iv$ , is  $u_x = v_y$  and  $u_y = -v_x$ .

- b) Define Laplace equation. Test  $u = \cos x \cosh y$  is harmonic or not. If yes, find the harmonic function and the corresponding analytic function  $f(z)$ .

2. a) State and Prove Cauchy Residue theorem. Evaluate  $\oint_C \frac{e^{iz}}{(z+i)^4} dz$ , where C is a circle  $|z| = 3$  along anticlockwise direction.

- b) Determine the region of  $w = e^{\frac{i\pi}{4}}$  in the w-plane corresponding to the triangular region bounded by the lines  $x=0$ ,  $y=0$ , and  $x+y=1$  in the z-plane.

Or

$$\text{Integrate: } \oint_C \frac{dz}{z^2 + 4} \quad c: 4x^2 + (y-2)^2 = 4$$

3. a) Find the Z-transform of  $f(t) = a^n$  and hence find  $Z \left\{ \sin\left(\frac{n\pi}{2}\right) \right\}$  and  $Z \left\{ \cos\left(\frac{n\pi}{2}\right) \right\}$ .

- b) Find the inverse of z-transform of  $\frac{3z^3 + 2z}{(z-3)^2(z-2)}$

4. a) Solve the difference equation:  $y_{n+2} + 6y_{n+1} + 9y_n = 4^n$ , where  $y_0 = 0$  and  $y_1 = 0$ .
- b) Find Fourier sine and cosine integral representation of the function

$$f(x) = e^{-x} + e^{-2x}, \text{ for } x > 0.$$

Or

$$\text{Find Fourier transform of } f(x) = \begin{cases} 1 & \text{for } |x| < 1 \\ 0 & \text{for } |x| > 1 \end{cases}$$

5. a) Define partial differential equation with suitable example. By separating the variables solve  $u_{xx} + u_{yy} = 0$
- b) Define partial differential equation with suitable example. By separating the variables solve  $u_{xx} + u_{yy} = 0$

Or

Find the solution of one dimensional heat equation  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ , with initial temperature  $f(x)$  and boundary conditions is  $u(0,t)=0=u(L,t)$ .

6. a) Express the Laplacian  $\nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$  in polar co-ordinates.

Or

Solve one dimensional wave equation Completely.

- b) Define Fourier integral. Choosing a suitable function, show that

$$\int_0^\infty \frac{\sin \pi w}{w} \sin wx dw = \begin{cases} \frac{\pi \sin \pi x}{2} & \text{if } 0 \leq x \leq \pi \\ 0 & \text{if } x > \pi \end{cases}$$

Or

Find the Fourier cosine transform of  $e^{-x}$ .

2x5

7. Write short notes on: (Any two)
- a) Solve the partial differential equation  $u_x = 2xy$ .

- b) Write equation of an ellipsoid. Sketch it with centre and axis of symmetry.

- c) Verify that  $u = x^2 + t^2$  is the solution of one dimensional wave equation
- d) Derive Z inverse of  $X(z) = \frac{z}{(z+1)(z-3)}$ .

8

### POKHARA UNIVERSITY

Level: Bachelor	Semester: Fall	Year : 2016
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Engineering Mathematics IV	Time : 3 hrs.	

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Prove that if the function  $f(z)$  is analytic then show that  $U_x = V_y$  and  $U_y = -V_x$  8

- b) Integrate the followings along the unit circle counterclockwise 7

$$\text{i. } \oint \frac{z^4}{(z-1)^5}$$

$$\text{ii. } \oint \frac{z+1}{z^2-2z^3}$$

2. a) Find the singular points and residues of the function 8

$$f(z) = \frac{z+2}{(z-2)(z^2+1)^2}$$

- b) State Laurent's theorem. Find the Laurent's series for 7

$$f(z) = \frac{1}{(z-\frac{1}{z})} \text{ in the region } 0 < |z+1| < 2.$$

2x5

3. a) Find the Z-transform of the function  $f(t) = e^{-at}$  and hence deduce the value of  $Z(\cos at)$  and  $Z(\sin at)$ . 7

- b) Using Z-transform solve the difference equation 8

$$y_{n+2} + 6y_{n+1} + 9y_n = 2^n \text{ when } y_0 = y_1 = 0.$$

4. a) Define Z - transform. State and prove Second shifting theorem of Z-transform. Evaluate  $Z(t^2 e^{-bt})$  7

OR

$$\text{Find } Z^{-1} \frac{z^2 + 1}{z^2 - 2z + 2}.$$

- b) Choosing a suitable function show that  $\int_0^\infty \left[ \frac{\cos \omega x + \omega \sin \omega x}{1 + \omega^2} \right] d\omega =$  8

$$\begin{cases} 0 & \text{if } x < 0 \\ \pi/2 & \text{if } x = 0 \\ \pi e^x & \text{if } x > 0 \end{cases}$$

5. a) Find the Fourier cosine and sine transform of  $f(x) = e^{-ax}$ ,  $a > 0$ . 7  
**OR**

Verify the convolution theorem for the functions  $f(x) = e^{-x^2}$  and  $g(x) = e^{-x^2}$ .

- b) Find  $u(x, t)$  of the string of length  $l = \pi$  when  $c^2 = 1$ , the initial velocity is zero and the initial deflection is  $0.1(\pi - x)$ . 8

6. a) What is Helmholtz's equation on  $F(x, y)$  and solve it subject to  $F(0, y) = 0 = F(a, y) = F(x, 0) = F(x, b)$ . 8  
**OR**

Find the deflection  $u(x, y, t)$  of the square membrane with  $a = b = 1$  and  $c = 1$ , if the initial velocity is zero and the initial deflection is  $(0, 1)$

$$\sin 3\pi x \sin 4\pi y.$$

7. Attempt all  
 b) Derive one dimensional heat equation with required assumptions. 7  
 c) Find the unit tangent vector to the curve 4x.5

$$\vec{r}(t) = 2 \cos t \hat{i} + \sin t \hat{j} \text{ at } (\sqrt{2}, \sqrt{2}, 0).$$

- d) Sketch the paraboloid  $z = x^2 + y^2$ .

Level: Bachelor	Semester: Spring	Year : 2016
Programme: BE	Full Marks: 100	
Course: Engineering Mathematics IV	Pass Marks: 45	
	Time : 3hrs.	

Candidates are required to give their answers in their own words as far as practicable.  
*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Define analyticity of the complex valued function  $f(z)$ . If  $f(z) = z + \frac{1}{z}$ , check analyticity of  $f(z)$  by using Cauchy Riemann equation. 8

- b) State and prove Cauchy integral formula. Integrate  $\int_C \frac{1}{z^2+4} dz$ , 7

$$C: 4x^2 + (y-2)^2 = 4 \text{ counter clock wise.}$$

2. a) Obtain the Taylor series and Laurent series of the function  $f(z) = \frac{1}{(z+2)(z^2+1)}$  when  $1 < |z| < 2$ . 7  
**OR**

Define conformal mapping. Name the types of conformal mappings. Translate the rectangular region ABCD in Z plane bounded by  $x=1$ ,  $x=3$ ,  $y=0$  and  $y=3$  under the transformation  $w=z+(2+i)$ . Illustrate with figure also.

- b) State Cauchy Residue Theorem and hence evaluate  $\oint_{Z^2-4z-5} \frac{z-23}{z^2-4z-5} dz$  where 8  
 $C: |z-2|=4$ .

3. a) Obtain the Fourier integral formula from the Fourier series assuming the required conditions. 7  
**OR**

- Show that:  $\int_0^\infty \left( \frac{1-\cos \pi v}{v} \right) \sin vx dv = \begin{cases} \pi/2 & \text{if } 0 < x < \pi \\ 0 & \text{if } x > \pi \end{cases}$  8  
 b) Find the Fourier transform of the function

$$f(x) = \begin{cases} 1 - x^2 & \text{for } |x| < 1 \\ 0 & \text{for } |x| > 1 \end{cases}$$

4. a) Find the solution of one dimensional wave equation by using D' Alembert's method. 8

- b) Find the temperature distribution in a laterally insulated thin copper bar ( $c^2 = 1.158 \text{ cm}^2/\text{sec}$ ), 100cm long and of constant thickness whose end points at  $x = 0$  and  $x = 100$  are kept at  $0^\circ\text{C}$  and initial temperature is  $f(x) = \sin^3(0.01)\pi x$  7

5. a) A string of length 20cm is fastened at both ends is displaced from its position of equilibrium by imparting to its points an initial velocity  $g(x) = \begin{cases} x & \text{if } 0 \leq x \leq 10 \\ 20 - x & \text{if } 10 \leq x \leq 20 \end{cases}$  7
- Find the deflection  $U(x, t)$

- b) Derive two dimensional heat equation and solve completely. 8

6. a) State and prove first and second shifting theorems in Z-transform. 8
- b) Find the value of  $Z(a^{\cos b})$  and  $Z(a^{\sin b})$ . 7

- c) Using Z-transform, solve the difference equation  
 $y_{n+2} + 5y_{n+1} + 9y_n = 2^n$  when  $y_0 = y_1 = 0$ . 7

7. Attempt all. 2.5×4
- a) If  $z = u + iv$  is an analytic function then prove that  $u$  and  $v$  both satisfy Laplace equation 8

- b) Represent the curve  $y^2/(z-3)^2 = 9$ ,  $x = 0$  parametrically 8

- c) Evaluate  $\int_{\gamma} z^3 \sin z dz$  along a unit circle 7

- d) State and prove the linear property on Z-transform

**POKHARA UNIVERSITY**  
 Level: Bachelor Semester: Fall Year : 2017  
 Programme: BE Full Marks: 100  
 Course: Engineering Mathematics IV Pass Marks: 45  
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.  
*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Define harmonic function. If  $v = \arg z$  is harmonic? If yes, find a corresponding harmonic conjugate. 7
- b) State and prove Cauchy's integral formula. Evaluate the integral  $\int_C \frac{\cos z}{(z-\pi)^2} dz$  where  $C$  is unit circle enclosing the point  $\pi i$ . 8

**OR**

- Find the fixed points and the normal form of the bilinear transformation  $w = \frac{z-1}{z+1}$ . Also determine the nature of this transformation. 8

2. a) Define singularity of a function. Evaluate the following integrals: 8

$$\text{i. } \int_C \frac{e^z}{\cos z} dz, \quad C: |z|=3$$

$$\text{ii. } \int_C \frac{z+1}{z^4 - 2z^3} dz, \quad C: |z|=\frac{1}{2}$$

- b) State and prove first shifting theorem for z-transform using it to find 7

मुम्प राजनीति एवं सेक्युरिटी विभाग  
 वान्यमार्गी संस्थान संग्रहालय  
 NCIT College

$$3. \text{ a) Find } Z^{-1} \left[ \frac{2z^2 + 3z}{(z+2)(z-4)} \right]$$

- b) Solve the difference equation  $y_{n+2} - 3y_{n+1} + 2y_n = 0$ , where  $y_0 = 0$  and  $y_1 = 1$ ; by using z-transform. 8

4. a) Derive one dimensional wave equation  $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$  with necessary 7

## QUESTION PAPER

- b) A homogeneous rod of conducting material of length 100 cm has its ends kept at zero temperature and the initial temperature is defined by  $f(x) = \begin{cases} x & \text{for } 0 \leq x \leq 50 \\ 100 - x & \text{for } 50 < x \leq 100 \end{cases}$ . Find the temperature at any time?

8. a) Starting from Fourier series, obtain the Fourier integral in complex form.
- b) Show that  $\int_0^{\pi} \frac{\cos wx + w \sin wx}{1+w^2} d\theta = \begin{cases} 0 & \text{if } w < 0 \\ \frac{\pi}{2} e^{-|w|} & \text{if } w > 0 \end{cases}$

6. a) Solve  $U_{xx} + U_{yy} = 0$

- b) Obtain the solution of one dimensional heat equation example by  
7. Attempt all

- a) Find the parametric representation of the surface  $x^2 + 4y^2 = 9, z = 3$

- b) Find the tangent on the curve C with position vector  
 $\vec{r} = \cosh t \hat{i} + \sinh t \hat{j}$  at  $P\left(\frac{5}{3}, \frac{4}{3}, 0\right)$

- c) Evaluate  $\int \frac{dz}{z}$  where c is the unit disk,  $|z|=1$ .

- d) Find poles with their order of function  $f(z) = \frac{1}{(z+2)^2}$

Level: Bachelor	Semester: Spring	Year: 2017
Full Marks: 100	Pass Marks: 45	Time: 3 hrs.

Calculators are required to give their answers in their own words (in *far as possible*).

The figures in the margin indicate full marks for answer of the questions.

- i. a) Define harmonic functions. If u is given say, show that v is harmonic. Also, find its harmonic conjugate and the corresponding analytic function.

OR

Define an analytic function. Show that the Cauchy-Riemann equations are necessary for a function to be analytic.

- b) State and prove Cauchy Integral Formula. Evaluate the integral  $\int \frac{z+1}{z^2 - 4z} dz$ , where c is the unit circle  $|z+2| = \frac{3}{2}$ , oriented clockwise

- ii. a) Determine the regions  $w = e^{j\theta/2}$  in the w-plane corresponding to the triangular region bounded by the lines  $x=0, y=0$  and  $x+4y=1$  in the z-plane.

b) State Residue theorem. Integrate  $\int \frac{z-2}{z^2 - 4z - 5} dz$  where

$|z| = 6$  using residue theorem.

3. a) State and prove second shifting theorem of Z-transform. Evaluate  
 $Z(e^{-at} \sin wt)$

OR

Find  $Z^{-1} \left[ \frac{z}{(z+1)^2(z-1)} \right]$

- b) Solve the difference equation:  $y_{t+2} - 3y_{t+1} + 2y_t = 4^n$ , where  $y_0 = 0$  and  $y_1 = 1$ , by applying Z-transform.

4.

- a) Show that  $\int_0^\infty \left[ \frac{\cos \pi / 2 \omega \cos x \omega}{1 - \omega^2} \right] d\omega = \begin{cases} \pi / 2 \cos x & \text{if } |x| < \pi / 2 \\ 0 & \text{if } |x| > \pi / 2 \end{cases}$  7

b) Find Fourier sine transform of  $f(x) = e^{-x}$ ,  $x > 0$  and then show that

$$\int_0^\infty \frac{x \sin mx}{x^2 + 1} dx = \frac{\pi}{2} e^{-m} \text{ for } M > 0.$$

5. a) Solve  $xu_{xy} + 2yu = 0$  by using separating variables. 7

b) Find the solution of one Dimensional wave equation by D'Alembert's method. 8

6. a) Find the temperature  $u(x, t)$  in a laterally insulated bar of length L whose ends are kept at temperature 0, assuming that the initial temperature is  $f(x) = \begin{cases} x & \text{if } 0 < x < L/2 \\ L-x & \text{if } L/2 < x < L \end{cases}$  7

b) Derive Laplace equation in polar co-ordinate and also write the expression for cylindrical co-ordinates. 8

OR

7. Attempt all questions Define potential function and then find the solution of potential function. by spherical membrane. 7

5x2.5

- a) Evaluate  $\oint_C \frac{dz}{z-3i}$ , where C is the circle,  $|z-2i|=2$  counter clockwise direction 7

b) Find  $Z(n^2)$

c) Solve  $u_{xx} - u = 0$

d) Write the equation of hyperboloid of two sheet and then sketch

## POKHARA UNIVERSITY

Level: Bachelor	Semester: Fall	Year : 2018
Programme: BE		Full Marks: 100
Course: Engineering Mathematics IV		Pass Marks: 45
		Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define harmonic function. Show that the function  $u = 3x^2y + x^2 - y^3 - y^2$  is a harmonic function. Find the analytic function for which the given function is a real part. 8

- b) Evaluate  $\oint_C \frac{\cos(\pi z^2)}{(z^2 - 3z + 2)} dz$  where C:  $|z| = 3$ . 7

2. a) Let the rectangular region R in the z-plane be bounded by lines  $x=0$ ,  $y=0$ ,  $x=2$ ,  $y=3$ . Find the region R' of the w-plane into which R is mapped under the transformation  $W = \sqrt{2} e^{\frac{i\pi}{4}} z$ . 7

- b) Find the Taylor's and Laurent's series of the function  $f(z) = \frac{z^2 - 1}{(z+2)(z+3)}$  8

OR

State Cauchy Residue Theorem. By applying Cauchy Residue

Theorem, evaluate  $\oint_C \frac{4 - 3z}{z(z-1)(z-2)} dz$  where C:  $|z| = \frac{3}{2}$ .

3. a) State & prove first shifting theorem on Z-transform. Find the Z-transform of  $e^{at}$ . 8

- b) Solve the differential equation  $y_{k+2} + 2y_{k+1} + y_k = k$  where  $y_0 = 0$ ,  $y_1 = 0$  using Z-transform. 7

4. a) Show that  $\int_0^\infty \frac{\sin \pi w \sin xw}{1 - w^2} dw = \begin{cases} \frac{\pi}{2} \sin x & \text{if } 0 \leq x \leq \pi \\ 0 & \text{if } x > \pi \end{cases}$  7

5) Find the Fourier cosine transform of  $f(x) = e^{-x}$  ( $x > 0$ ) and hence by

$$\text{using Parseval's identity, show that } \int_0^\infty \frac{dx}{(1+x^2)^2} = \frac{\pi}{4}.$$

5. a) Define partial differential equation with suitable example. By separating the variables solve  $u_{xx} + u_{yy} = 0$

5. b) Find  $u(x, t)$  from one dimensional wave equation  $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ , with boundary condition,  $u(0, t) = 0 = u(L, t)$ , initial deflection  $f(x)$  and initial velocity  $\left. \frac{\partial u}{\partial t} \right|_{t=0} = g(x)$ .

6. a) Find the temperature in a laterally insulated bar of length L whose ends are kept at a zero temperature, assuming that the initial temperature is

7

6. b) Express the laplacian  $\nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$  in polar co-ordinates.

7

$$f(x) = \begin{cases} x & \text{if } 0 < x < \frac{L}{2} \\ f' & \text{if } \frac{L}{2} < x < L \end{cases}$$

- 7) Attempt all questions.

- 8) If  $u = y^3 - 3xy^2$  show that  $u$  is harmonic.

8

- 8) Find Z-transform of  $z(a^n)$

8

- 8) If  $\vec{r} = (360ct, A\sin \omega t)$  be the position vector of the curve. Find its curve.

8

- 8) Solve the partial differential equation  $u_{yy} = u$ .

### POKHARA UNIVERSITY

Semester spring

Year : 2018  
Full Marks: 100  
Time : 3 hrs.

Level: Bachelor  
Programme: BE  
Course: Engineering Mathematics IV

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.  
*Attempt all the questions.*

1. a) Define analytic function. Show that the function  $u(x, y) = 3x^2y + x^2 - y^3 - y^2$  is a harmonic function. Find a function  $v(x, y)$  such that  $u + iv$  is an analytic function.

7

- b) Define Pole and Zeros of a function. State Cauchy's residue theorem and evaluate  $\oint_C \frac{e^z}{z} dz$  where  $C: |z|=3$ .

2. a) Find the expansion of  $\frac{7z-2}{(z+1)z(z-2)}$  in the region given by  
i)  $0 < |z+1| < 1$ .      ii)  $1 < |z+1| < 3$ .

8

8

- b) Given the bilinear transformation  $w = \frac{3-z}{2z+1}$ , find the mapping of the circle  $|z|=1$  in the w-plane

7

3. a) Show that  $\int_0^\infty \frac{\cos wx + w \sin wx}{1+w^2} dx = \begin{cases} 0 & \text{if } x < 0 \\ \frac{\pi}{2} & \text{if } x = 0 \\ \pi e^{-x} & \text{if } x > 0 \end{cases}$

7

- b) Find the Fourier sine and cosine transform of the function  
 $f(x) = 2e^{-ax} + 5e^{-bx}$

8

4. a) Derive and find the solution of one dimensional wave equation.

- b) Find the temperature in a laterally insulated bar of length L whose ends are kept at a zero temperature, assuming that the initial

$$\text{temperature is } f(x) = \begin{cases} x & \text{if } 0 < x < \frac{L}{2} \\ L-x & \text{if } \frac{L}{2} < x < L \end{cases}$$

5. a) Solve  $U_{xx} + U_{yy} = 0$  by the method of separation of variables  
8  
b) What is Helmholtz equation? Find its solution.  
7

6. a) State and prove Initial and Final value theorems in Z-transform. Find  
8  
the value of  $Z(a^n \cos b)$  and  $Z(a^n \sin b)$   
b) Solve  $y_{n+2} - 3y_{n+1} + 2y_n = 0$ ,  $y_0 = 0, y_1 = 1$   
7  
4x2

7. Answer all of the following questions.  
a) Express the parametric equation of the hyperbola  $x^2 - y^2 = 1, z = 0$ .  
b) Check the analyticity of the function  $f(z) = \operatorname{Arg} z$   
c) Find the z-transform of  $f(n) = na^n$   
d) Find the residue of  $f(z) = \frac{1}{z^2 - 1}$  at  $z = 1$ .

8  
7  
4x2  
1x6

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) State and prove the necessary condition for analyticity. Test the  
analyticity of the function  $f(z) = \log z$

- b) State Cauchy Integral formula for derivative. Evaluate  $\oint_C \frac{z^6}{(2z-1)^6} dz$ ,  
where C is the unit circle  $|z|=1$ , counterclockwise  
7

2. a) Integrate  $f(z) = \frac{e^z + z}{z^3 - z}$  around a unit circle:  $|z| = \frac{\pi}{2}$  using  
Cauchy's Residue theorem.  
7

- b) Find the fixed points and the normal form of the bilinear transformation  $w = \frac{z-1}{z+1}$ . Also, determine the nature of this transformation.  
8

3. a) Define Fourier integral. Choosing a suitable function, show that  

$$\int_0^\infty \frac{\sin \pi \omega}{\omega} \sin \omega x d\omega = \begin{cases} \frac{\pi \sin \pi x}{2} & \text{if } 0 \leq x \geq \pi \\ 0 & \text{if } x > \pi \end{cases}$$

- b) Find the Fourier Transform of the function  $f(x) = e^{-\frac{x^2}{2}}$   
7

4. a) Define Z - transform. State and prove First shifting theorem of Z- transform. Evaluate  $Z(t^2 e^{-bx})$   
8

OR

## POKHARA UNIVERSITY

Level: Bachelor	Semester: Fall	Year : 2019
Programme: BE		Full Marks: 100
Course: Engineering Mathematics IV		Pass Marks: 45
		Time : 3 hrs.

**POKHARA UNIVERSITY**

Find  $Z^{-1} \left[ \frac{z^3}{(z-1)^2(z+1)} \right]$

b) Solve the difference equation by using Z-transform:

7

$y_{n+2} - 3y_{n+1} + 2y_n = 4^n$  with  $y_0 = y_1 = 1$

a) Derive one dimensional wave equation with solution.

8

b) Find the temperature  $u(x, t)$  which is distributed laterally in a insulated copper bar ( $c^2 = 1.158$  cm<sup>2</sup>/sec), 100 cm long and of constant cross section whose end points at  $x = 0$  and  $x = 100$  are kept at 0°C and its initial temperature is  $f(x) = \sin^3(0.01)\pi x$

8

a) Express the Laplacian  $\nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$  in polar co-ordinates.

8

b) Define partial differential equation with suitable example. By separating the variables solve  $u_{xx} + u_{yy} = 0$

7

7. Attempt all questions:

a) Find the unit tangent vector to the curve

$$\vec{r}(t) = 2\cos t \hat{i} + \sin t \hat{j} \text{ at } (\sqrt{2}, \sqrt{2}, 0).$$

10

b) Express  $f(z) = \sinh z$  in terms of  $u + iv$ .

c) Solve  $u_{xx} - u = 0$  by using separation of variables

7

d) Find z-transform of  $n4^n$

$$f(t) = 2\cos t \hat{i} + \sin t \hat{j} \text{ at } (\sqrt{2}, \sqrt{2}, 0).$$

7

Level: Bachelor Semester – Fall  
 Programme: BE Full Marks: 100  
 Course: Programming in Java Pass Marks: 45  
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.  
*The figures in the margin indicate full marks.*  
**Attempt all the questions.**

1. a) How java is more secure than other programming language? Explain. 5  
 b) Write a java program to generate the following triangle using for loop. 5

1  
0 1 0 1  
1 0 1

c) Explain the uses of super and this keyword with suitable example. 5

2. a) What are the significant uses of interface? Explain how it is implemented in java. 8

b) Write a function that takes an array of integers as an argument and returns sum of even numbers in that array. 7

3. a) Explain the user defined Exceptions with suitable java code. 8  
 b) What is user define package? Illustrate the process of defining and using define package with suitable example. 7

4. a) What is an Applet? Write an applet program to play an audio file. The name of audio file is supplied from HTML tag. 8  
 b) What is an event? Briefly explain the models available for event handling. 7

5. a) Write down the significant uses of URL and URL Connection classes. 7  
 b) What is the difference between TCP/IP Programming & datagram Programming? Briefly explain the Classes and Methods that are used to create a TCP/IP Server application. 8

6. a) What are the steps involved for making a connection with a database. 8  
 Write a Java program to extract and display the information in console from ABC table of Ms-access with suitable values. The ABC table has AAA and BBB fields. 8

(G2)

b) Define JDBC and ODBC. Briefly explain the different types of JDBC.

7

Write short notes on any two:

2x5

a) Dynamic Dispatching

b) Layout Management

c) Graphics object

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Discuss the features of Java Programming. Why Java is popular than C/C++. 8
- b) What do you mean by interface? How do you implement interface in java. Explain with example program. 7
2. a) Explain the following terms with suitable program.
  - i. Access Protection Mechanism 8
  - ii. Inner classes. 8
- b) Explain various stream classes available in Java. Write a program using any stream class for writing text to a file. 7
3. a) What does security restriction means in applet? List out the attributes of applet tag and explain them. 8
- b) Write a program to create a frame in swing. The frame should contain three test fields with labels arg1, arg2 and result respectively, a menu called file with sub menus add, subtract and close. 7
4. a) Explain the Layout Manager in detail. Write a program to change the font of text in textfield of the Frame. The frame contains 3 checkboxes named bold, italic and plain. 8
- b) Write a simple GUI addition application that used two input dialogs to obtain integers from the user and a message dialog to display the sum. 7
5. a) What is socket? Write a program to find local IP Address & Hostname of the system. 8
- b) Explain URL andURLConnection class with suitable program. 7
6. a) Write a program to connect to a database using JDBC. Assume that database name is test Db and it has table named employee with 2 records. 8

b) Explain different types of JDBC drives.

7. Write short notes on: (Any two)
- Casting abstract class
  - Life Cycle of Applet
  - Frame Layout.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Fall	Year : 2014
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Programming in Java	Time : 3 hrs.	

- a) Explain how java is platform independent. Write a java program to print "Hello Nepal" in console. 7
- b) What is inheritance? Explain it with suitable example. 8
- a) Write a java program to demonstrate runtime polymorphism via method overriding. Write the following classes: Animal as a base class, Cat (derived class of Animal) and Cow (derived class of Animal). Write a method eat () in Animal class and override that method in the derived classes. 8
- b) What are exceptions? Write a program to input an integer from keyboard and print it on the console. Fire an exception if the input is other than integer using try and catch blocks. 7
- a) Write down the steps for converting java application to java applet. 5
- b) Write an applet program with three text fields with the following names: "number1", "number2" and "result". When the user clicks a "sum" button then the sum of the two number in "number1" and "number2" should be displayed in the text field named "result". 5
- c) What do you mean by Border Layout? Give an example program. 5
- a) Write a following program using Frame. 8
  - It should have three Text Field and one Button
  - It should accept 2 numbers
  - When user clicks the button, it should calculate the sub of two number entered in two Text Field and display the result in third Text Field.
- b) Write a program to display "Pokhara University" inside an ellipse. Note that the string should be in serif font with size 20 and style bold. 7

5. a) Define Socket programming and its usage in java.

b) What do you mean by URL? Provide a simple program using the URL class to show URL processing in java.

6. a) What do you mean by JDBC Drivers? Write short notes about:

i. JDBC-ODBC Bridge

ii. Java Native Driver

b) Write the steps to insert data in following table

Table name : student

Column

Data Type

Column	Data Type
Id	number
Name	varchar
Roll number	number

2x5

7. Write short notes on: (Any two)

a) Reflection

b) Data Types

c) Closable Frames.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

Level: Bachelor Semester: Spring Year : 2014  
Programme: BE Full Marks: 100  
Course: Programming In Java Pass Marks: 45  
Time : 3 hrs.

#### POKHARA UNIVERSITY

1. a) What do you mean by Java System Overview? Explain why Java program are known as portable and architecture neutral.
- b) Differentiate between package and interface in Java. Provide examples for each of them.
2. a) Implement an abstract class named Person and two subclasses named Student and Employee in Java. A person has a name, address, phone number and e-mail address. A student has a class status (freshman, sophomore, junior or senior). Define the status as a constant. An employee has an office, salary and date-hired. Implement the above classes in Java. Provide Constructors for classes to initialize private variables. Override the to String method in each class to display the class name and the person's name. Write an application to create objects of type Student and Employee and print the person's name and the class name of the objects.
- b) Why do we need to serialize an object? Write a program to read numbers from the console using the Input Stream. Also, apply the method of object serialization in your program.
3. a) How can a HTML file pass data to an applet? Explain with relevant code tags.
- b) Write an applet program with three textfields with the following names:  
"number1", "number2" and "result". When the user clicks a "sum" button then the sum of the two numbers in "number1" and "number2" should be displayed in the text field named "result".
- c) Differentiate between Gridbag Layout and Grid Layout.

2

1

5

4. a) What are heavyweight components in Java? Are there any alternatives to those heavyweight components? Provide a comparative illustration. 8
- b) Write a program to draw a Bar Char of Number of Students giving exam for Java, C and C++. 7
5. a) Differentiate between URL and URL Connection class with relevant examples. 8
- b) Discuss the process of creation of server and client sockets with Exceptions handled explicitly with a suitable example. 8
6. a) What do you mean by JDBC Drivers? Write short notes about:
- i. JDBC-ODBC Bridge. 8
  - ii. Java native Driver. 8
- b) Write a simple Java Program to connect ms access database and insert data in the table named "Student" which have four fields named " id", "name", "address", "DOB", and "Class". 7
7. Write short notes on: (Any two) 2×5
- a) Dialog Box. 8
  - b) Closable Frames. 8
  - c) Inner Class. 8

## POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE  
Course: Programming in Java

Semester: Spring

Year : 2015  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Is JVM is machine independent? Explain the use of JVM. How JVM makes Java machine independent. 8
- b) Why is multiple inheritance not supported in Java. Provide a simple code example to support your answer. 7
2. a) What is reflection? Why do we need reflection? Explain with sample code. 7
- b) How can you create your own exception in Java? Explain with program. 8
3. a) Discuss about the Sandbox Security model with regard to Java Applet. 5
- b) Explain how to display a picture in an applet. 5
- c) Differentiate between GridBag Layout and Grid Layout. 5
4. a) What is the difference between AWT and Swing package in Java? Write a sample code for creating a closable frame in the front and centre of your desktop. 8
- b) Write a program to draw a Bar Char of the total number of students appearing exam in Java. Also, provide Bar Chart for number of male and female students. Hint: Each Bar can be drawn using drawRect() and fillRect() method. 7
5. a) What is an URL. Write a Java program for reading contents in a given URL. 7
- b) Write a client program which connects with server running at port 5000 and send "I am client" message to server and also print received message from server in console. (Assume TCP/IP communication) 8
6. a) Differentiate between simple statements and prepared statements. Provide an example to illustrate their differences. 8
- b) Write a simple Java Program to connect database and read data in the table named "Student" which have four fields named " id", "name", "address", "DOB", and "Class". Assuming the "id" field as simple number, display the data of the students with id less than 100. 7
7. Write short notes on: (Any two) 2×5
  - a) JIT compile
  - b) Repaint method
  - c) Inner Class

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Fall	Year : 2016
Programme: BE		Full Marks: 100
Course: Programming in Java		Pass Marks: 45
		Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) How does Java support re-usability? Provide examples. 7  
b) Discuss about the concept of instance variable hiding in Java. 8  
Illustrate with a code example.
2. a) Make a class Human with a name and age. Make a class Employee inherit from Human. Add instance variable salary of type double. Supply a method showData() that prints the Employee's name, age, and salary. Make a class Manager inherit from Employee. Supply appropriate showData() methods for all classes. Provide a test program that tests these classes and methods. 8
3. a) Why is exception handling essential? Differentiate between checked and unchecked exceptions with relevant examples. 2+5  
b) Discuss about the life cycle of an Applet.
4. a) Write an Applet program to illustrate the message sharing between HTML and Applets. 5  
b) Differentiate between Panel and Frame. 5
5. a) Write a program to generate a Frame with two buttons "BLACK" and "BLUE". When a button is clicked it should change the background color of the Frame to respective color. 8  
b) Write a Java Program to draw a 2D rectangle in green color. Next draw the flag of Nepal inside the rectangle. Write a string "MY NEPAL" below the rectangle. 7
6. a) What is a socket? Differentiate between datagram and stream communication. 7  
b) Write the steps to create a client server program. Provide code snippet to for each steps. 8

6. a) What is a ResultSetMetadata. Provide a simple example code to illustrate its usage. 7  
 b) Discuss about the different types of database drivers 2x5
7. Write short notes on: (Any two)
- a) Assignment vs. initialization
- b) Closeable JFrame
- c) Runtime Polymorphism in Java

मुम्प सेसनरी सल्लाहसं लृष्ट फेसेक्युले सर्विस  
 बालबुद्धामि नेत्रित्वर १८८५१९९१  
**NCT College**

7 8

**POKHARA UNIVERSITY**  
 Level: Bachelor Semester: Spring Year : 2016  
 Programme: BE Full Marks: 100  
 Course: Programming in Java Pass Marks: 45  
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.  
 The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define java. Write a program to print "Hello Java" in a console. 8  
 b) Define Polymorphism. How should we implement polymorphism in java? Explain with Example. 7
2. a) What is interface? Define with Example. 8  
 b) Create a class MyClass in a package MyPack. Import newly created class MyClass from IpmClass. 7
3. a) What is the usage of exception handling? Define with example. 8  
 b) Create a program to write "Hello World" in a file abc.txt. 7
4. a) Define Applet life cycle. 8  
 b) What is Frame? Create a frame with following attributes: 7
- Height = 400  
 Width = 400  
 Title = My Frame
5. a) Create a Frame with one button and one textfield, when user clicks on the button the text entered on textfield should be changed to uppercase. 8  
 b) Explain Event Handling with various types of event available on java. 7
6. a) Define Socket Programming with example. 8  
 b) Why JDBC is required in java. Explain the role of JDBC Driver. 7
7. Write short notes on: (Any two) 2x5
- a) Inheritance  
 b) URL  
 c) Java Virtual Machine  
 d) ResultSet

मुम्प सेसनरी सल्लाहसं लृष्ट फेसेक्युले सर्विस  
 बालबुद्धामि नेत्रित्वर १८८५१९९१  
**NCT College**

POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE  
Course: Programming in Java

Semester: Fall  
Full Marks: 100  
Pass Marks: 45

Year : 2017  
Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Justify the statement, " Java is designed for distributed application". Explain the different types of Java variables. 7
- b) Explain with example: static block, static variable and static method. Why main method is always static and public in Java? 8
2. a) How can you achieve multiple inheritance in java? Explain with a suitable program. 7
- b) What are the main uses of super, finalize and this keyword? Explain how a package is created and accessed while developing an application in Java. 8
3. a) Write a program to store object of a class Student into a file "student.dat" also read the objects from same file and display the state of objects on the screen. Handle possible exceptions. 7
- b) Differentiate error with exception. Write a program to create your own exception class in java. 8
4. a) Explain Applet Architecture. How can you convert applet to application? Explain with suitable example. 7
- b) How Event is handled in Java? Write a Java program to create a swing application with 3 buttons representing your favourite colors. When a button is clicked, the background color must change to the corresponding color. 8
5. a) Differentiate between GridLayout and GridBagLayout. Write a program to show the use of BorderLayout. 7
- b) What is GUI programming? Write a program to draw Nepali flag using graphics. 8
6. a) What is Java URL processing? Demonstrate URLConnection class 7

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Spring	Year : 2017
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Programming in Java	Time : 3hrs.	

- method with suitable example program. 8  
 b) What are the different types of JDBC statements available? Explain with example. 2x5
7. Write short notes on: (Any two) 7
- Socket Programming in Java
  - JDBC Driver types
  - Reflection in Java

*Candidates are required to give their answers in their own words as far as practicable.*  
*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Define Java as Platform Independent Programming Language. 7  
 b) What is constructor, Explain with example? 8
  2. a) Write a program to show the usages of various data types in java. 7  
 b) Define Inheritance. Write a program which has two classes A and B, where A should act as Parent class and B should inherit from A. 8
  3. a) Define Exception handling with Example. 7  
 b) Create a Frame which has three textfield and one button. When user clicks on button it should calculate sum of the value of first and second textfield and display on third textfield. 8
  4. a) What is difference between Interface and Class? Explain with an example. 8  
 b) Write a program to read content from file "abc.txt" and store it in "xyz.txt". 7
  5. a) What are applets? Define Applet life cycle with Example. 7  
 b) Write a program to send "Message from Pokhara University" from client to server using java socket programming. 8
  6. a) Define JDBC. Write a program to update data on following table. 8
- Table: student
- | Column: | NAME    | TYPE |
|---------|---------|------|
| id      | number  |      |
| name    | varchar |      |
| age     | number  |      |
- b) What is the difference between Frame and Swing? 7
7. Write short notes on: (Any two) 7
- a) JRE
  - b) Event handling
  - c) Result Set

POKHARA UNIVERSITY

Level: Bachelor  
Programme: BE  
Course: Programming in Java

Semester: Fall

Year : 2018  
Full Marks: 100  
Pass Marks: 45  
Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) How is interface different from abstract class? Explain the use of interface to achieve multiple inheritances. 8
- b) What are the uses of abstract keyword? Explain with a suitable program. 7
2. a) Create a class Employee with id, name, post and salary. Create a parameterized constructor to initialize the instance variables. Override the to String() method to display the employee details. 7
- b) What is exception handling? Explain. Write a program to handle Arithmetic Exception. 8
3. a) What is a dialog box? Explain its types. Write a program to create your own dialog box. 7
- b) What are the different types of streams supported by java? Explain. A data file "emp.txt" contains name, address and salary of 30 employees. Write a program to display only those records who are from "Kathmandu". 8
4. a) Create a swing GUI that contains a two buttons (add and subtract) and three text fields. When the buttons are clicked sum or difference of values of first two text fields should be displayed in the third text field respectively. 8
- b) Explain the use of URL and URL Connection class with a suitable program. 7
5. a) Write a program to display all records from the database table. Assume the name of database and table yourself. 7
- b) Differentiate between TCP and UDP. Create a TCP client application that takes input from user and sends it to the server. 8
6. a) How is applet different from normal java program? List out the steps for 7

- converting applet into application.
- b) How can you create closable frames in swing and AWT? Write a program to draw a bar chart.
7. Write short notes on: (Any two)
- Reflection API
  - History of Java
  - JDBC API

8

2x5

### POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Programming in Java

Semester: Spring

Year : 2018

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What do you mean by architectural-neutral? What are wrapper classes? Explain. 7
- b) Mention the scope of all modifiers (private, default, protected and public). Write suitable program to illustrate the concept. 8
2. a) What is method overloading? Can you override a private or static method in Java? Explain with an example. 8
- b) How does interface differ from abstract classes? Elaborate using code snippets to justify. 7
3. a) Explain about FileReader and BufferedWriter class. How do you create own exception subclasses? Explain with an example. 8
- b) What are the differences between applet and normal java program? Create an applet with the functionalities to play, stop and repeat the audio. 7
4. a) Create a swing GUI that contains a text field and a button. When the button is pressed the content in the text field should be changed into uppercase and background color of text field should be changed. 7
- b) Demonstrate various drawing methods. How do you create, load and display image? 8
5. a) Differentiate between TCP and UDP sockets. Explain InetAddress class. 7
- b) What are some key classes defined in java to work with datagrams? How do you get a list of IP addresses that are assigned to a network interface? 8
6. a) What is the benefit of using Prepared Statement in java? What is JDBC database connection pool? How to setup in Java? 8

- b) A database "testdb" contains a table "employee" with some records having id, name, post, salary. Write a program to update the salary to 50000 whose post is "Manager".

2×5

7. Write short notes on (Any Two):  
a) Inner Class  
b) C++ Vs Java  
c) Types of JDBC drivers

## POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2019

Programme: BE

Full Marks: 100

Course: Programming in Java

Pass Marks: 45

Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What are the most powerful features of java? Describe how it is a platform neutral language by a diagram. 7
- b) Explain multiple inheritance. How is it possible to achieve multiple inheritance in java? 8
2. a) What is interface? WAP to show interface implementation in java. 8
- b) Create a program to write "Test on File Handling" inside a file "abc.txt". 7
3. a) What is an Applet? Explain life cycle of applet. 8
- b) What are the differences between GridLayout and GridBagLayout? Explain FlowLayout. 7
4. a) Create a swing GUI that contains a button, and two text fields. When the button is clicked the value of first text field should be checked and display "odd number" or "even number" in the second text field. 8
- b) Create a graphics application to display "Pokhara University" in blue color with font name: Times New Roman, type:Bold and size:20. Also write HTML to embed the applet. 7
5. a) Draw a diagram illustrating how client server interaction occurs in UNIX based system, with detailed methods in each step. 7
- b) Create a TCP client/server program in which client sends an integer to the server and the server responds to client by sending square of the number sent by client. 8
6. a) Briefly describe the JDBC-ODBC types of bridge and driver in java. 7

- b) Write a program to display only those records whose salary is more than 25000 from a table that contains id, name, post and salary of some employees.
7. Write short notes on: (Any two)
- Reflection API
  - Events and event classes
  - Types of JDBC drivers

8

2×5

## POKHARA UNIVERSITY

Level: Bachelor

Semester - Fall

Year : 2013

Programme: B.E

Full Marks: 100

Course: Microprocessor and Assembly Language Programming

Pass Marks: 45

Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Differentiate microprocessor and microcontroller. Explain the chronological development of Intel microprocessor. 7  
b) Draw the Functional block diagram of 8085 microprocessor and explain' 8
2. a) Write an assembly language program of 8086 to read a string , count the vowels and display them in clear screen with reverse attribute 8  
b) Explain assembler. Describe one-pass assembler and two – pass assembler with suitable diagrams. 7
3. a) Write a program to input string from keyboard and display it. 7  
b) Define linking and relocation. Write an ALP to copy the contents of "TABLE 1" which contains 10 numbers into "TABLE 2" in reverse order. 8
4. a) Differentiate between memory mapped and I/O mapped input output. Draw a circuit diagram of an interfacing circuit that contains 4 KB RAM and 4 KB ROM assuming base address of RAM is 8000H. 8  
b) What is IVT in 8086? Explain the table in detail with diagram. Is the difference between IDT and IVT? 7
5. a) Why 8255 PPI is used in IO interface? Explain 8255 PPI with block diagram. 8  
b) What are the priority modes of 8259 PIC. Explain 8259 interrupt operation with block diagram. 7

**POKHARA UNIVERSITY**

6. a) Write a program for 8086 assembler to reverse the string read from keyboard. 8  
 b) Draw a I/O write cycle timing diagram for minimum mode. 7  
 2×5
7. Write short notes on any two:  
 a) Addressing Modes of 8085  
 b) DMA  
 c) Memory

Level: Bachelor      Semester: Spring  
 Programme: BE  
 Course: Microprocessor and Assembly Language Programming

Year : 2013  
 Full Marks: 100  
 Pass Marks: 45  
 Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Draw the internal architecture of 8 bit microprocessor and explain it. 8  
 b) Compare Microprocessor, Microcomputer and Microcontroller. Which is better for high speed operation? Give reason. 7
2. a) Draw the timing diagram for the 8085 instruction STA 2013H. 8  
 b) Write a program for 8086 assembler to find the sum of even numbers from given array? 7
3. a) Explain assembler. Describe one-pass assembler and two-pass assembler with suitable diagrams. 7  
 b) Write an 80x86 programs to input string from the keyboard and display the characters on the monitor. 8
4. a) What do you mean by address decoding? Design an address decoding circuit to interface 2K×8 RAM, 2K×8 ROM and 8K×8 RAM with starting address 0000h. 7  
 b) What do u mean by IVT? Explain various interrupts of 8086 IVT. 8
5. a) How interrupt processing occurs in a microprocessor? Explain vector chain and polled interrupt. 8  
 b) Why 8251 USART is used in IO interface? Explain its use with block diagram. 7
6. a) What is DMA controller? How can we accommodate 16 interrupt sources with 8259 PIC? 8  
 b) Describe its internal architecture of 8254 PIT. 7
7. Write short notes on: (Any two) 2:  
 a) 8086 flag register  
 b) Synchronous and Asynchronous bus  
 c) Memory Hierarchy.

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2014

Full Marks: 100

Programme: BE

Pass Marks: 45

Course: Microprocessor and Assembly Language

Time : 3hrs.

Programming

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) What is microcontroller? Differentiate between Intel 4004 and Intel 8008 microprocessor. 7
- b) Draw the timing diagram of 8085 instruction MVI A,12H. 8
2. a) Write an ALP in Intel 8085 microprocessor to find largest and smallest of 10 bytes stored in memory location starting from C001H and store the largest number in port 80H and the smallest number in port 81H. 8
- b) Write an assembly language program for 8086 to accept the number from user through keyboard, calculate its factorial and prints on screen. 7
3. a) Describe modular programming and its advantages. Write an ALP to count the positive and negative numbers stored in "Table 1" which contains 10 numbers starting from C050 H. 7
- b) What are the directives in assembly language programming? Explain the role of Macros. 8
4. a) Differentiate maskable and non-maskable interrupt with examples. 8
- b) Describe the interrupts of 8086 microprocessor with IVT. 7
5. a) Draw the block diagram of 8254 PIT. Write instructions to generate 5 kHz square waveform. 7
- b) Explain the USART? Write different modes of 8255 PPI. 8
6. a) Describe the execution of DMA in both slave mode and master mode with interfacing circuit of 8237 A DMA with 8085 microprocessor. 8
- b) What is memory interfacing? Draw an address decoding circuit to interface input device with 8 input switches at 41 H and LED output at 42H. 8

- b) Explain 8259A PIC with suitable block diagram.
7. Write short notes on: (Any two)
- RAM vs. ROM
  - Software interrupts
  - Polling Interrupt.

### POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2014

Programme: BE

Full Marks: 100

Course: Microprocessors and Assembly Language

Pass Marks: 45

Programming

Time : 3 hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Explain the evolution of Intel Series Microprocessors from 16-bit processors to 64-bit processors. 7

- b) Draw block diagram 8086 Microprocessor and explain its Bus Interface. 8

2. a) Draw a timing diagram of ADI 45H. 8

- b) Describe various addressing modes provided in 8085 microprocessor. 7

3. a) The following 8085 instruction has been written to transfer the content of memory location 2014H to 2015H. Find out error in the instructions, give reason for the error and correct it. What will be the content of memory location 2015 after correction? 7

MVI B, 23H

सुन स्वेच्छा समाधर्त एंड फोटोकी सर्विस  
बालकुमारी, ललितपुर ९८४९५४५५२३

LXI H, 2014H

MOV M, B

LDA 20H

LXI D, 2015H

STAX D

HLT

HCIT College

- b) Write a 8086 program in MASM to find the square of a given number. 8

4. a) Write an assembly language program to input a string from keyboard and print it in reverse order. 7

- b) What do you mean by address decoding? Design an address decoding circuit to interface 4Kx8 RAM, 8Kx8 ROM and 16Kx8 RAM with starting address 8000h. 8

5. a) Explain how 8086 handles interrupt. 8

- b) What do you mean by Interrupt Vector Table (IVT)? Explain 7

predefined interrupts of 8086 microprocessor.

6. a) Write a control word format of 8255 PPI in I/O mode.

- b) What is Programmable Interval Timer? Illustrate with a diagram.

7. 8  
2×5

- a) Synchronous and Asynchronous bus.

- b) Macro Assembler.

- c) DMA controller.

**POKHARA UNIVERSITY**

Level: Bachelor Semester: Fall Year : 2015

Full Marks: 100  
Pass Marks: 45

Programme: BE Course: Microprocessor and Assembly Language Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Attempt all the questions.*

1. a) Explain the evolution of Intel Series Microprocessors from 16-bit processors to 64-bit processors. 7
- b) Draw block diagram 8086 Microprocessor and explain its Bus Interface Unit. 8
2. a) What do you mean by addressing modes? Explain 80863 addressing modes in detail. 7
- b) Define flags and addressing modes. Explain the role of all the flag bits in 8085 microprocessor with essential examples. 8
3. a) What do you mean by assembler directives? Explain various assembler directives. 7
- b) What do you mean by Instruction Cycle? Draw the timing diagram of Memory Read operation? Explain. 8
4. a) Write a 8086 assembly language program to transfer 16 bytes of data starting from memory locations D000H to E000H. 5
- b) Write an assembly language program to input a string from keyboard and print it in uppercase. 5
- c) What are procedures and macros? Which is better for the development of assembly language programming? 5
5. a) What do you mean by Interrupt Vector Table (IVT)? Explain the software interrupts of 8086 microprocessor. 8
- b) What do you mean by address decoding? Design an address decoding circuit to interface 8K×8 ROM and 16K×8 RAM with starting address 8000h. 7
6. a) Draw the block diagram of 8255 PPI and explain it in brief. 8
- b) How can we accommodate 16 interrupt sources with 8259 PIC? 7

**POKHARA UNIVERSITY**

Level: Bachelor	Semester: Spring	Year : 2015
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Microprocessor and Assembly Language Programming	Time : 3hrs.	

*Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.*

*Attempt all the questions.*

7. Write short notes on: (Any two)
- DMA controller
  - Macro Assembler
  - Vector and Polled Interrupts
1. a) Explain the evolution of Intel Series Microprocessors from 16-bit processors to 64-bit processors. 7
- b) Draw the functional block diagram of 8085 microprocessor. What are the purposes of ALU and flags? 8
2. a) Draw the timing diagram for the 8085 instruction OUT 34H. If the clock frequency of 2MHz is used, then how much time will it take to execute this instruction? 5
- b) The following 8085 instruction has been written to add the content of memory location 2014H with 2015H. Find out error in the instructions, give reason for the error and correct it. What will be the content of memory location 2015 after correction? 5
- ```

MVIA, 32H
STA 2014H
MVI A, 23H
STA 2015H
LXI H, 2014H
MOV B, M
LDA 20H
ADD B
LXI D, 2015H
STAX D
HLT
    
```
- c) What will be the value of accumulator A after the execution of following 8085 instructions? Justify your result. 5
- MVI A, 0  
MVI B, 4

**POKHARA UNIVERSITY**

Level: Bachelor  
Programme: BE  
Course: Microprocessor and Assembly Language Programming

Semester: Fall

Year : 2016  
Full Marks: 100  
Pass Marks: 45  
Time : 3hrs.

- |                                                                                                                                                                  |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| MVI C, 5                                                                                                                                                         | 8   |
| LOOP: ADD B                                                                                                                                                      |     |
| DCR C                                                                                                                                                            |     |
| JNZ LOOP                                                                                                                                                         |     |
| HLT                                                                                                                                                              |     |
| 3. a) Draw an interfacing circuit to interface 4 KB ROM and 2 KB RAM for 8085 microprocessor.                                                                    | 7   |
| b) What are IVT and ISR? How is it used to handle software and hardware interrupts? Explain.                                                                     | 8   |
| 4. a) Describe the different modes of 8255 PPI with diagram.                                                                                                     | 7   |
| b) Write down the instructions to generate 3 KHz square waveform for 8254 PIT.                                                                                   | 7   |
| 5. a) How can we accommodate 16 interrupt sources with 8259 PIC?                                                                                                 | 8   |
| b) Write a 8086 program to find the square of a given number.                                                                                                    | 7   |
| 6. a) Define interrupts. Explain vector chain and polled interrupt.                                                                                              | 8   |
| b) Assuming: DS=2000H, BP=2030H and SI=2020H; State the addressing mode of the following 8086 instructions and find the physical address of the source location. |     |
| i. MOV BX, [1234H]                                                                                                                                               |     |
| ii. MOV BX, [BP]                                                                                                                                                 |     |
| iii. MOV BX, [BP+SI]                                                                                                                                             |     |
| iv. MOV BX, [BP+SI+5]                                                                                                                                            |     |
| v. MOV BX, [SI+4]                                                                                                                                                |     |
| 7. Write short notes on: (Any two)                                                                                                                               | 2x5 |
| a) Synchronous and Asynchronous Data Transfer                                                                                                                    |     |
| b) Maskable and Nonmaskable Interrupts                                                                                                                           |     |
| c) Macro Assembler.                                                                                                                                              |     |

2

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Differentiate between microprocessor, microcontroller and microcomputer.
- b) Describe the flags available in 8085 microprocessor. Write an ALP to find the smallest number in a data array. Data are stored in location C000H to C005 H.
2. a) Draw the timing diagram of MVIA, 32 H. Also calculate the total time for execution if frequency is 2.5MHz.
- b) Write a program in 8086 microprocessor in MASM to find the square root of a given number. Given that the number is a perfect square of two digits.
3. a) Differentiate macros and procedures. Write an assembly language program to copy the string from one location in memory to other location.
- b) Write a program to display string "POKHARA" into a standard output device using DOS/BIOS interrupt.
4. a) Define bus structure. Draw an address decoding circuit to interface 2 KB ROM and 4KB RAM for 8085 microprocessor.
- b) How are non vectored interrupts processed? Describe with the necessary hardware implementation.

OR

- What are interrupts and interrupt vector? What could be the different sources of interrupts? Describe in brief.
5. a) Differentiate:
    - i. Data, Control and Address Bus
    - ii. Vectored and Non Vectored Interrupts

- b) Describe the process to transmit and receive the serial data in 8251A USART. 7
6. a) Describe the Input-output control word and BSR control word in 8255 PPI. 7
- b) What is DMA? Describe how it works with suitable illustration. 8
7. Write short notes on: (Any two) 2×5
- a) Types of Directives  
 b) Application of PIT  
 c) Evolution of Microprocessor

### POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2016  
 Programme: BE Full Marks: 100  
 Course: Microprocessor and Assembly Language Pass Marks: 45  
 Programming Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Compare microprocessor, microcomputer and microcontroller. What are the applications of microprocessor? 4+3
- b) Draw and explain the internal architecture of microprocessor. 8
2. a) What do you mean by addressing mode? Explain different addressing modes of 8086 microprocessor with example. 2+5
- b) Draw and explain the timing diagram for STA 8050H instruction. 8
3. a) What do you mean by assembly language programming? Explain the assembling process. What are one pass and two pass assemblers? 2+4+2
- b) Write a program for 8085 to transfer numbers from a table of ten eight bit numbers to another table if bit D<sub>5</sub> is 1 and bit D<sub>3</sub> is 0 else store 0 in the destination table. 7
4. a) Write an assembly language program for 8086 microprocessor to read a number from the user, find the sum of squares of the numbers from 1 up to the entered number and display the result. 7
- b) What do you mean by address decoding? Design an address decoding circuit to interface one RAM chip of 8KB and one ROM chip of 8KB for 8085 microprocessor consecutively at the address C000H. 8
5. a) Why is interrupt required in microprocessor system? Explain how interrupt pins of 8085 microprocessors are used. 2+5
- b) What is interrupt vector table? Explain how hardware interrupts are handled in 8086 microprocessor. 3+5
6. a) What are the parallel and serial interfaces? Explain RS232 standard. 2+5
- b) What are the modes of parallel data transfer? Draw the diagram of 8255 PPI and explain its operation. 3+5
7. Write short notes on: (Any two) 2×5
  - a) Stack operation
  - b) PIC
  - c) DMA

सुगम सेवनरी सलायर्स एंड फोटोकॉपी सर्विस  
 बालबुमारी, ललितपुर ९८४९५९९५९२

NCIT College

**POKHARA UNIVERSITY**

Level: Bachelor Semester: Fall Year : 2017  
Programme: BE Full Marks: 100  
Course: Microprocessor and Assembly Language Pass Marks: 45  
Programming Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) How was microprocessor evolved? State the difference between microprocessor and microcontroller and what are its uses in daily life. 7  
b) What are the different addressing modes in 8085? Explain in detail with an example. 8
2. a) Write an assembly language program to find factorial of numbers from 1 to 20. 7  
b) Write an assembly language program to print "Gandaki College of Engineering and Sciences" and display it into a standard output device. 8
3. a) What are the different modes of operation of an 8086 microprocessor? 7  
b) Draw its internal architecture and explain each block in brief. 7
4. a) Differentiate between procedure and macro. List different assembly language development tools. 7  
b) Draw the timing diagram for moving an immediate data to 8086. (Eg: MVI A, 43H). 7
5. a) What is the importance of memory interfacing? Draw a circuit diagram of an interfacing circuit for RAM of size 2KB starting at 5300H and ROM of size 4KB starting at 5400H. 8  
b) Draw the block diagram of USART and explain each of them. What are the different control words used in USART? 7
6. a) Draw an internal structure of 8255 PPI. Also explain its modes in brief. 8  
b) What is an interrupt and what are its types? Describe an interrupt vector table in 8086. 8  
c) What are different flags in 8086 and how to calculate its physical address? 7
7. Write short notes on: (Any two) 2x5
  - a) IVT and ISR
  - b) Programmable Interval Timer
  - c) Synchronous and Asynchronous Bus

**POKHARA UNIVERSITY**

|                                              |                  |             |
|----------------------------------------------|------------------|-------------|
| Level: Bachelor                              | Semester: Spring | Year : 2017 |
| Programme: BE                                | Full Marks: 100  |             |
| Course: Microprocessor and Assembly Language | Pass Marks: 45   |             |
| Programming                                  | Time : 3hrs.     |             |

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) You are required to buy a brand new personal computer. What would you want the specifications and features of the microprocessor in the system and why? Explain with reference to the evolution of microprocessors. 7
- b) Draw block diagram 8086 Microprocessor and explain its Execution Unit. 8
2. a) Write the function, addressing modes, size and name of machine cycles for the following instructions: 6
  - i. MOV A,B
  - ii. MVI A, 32H
  - iii. LXI H, 2030H
- b) Define Instruction cycle, Machine cycle and T-states. 3
- c) Draw the timing diagram for the 8085 instruction IN 34H. 6
3. a) Assuming: DS=1000H, BX=2030H and SI=2020H; State the addressing mode of the following 8086 instructions and find the physical address of the source location. 5
  - i. MOV AX, [1234H]
  - ii. MOV AX, [BX]
  - iii. MOV AX, [BX+SI]
  - iv. MOV AX, [BX+SI+5]
  - v. MOV AX, [SI+4]
- b) Write an 8085 ALP to subtract two 16-bit numbers and store the result in memory locations starting from 2017H. 5
- c) Explain various assembler directives in brief. 5
4. a) Write an assembly language program to find the sum of two no. which 7

**POKHARA UNIVERSITY**

Level: Bachelor      Semester: Fall  
 Programme: BE      Course: Microprocessor and Assembly Language  
 Programming

Year : 2018  
 Full Marks: 100  
 Pass Marks: 45  
 Time : 3hrs.

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

- is input by the user through the key board and display the sum in screen. 8
- b) You have given string data "Microprocessor and Assembly language Programming". Write an ALP to print "Microprocessor Programming" from the above given data. 8
5. a) How interrupt processing occurs in a microprocessor? Explain vector chain and polled interrupt. 8
- b) What do you mean by address decoding? Design an address decoding circuit to interface  $4K \times 8$  RAM,  $8K \times 8$  ROM and  $16K \times 8$  RAM with starting address 4000h. 7
6. a) Draw block diagram of 8254 PIT and explain in brief. 5
- b) How can we accommodate 20 interrupt sources with 8259 PIC? 5
- c) Explain the different control words of 8255A PPI. 5
- 2×5
7. Write short notes on: (Any two)
- a) DMA controller
- b) Macro Assembler
- c) 8085 flag register

1. a) Describe in brief the evolution of INTEL series. 8
- b) Draw the block diagram of 8085 Microprocessor. Explain about its register set. 7
2. a) Draw the timing diagram of 8085 instruction LDA CBD2H. 8
- b) What is addressing modes? Describe about the different addressing modes in 8085 microprocessor. 7
3. a) Describe about the format of an ALP, illustrating a simple program. 7
- b) Write an ALP for 8085 microprocessor to copy the largest value among ten values at starting address CB08H to CD00H. 8
4. a) Write an ALP to find the difference between two 8-bit numbers using two's complement method and display the difference in the screen. 8
- b) What are the different components of ALP Development tool? Describe their functions. 7
5. a) Differentiate between synchronous and asynchronous bus. 5
- b) List out the possible sources of interrupts. Also Describe the Polled Interrupt hardware with necessary diagram. 10
6. a) Explain 8259A modes of operation. How can we accommodate 18 interrupt sources with 8259A PIC? 8
- b) Describe in detail the working mechanism of USART with necessary diagram. 7
7. Write short notes on: (Any two) 2×
- a) Addressing Decoding
- b) Interrupt Vector Table
- c) Application of 8254 PIT

**POKHARA UNIVERSITY**

|                                              |                  |             |
|----------------------------------------------|------------------|-------------|
| Level: Bachelor                              | Semester: Spring | Year : 2018 |
| Programme: BE                                | Full Marks: 100  |             |
| Course: Microprocessor and Assembly Language | Pass Marks: 45   |             |
| Programming                                  | Time : 3 hrs.    |             |

Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain the evolution of Intel Series Microprocessors starting from 16-bit architecture to 64-bit architectures. 7
2. b) Draw block diagram of a Microprocessor and explain it in detail. 8
3. a) Write the function, addressing modes, size and name of machine cycles for the following instructions: i) LDAXX D ii) ADI32H iii) LX1B, 2075H b) Define Instruction cycle, Machine cycle and T-states. 3
4. c) Draw the timing diagram for the 8085 instruction MVI A, 32H. 6
5. a) What do you mean by Segmentation Offset Scheme in 8086 Microprocessor. Explain with suitable example. 5
6. b) Write an 8085 ALP to subtract two 16-bit numbers and store the result in memory locations starting from 2075H. 5
7. c) Explain various assembler directives in brief. 5
8. a) Write an assembly language program to find the sum of two number which is input by the user through the key board and display the result in screen. 7
9. b) Write a procedure program for 8086 for newline and use it to display three different strings in different lines. 8
10. a) What are various sources of interrupts? Explain interrupt vector table of 8086 microprocessor. 8
11. b) What do you mean by address decoding? Design an address decoding circuit to interface  $4K \times 8$  RAM,  $8K \times 8$  ROM and  $16K \times 8$  RAM with starting address 0000h. 7
12. a) You are given a microprocessor system with clock frequency 10MHz. Write a program for 8254 PIT to generate a square wave of frequency 2KHz. 5

|                                                                                                     |     |
|-----------------------------------------------------------------------------------------------------|-----|
| b) How cascading is done to handle more than 8 interrupts using 8259 PICs?                          | 5   |
| Explain.                                                                                            |     |
| c) Write 8085 program for 8255 PPI to take input from input device connected to Port A of 8255 PPI. | 2×5 |
| 7. Write short notes on: (Any two)                                                                  |     |
| a) Direct Memory Access Controller                                                                  |     |
| b) Different types of Assemblers                                                                    |     |
| c) 8085 flag register                                                                               |     |

**POKHARA UNIVERSITY**

|                                                          |                 |                |
|----------------------------------------------------------|-----------------|----------------|
| Level: Bachelor                                          | Semester: Fall  | Year : 2019    |
| Programme: BE                                            | Full Marks: 100 | Pass Marks: 45 |
| Course: Microprocessor and Assembly Language Programming |                 | Time : 3 hrs.  |

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. a) Compare Microprocessor, Microcomputer and Microcontroller. Which is better for high speed operation? Give reason. 7
- b) Define Instruction cycle. Explain flags, registers and control signals available in 8085 microprocessors. 8
2. a) What is addressing mode? Explain the addressing modes of 8086 microprocessor giving appropriate examples. 7
- b) Draw the timing diagram for the 8085 instruction MVI M,14H. 8
3. a) Write an Assembly language program to multiply two 8 bit numbers stored in the memory address D050H and E050H and if the result is less than 80H, save it to F050H else store it in FFFFH. 7
- b) What is the role of assemblers in ALP? Explain one-pass and two-pass assemblers in brief. What is macro assembler? 8
4. a) Write an assembly language program for 8086 to compare two strings and display "Strings are same" for same strings value otherwise display "Strings are Different" in Dos Screen. 7
- b) What is memory interfacing? Interface 4K x 8 EPROM, 8K x 8 RAM with starting address of 1000H. 8
5. a) What is interrupt? What are the source of interrupts? Explain Maskable/Non-maskable, vectored and non-vectored interrupt. 8
- b) Describe the process to transmit and receive the serial data in 8251 USART. 7
6. a) Describe 8254 PIT with diagram. Write down the instructions to generate 4 KHz square waveform for 8254 PIT. 8
- b) What is DMA? Describe how it works with suitable illustration and block diagram. 7

7. Write short notes on: (Any two)
- a) Interrupt Vector Table
  - b) MACRO vs PROCEDURE
  - c) Memory Classification.

2×5