Pre-University Examination Questions paper collection

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Pokhara University

Everest Engineering College

Preboard

Spring

Level: Bachelor
Program : BE CMP(4TH Sem)
Course: Theory of Computation

Year : 2025
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

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

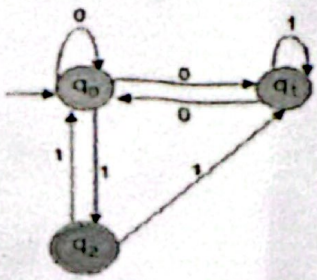
1. a) what is string and alphabet. State and prove mathematical induction for sum of square of N natural numbers.7

Or

State digonalization Principal with example. Use mathematical induction to prove that $7^{2n}+2^{3n-3}*3^{n-1}$ is divisible by 25 for n∈N.8

b) Design a DFA to accept string of 0's & 1's when interpreted as binary numbers .8 would be in Multiple of 3. 7

2. a) Differentiate NFA AND DFA.Convert the following NFA into DFA. 7



b) Create a ∈-NFA for regular expression: (a/b)*a and also show the steps while constructing it.8

Or

What are regular expression. Construct a Nfa for given regular expression.

(ab)* .ac.(a|b)

3 a) Explain the decision algorithm for regular set.7

b) what is the rules for the production of GNF? Convert the following CFG into GNF.8

$S \rightarrow AY \mid XX$

$X \rightarrow x \mid SX$

$Y \rightarrow y$

$A \rightarrow x$

4.a) when the grammer is said be ambigious ? verify this with an example and derivation of string.7

b) why PDA is considered more powerful than Finite state machine. Design a PDA for accepting the language ($a^n b^m c^n \mid n,m>1$) over input alphabet {0,1}.8

5 a) Define Turing Machine. that accepts the language: L = { w ∈ {a, b}* | w is a palindrome }. Trace the steps of the machine when processing the input string baabbaab.7

Or

Design a Turing machine for a 2"s Compliment and show each steps and also check a 2"s compliment for a string 010010010010.

b) Why Turing machine is considerd as much powerful machine.Explain in details. Design a turing Machine for $a^n b^n c^n \mid n,m>1$ over input alphabet {a,b}.8

6 a) What does it mean to say that a language is "Turing-recognizable" and how does the UTM relate that.7

b) What do you understand by time and space complexity in algorithm analysis? Illustrate and differentiate between the complexity classes P and NP using examples. Discuss their importance in addressing practical computational challenges.8

7. write short notes (Any Two)

a) Let $*L = \{ ww \mid w \in \{a, b\} \}^{**}$. Prove that L is not regular using the Pumping Lemma.

b)Halting Problem

c) Recursive and Recursively Enumerable languages

Pokhara University

Everest Engineering College

Final Internal Assessment
Spring - 2025

Level: Bachelor — **F.M. 100**
Program: BE CMP(4th Semester) — **P.M. 45**
Faculty: Science & Technology — **Time: 3hrs**
Section: A/B
Subject: Numerical Methods

Attempt all the questions.

1. a) Find out at least one real root of $x^3 + x^2 - x - 1 = 0$ using Secant method to three decimal places. **7**

   b) Find out all real roots of the equation $x \log_{10} x = 1.2$ using Newton Raphson method or fixed point iteration. **8**

2. a) The following set of data represent the position of a car in a road at specified time, Calculate the position of the car at T = 1.75 hours. (You can use any method) **7**

Time(hr)	0	0.5	1.0	1.5	2.0
Position(km)	0	0.25	1.0	2.25	4.0

OR

Find the missing value from the following table.

x	1	2	?	2.5	3.5
y	0.125	0.5275	0.7520	1.125	2.125

b) For the following set of data, fit a curve $y = ae^{bx}e$ using least square method. **8**

x_i	0.5	1.5	4.5	7.5
$f(x_i)$	2.5	3.5	6.5	9.5

3. a) Integrate the given integral 7

$$\int_1^3 \cos x dx$$

Using trapezoidal, simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule.

b) Using two- and three-point Gauss Legendre formula. Evaluate 8

$$\int_{0.5}^{1.5} e^{x^2} dx$$

4. a) Solve the following system of linear equation using Gauss Jordan Elimination or Cholesky Method. 8

$$2w + x + 3y - z = 9$$
$$-3w + x - 2y + z = -4$$
$$w + 2x - y + 2z = 5$$
$$3w - x - y + 2z = 1$$

b) Find the largest Eigen-value and the corresponding Eigen-vector of the following square matrix using power method. 7

$$\begin{bmatrix} 3 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

5. a) Find the value of y at x = 2.0 for the following initial value problem by using Euler method. $y' = x + y^2$; $y(1) = -0.8$, step size $h = 0.5$. 8

b) Solve $\frac{d^2y}{dx^2} + \frac{2dy}{dx} + 6y = x$, with $y(0) = 0$, $y'(0) = 1$ for $y(0.2)$ taking $h = 0.2$ by RK4 method.

6. a) Solve the Poisson equation $\nabla^2 f = 2x^2 + y$, over the square domain $1 \le x \le 4$, $1 \le y \le 4$, with $f = 0$ on the boundary. 8

b) A steel plate is of size 15 cm × 15 cm. If two of the sides are held at 100 °C and other two sides are held at 0 °C, what is the steady state temperature at interior points assuming a grid size of 5 cm × 5 cm? 7

7. Write short notes on *(Any Two)* 2×5

a) Errors in numerical computing

b) Cubic spline interpolation

c) Solution of differential equation

Pokhara University

Everest Engineering College

Final Internal Assessment
Spring- 2025

Level: Bachelor — **F.M.** 100

Program: BE CMP (4th Semester) — **P.M.** 45

Faculty: Science & Technology — **Time:** 3hrs

Section: A

Subject: Advance Programming with JAVA

Attempt all the questions.

1.	a)	Explain the java architecture and significance of class path. Differentiate between error and exception.	7
	b)	Write a java program to create Rectangle class with data member length and breadth. Include methods getData() and displayArea() in the class. Finally create an object of Rectangle class and display its area.	8
2.	a)	Define package. Explain the types of access modifiers in java.	7
	b)	Define subclass and super class. Explain different types of inheritance in detail.	8
3.	a)	Write a GUI program using components to find factorial and cube of number. Use TextField for giving input and label for output. The program should display factorial if user press mouse on result button and cube if user release mouse from result button.	7
	b)	What are the pros and cons of JavaFX, Explain any two javaFX layout managers.	8
4.	a)	Create a TCP client server application where the client sends a string and the server responds by echoing the same string in uppercase.	7
	b)	Define RMI stubs and skeleton. Create an RMI application where a client can remotely invoke a method that identify either the given number is odd or even.	8
5.	a)	Differentiate between GET and POST methods. Write java program to depict sessions and cookies.	7
	b)	Write a program to extract the user information such as Reg_no, Name, Address, Phone_no from the database and display in the console	8

6. a) Explain life cycle of servlet. Create a HTML file with principal, time and rate. Then create a servlet file that reads values from the HTML form, calculates simple interest and display it. 7

b) Why do we need design patterns? Explain Singleton Pattern and Abstract factory pattern in detail. 8

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

a) SQL injection

b) Multithreading in java (unit 7)

c) CORBA

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Pokhara University

Everest Engineering College

Final Internal Assessment

Fall-2025

Level: Bachelor | **Year : 2025**

Program : BECMP(4th Sem) | **Full Marks: 100**

Section : A | **Pass Marks: 45**

Course: Research Fundamentals | **Time : 3hrs.**

Attempt all the questions.

1. a) Give one example of Applied Research? Why is it important for everyday life? 8

   b) What is a research question? Why is it important ? 7

2. a) How can a researcher identify a research gap during the process of conducting a study? 8

   b) What is Plagiarism? Discuss the importance of plagiarism-free research. 7

3. a) In which situation a questionnaire survey is important? What are the various formats of questions that can be asked in questionnaire survey? 8

   b) How design and creation-based research is carried out? What is the importance of the evaluation of system? 7

4. a) What are different types of used in quantitative research ? Explain with Example. 8

   b) What is unstructured data? What are the steps in text-based data analysis? 7

5. a) Why is data visualization crucial in quantitative research? Describe four different techniques used for visualizing data. 8

b) Explain the rights of people directly involved in research. Why is it important to obtain informed consent from participants? 7

6 a) Give the reason why the proposal is written? 7

b) Explain the need of research report. List out components of a research report. 8

Write short notes on: (Any **Two**) **2×5=10**

a) Imperial Research

b) Annotated bibliography

c) Interview based data generation

d) Hypothesis

Pokhara University

Everest Engineering College

Final Internal Assessment
Spring- 2025

Level: Bachelor — **F.M. 100**
Program: BE CMP(4th Semester) — **P.M. 45**
Faculty: Science & Technology — **Time: 3hrs**
Section:
Subject: Computer Architecture

Attempt all the questions.

1	a)	Define Computer Architecture. Draw a neat structure of a computer system and explain its four general functions.	8
	b)	Define addressing mode. Explain about different addressing modes with appropriate figures and example of each.	7
2	a)	Draw an instruction cycle state diagram with interrupts and explain how it works.	8
	b)	Design a 4-bit ALU using one-bit ALU design. Also draw a sample 1-bit ALU along with the function table for all the works it can perform using S0, S1 and Cin.	7
3	a)	What is associative memory? Explain the match logic for associative memory with the help of diagram and Boolean equation.	8
	b)	Multiply 13 by -7 using Booth's algorithm.	7
4	a)	Why is DMA needed even though we have interrupt driven I/O and programmed I/O. Draw a neat diagram of a DMA controller connected to a CPU and then explain the operations of a DMA transfer.	7
	b)	Draw a block diagram of microprogrammed sequencer and explain the operation on a one address microinstruction format control unit.	8
5	a)	What is pipelining. Explain the hazards prevalent in pipelining and provide the solution for all the hazards.	8
	b)	Explain on how can we connect multiprocessor system using the interconnection structures and explain them all.	7

6 a) Compare and contrast between dual core, quad core and octa core computers. 7

b) How can you achieve parallelism in uniprocessor system? Explain about Flynn's classification of Parallel Processors. 8

7 Write short notes on: (Any two) 2*5=10

a) RISC vs CISC
b) Vector Processor and Array Processor
c) Hardware Performance issues in multicore system.

Best Wishes

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LUMBINI ENGINEERING COLLEGE (LEC)

Final Internal Exam-Spring

Level: Bachelor. Year: 2025

Program: BE Computer- 4th Sem Full marks: 100

Course: Advance Java Programming Pass marks: 45

Attempt all the questions. Time: 3Hrs

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

1.a) Define class and object in java. What is the importance of constructor? Write a java program to perform constructor overloading . (8)

b.) What are the benefits of inheritance? Explain various forms of inheritance with suitable code segments (7)

2. a) Explain about try, catch and finally block.Write a program to show the use of try, catch and finally clause. (7)

b)Illustrate the usage of this keyword. Explain about methods? Explain Method overloading? explain about access modifiers? Explain nested classes. (8)

3. a) What is interface? How does it support multiple inheritance in java (7)

b) Design a GUI form using swing with a text field, a text label for displaying the input message "Input any integer number", and two buttons with caption CheckPalindrome, Reverse. Write a complete program for above scenario and for checking palindrome in first button, reverse it after clicking second button . (8)

Or

Define JDBC drivers. Mention all four types of JDBC drivers and contrast them with their advantages and disadvantages, finally when to use which drivers.

4. a) List and explain the features of HTTP protocol. If HTTP is stateless protocol then with reference to coolies, explain how the server remembers a client over the internet. (8)

b)Explain the architecture of JSP in contrast to MVC. Mention its usefulness in application development and how it separates the content, behavior and presentation. (7)

5. a) What is socket? How can you write java programs that communicate with each other using TCP sockets? Discuss with suitable example. (8)

b) . What is Java Mail API ? How can you use this API to send email messages? (7)

6. a) Compare JavaFX with swing. Explain HBox and VBox layouts of JavaFX. (8)

b) Explain the significance of cookies and sessions with suitable example? (7)

7. Write Short Notes on any two (2X5)

a. InetAddress class b.ORM c. Singleton and Abstract Factory design.

LUMBINI ENGINEERING MANAGEMENT AND SCIENCE COLLEGE

FINAL INTERNAL ASSESSMENT

Level: Bachelor

Year: 2025

Programme: Computer/ 4th semester

Full Marks: 100

Course: Computer Architecture

Pass Marks: 45

Time: 3 hrs.

Attempt all the questions.

1.

a. Determine the following based on given instruction format where the number of bits in each field is specified. [2+2+1+3]

I Field	Opcode Field=8	Register Code Field=7	Address Field=16

i. Memory size and data size of the system.
ii. Total number of register used by the system and size of register.
iii. Total number of instructions used in the system
iv. The address of four consecutive microinstruction in the control memory of 2KB.

b. Define micro-operation. Explain different types of micro-operation.[2+5]

[OR]

Define control memory. Explain the working of microprogrammed control unit. Differentiate between vertical and horizontal microprogrammed control unit.[1+3+3]

2.

a. What is the significance of addressing modes? Explain different addressing modes with suitable example.[1+6]

b. Write the structure of VHDL programming and write the VHDL code for full adder using component.[3+5]

3.

a. A digital computer has a common bus system for 8 registers of 8 bits each. The bus is constructed with multiplexers. [2+1+1+3]

i. How many selection inputs are there in each multiplexers?
ii. What size of multiplexers are needed?
iii. How many multiplexers are there in the bus system?
iv. Draw your bus system.

b. Why CPU registers are necessary? implement the expression $X=(A+B)*(C-\frac{D}{E})$ in [2+2+4]

i. Single accumulator organized CPU.
ii. Stack organized CPU.
iii. Register organized CPU.

4.

a. How a negative number can be represented? Find the product of (-12)*(+10) using Booth's multiplication algorithm. [2+6]

b. How parallel processing can be achieved? In a certain scientific computations it is necessary to perform the arithmetic operation $(A_i + B_i)*(C_i + D_i)$ with stream of numbers. Specify a pipeline configuration to carry out this task. List the contents of all registers in the pipeline for i=1 to 6.[2+5]

5.

a. Given a cache memory with access time of 200 ns and RAM with access time of 2000 ns, if the hit ratio is 90%, find the average memory access time. Consider a direct mapped cache of size 16 KB with block size 256 bytes. The size of main memory is 1 MB. Find-[3+2+2]

i. Number of bits in tag
ii. Tag directory size

b. Why page replacement is necessary? Consider the following pages references and determine the hit ratio and the pages in the frame at the end of replacement, if there are three frames.

i. Using FIFO
ii. Using LRU
iii. Using Optimal page replacement

Reference pages:- 6, 1, 1, 2, 0, 3, 4, 6, 0, 2, 1, 2, 1, 2, 0, 3, 2, 1, 2, 0.
[2+2+2+2]

6.

a. DMA overcome the drawbacks of programmed I/O and interrupt driven I/O, clarify the statement. [7]

b. Define multiprocessor. List the different types of interconnection of multiprocessor and explain any one of it. [2+1+5]

7. Write short note (ANY TWO) [2*5=10]

a. Multicore organization
b. I/O interface module
c. Computer organization vs computer architecture

1900

128×2 256

2×2×2×2×2×2

Lumbini Engineering College (Internal Exam)

Level: Bachelor | **Year: 2025**
Program: Com/EnE | **F.M: 100**
P.M: 45
Course: Engineering Mathematics IV | **Time: 3 hrs.**

Attempt all the questions:

1.a) Define analytic function. State and prove the necessary condition for f(z) to be analytic. Also check: whether cosz is analytic or not? (8)

OR

Define Harmonic function. If a function f(z) is analytic then show that $U_x = V_y$ and $U_y = -V_x$.

b) Write Define conformal mapping. Name the type of conformal mapping. 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). Show with figure. ....(7)

2.a) State Cauchy Integral formula for derivative. Evaluate $\oint_C \frac{e^z}{(z+1)^3(z-2)}dz$, where c:|z-1|=3 (8)

b) Find the Laurent Series expansion of $\frac{z^2-1}{z^2+5z+6}$ in the region i) |z|<2 ii) 2<|z|<3 (7)

3.a) State and prove that second shifting theorem of Z-transform. Obtain z-transform of $(1-e^{-at})$, a>0. (7)

b) Solve the difference equation using z-transform.
$y_{n+2}-3y_{n+1}+2y_n=4^n$, $y_0=0$, $y_1=1$ (8)

4.a) Find the Fourier cosine transform of $f(x)=e^{-x}$, x>0 and hence show that $\int_0^\infty \frac{1}{(1+x^2)^2}dx = \frac{\pi}{4}$ (7)

b) What are the Fourier sine and cosine integrals of a function f(x)?

Show that $\int_0^\infty \frac{\cos\frac{\pi}{2}w \cos xw}{1-w^2}dw = \begin{cases}\frac{\pi}{2}\cos x ; |x| < \frac{\pi}{2} \\ 0 \quad |x| > \frac{\pi}{2}\end{cases}$

5.a) Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = c^2\frac{\partial^2 u}{\partial x^2}$ with given boundary conditions u(0,t)=0, u(L,t)=0 and initial deflection u(x,0)=f(x), initial velocity $\frac{\partial u}{\partial t}$=g(x). (8)

b) A rod of length l has it's ends A and B maintained at 0°C and 100°C respectively, until strady state condition prevails. If the changes consist of raising the temperature A to 20°C and reducing that of B to 80°c. Find the temperature distribution in the rod at time t. (7)

6.a) Change the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}=0$ into cylindrical polar co-ordinate form. (8)

OR

Derive the solution of two dimensioned wave equation under the condition when a circular membrane of radius R is vibrating.

b) Show that U= e^{2x}(x cosy – y siny) is a harmonic function. Find an analytic function for U. If U is the real part. (7)

Solve the following: Any Two **(2x5=10)**

i) Find the solution of the differential equation. $y^2u_x - x^2u_y = 0$ by separating the variables method.

ii) Find the image of infinite strip $\frac{1}{4} < z < \frac{1}{2}$ under the transformation $w=\frac{1}{z}$

iii) Find the z transform of $\sin(\frac{n\pi}{2})$ and $\cos(\frac{n\pi}{2})$.

The End

z^2-2z+2

$z(z-2)-1(z-2)$

Lumbini Engineering, Management & Science College

Final Internal Exam

Level: Bachelor
Programme: BE Computer/Electrical 4th sem
Course: Numerical Methods

Year: 2025
Full Marks: 100
Time: 3 hr

Attempt all questions.

Q>1(a) Find the root of the equation $4e^{-x}\sin x - 1 = 0$ using secant method given that the root lies between 0 and 0.5 correct to three decimal place. (8)

Q>1(b) Find the square root of 18 using NR method correct to 3 decimal place. (7)

Q>2(a) Find the root of the equation $x^3 + x^2 - 1 = 0$ correct to 6 decimal place using fixed point iteration method. (8)

Q>2(b) A third degree polynomial passes through (0,1), (1,-1), (2,-1) and (3,2). Find its value at x = 4 using forward difference interpolation. (7)

Q>3(a) Find the distance moved by a particle and its acceleration at the end of 4 seconds if the time versus velocity data is as follows: (8)

Time(t)	0	1	3	4
Velocity (v)	21	15	12	10

Q>3(b) Fit the exponential curve $y = ae^{bx}$ to the following data (7)

x	2	4	6	8	10
y	25	38	56	84	104

Q>4(a) Using Gaussian 2 point and 3 point quadrature formula, evaluate $\int (\tan^{-1} x/x)\, dx$ with lower limit 0 and upper limit 1. (8)

Q>4(b) Solve the following set of equation using LU factorization method (7)

$x + 2y + 3z = 5$
$2x + 8y + 22z = 6$
$3x + 22y + 82z = -10$

Q>5(a) Find the largest eigen value and corresponding eigen vector using power method (8)

$$A = \begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$$

Q>5(b) Solve the first order IVP by RK-1: $y' = x + y$, $y(0) = 0$ at $x = 1$ taking $h = 0.2$. (7)

Q>6(a) Solve the following boundary value problem by shooting method $y'' = 6x + 4$, $y(0) = 2$, $y(1) = 5$ by applying RK-2 method. (8)

Q>6(b) Solve the equation $\nabla^2 u = -81xy$, $0 < x < 1$, $0 < y < 1$ with $h = 1/3$, $u(0,y) = u(x,0) = 0$ & $u(1,y) = u(x,1) = 100$ (7)

Q> 7 Write short notes on: (any two) (5*2=10)

(i) Gauss Jacobi method
(ii) Errors in Numerical Methods
(iii) Interpolation

Lumbini Engineering Management & Science College

Final Term Assessment

2022

Program : Computer (4th Sem)
Semester : IV
Subject : Theory of Computation (TOC)

Time : 3 hrs
FM : 100
PM : 45

- ✓ *Candidates are requested to give their answer as far as practicable in their own words.*
- ✓ *The figure in the margin indicates the full marks*
- ✓ *Attempt ALL question*

1 a) Define alphabet, string and language with examples. Discuss the operational characteristics of a Finite Automata. [8]

b) Construct a FA equivalent to the following Transition Table and construct an equivalent DFA. [7]

Q\ Σ	0	1
→q_0	{q_0, q_1 }	q_0
q_1	q_2	q_1
q_2	q_3	{q_3, q_2 }
*q_3	∅	q_3

2 a) Construct a Finite Automata equivalent to the following Expression. [8]

i) $(xy + x)^* + x^*$

ii) $(nm + n)^* (nn+m)^*$

b) State and prove pumping lemma for regular languages. [7]

3 a) Show that the class of languages of FA is closed under union and kleene closure. [8]

b) State pumping lemma for context free grammar. Show L= {$a^n b^n c^n$: n>0} is not context free. [7]

4 a) What do you mean by unit production and null production? Let G be S→AB, A→a, B→C | b, C→D, D→E and E→a. Eliminate unit production and get an equivalent grammar. 7

b) What do you mean by Normal Form? Reduce the following grammar to CNF. [8]

S→1A | 0B, A→1AA | 0S | 0, B→0BB | 1S |1

5 a) "TM is stronger than PDA". Justify this statement. Construct a PDA that will accept all strings over {a, b} consisting of equal number of a's and b's. [7]

b) Define universal Turing Machine and explain its encoding technique in detail with suitable examples. [8]

6 a) What are P and NP problems? Explain NP complete problems giving examples. [7]

b) Describe the Computational Complexity theory. [8]

7. Write short notes on (Any two) [5*2=10]

a) Chomsky Normal Form
b) Church Turing Thesis.
c) Halting problem

GANDAKI COLLEGE OF ENGINEERING AND SCIENCE

Level: Bachelor | Seimester: Spring | Year : 2025
Programme: BE CE IV | Full Marks: 100
Course: **CMP 262 : Computer Architecture** | Pass Marks: 45
Time : 3hrs.

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

1.	a)	Differentiate Computer organization and Computer architecture in detail with example.	4+4
	b)	Explain various types of micro-operations in detail with examples.	7
2.	a)	What is the instruction cycle? Explain various sub cycles involved in instruction cycle with the help of T states.	2+5
	b)	Explain about the micro-programmed and hardwired control unit in brief.	8
3.	a)	Verify the operation (8) x (-3) using Booth's algorithm.	8
	b)	How is the floating-point number represented in a computer system explain in brief ?	7
4.	a)	Register Windowing and Register Renaming is the techniques used in RISC pipeline. Explain this in detail with examples.	7
	b)	Explain cache write policy in brief and explain FIFO, LFU cache replacement algorithm with example.	4+4
5.	a)	Explain in detail about I/O processor and I/O channel describing the communication steps in detail.	8
	b)	Explain Flynn's classification of computer system in detail.	7
6.	a)	Explain different hardware and software performance issues in multicore computers.	4+4
	b)	Explain different types of interconnection structures in multiprocessors.	7
7.	Write short notes on **(Any Two)**		2×5
	a)	GPU and TPU	
	b)	VHDL program for Half Adder	
	c)	Microinstruction sequencing and execution.	

Lumbini Engineering, Management & Science College

Internal Assessment - I

Level: Bachelor | Year: 2025

Program: BE (Computer - 4th) | Full Marks: 100

Course: Research Fundamental | 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.

Q. 1 a) Define and explain the term "Research". Explain its importance and objectives. (7)

b) What are the different types of research? Explain each in detail. (8)

Q. 2 a) Explain the 6 P's of research in detail. (7)

b) What are the differences between a Project report and a Research report? (8)

Q. 3 a) What is a literature review? Explain the effective literature studies approach for the research problem. (8)

b) Explain the Research process with a suitable diagram. (7)

Q. 4 a) Explain the essentials that are to be considered by a researcher while formulating Research Problem. (7)

b) What is a Research Problem? Explain Components of Research Problem. (8)

Q. 5 a) What is a Questionnaire? Explain the process of constructing a questionnaire. (8)

b) What are the ethical issues concerning the research participants of a research activity? Explain. (7)

Q. 6 a) What do you mean by plagiarism? Explain different types of plagiarism. (8)

b) Explain how quantitative researches differ from qualitative research. (7)

Q 7. Write short notes (Any Two) (2x5=10)

a) Ethnographic research and its types

b) Rights of an ethical researcher

c) Action research

1 Fall

GANDAKI COLLEGE OF ENGINEERING AND SCIENCE

Level: Bachelor | Semester: Spring | Year : 2025
Programme: BE CE IV | Full Marks: 100
Course: **Theory of Computation** | Pass Marks: 45
Time : 3hrs.

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

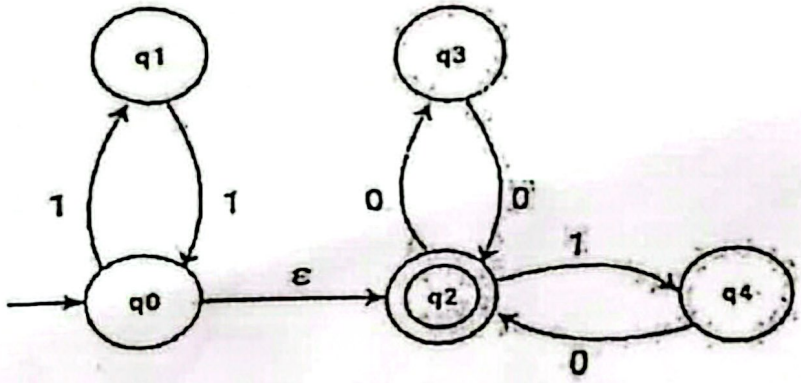
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) State and Prove Pigeonhole Principle. Prove by mathematical induction that n^4-4n^2 is divisible by 3 for $n>=0$; 7

   b) Differentiate between DFA and NFA. Construct a DFA that recognizes Languages L that accepts the set of strings that starts and ends with different symbol over $\sum$= (a, b) and test your design with a valid string. 8

2. a) Convert the following NFA to its equivalent DFA. 7



   b) Define Pumping Lemma for regular language. Show that $L=\{a^n b^{2n} : n>1\}$ is not regular using pumping lemma for regular language. 8

3. a) What is CFL? Convert the following CFG into CNF. 7

   $S \rightarrow ASA \mid aB$

   $A \rightarrow B \mid S$

   $B \rightarrow b \mid \epsilon$

b) Design a PDA for the following language $L= \{a^n b^{2n+1}: n>0\}$ also check it for aabbbbb and aabbb. 8

OR,

Define PDA with block diagram. Construct a PDA that accepts $L= \{a^n b^n: n>0\}$. Show by sequence of IDs that aabb is accepted by this PDA,

4. a) Show the language $L= \{a^n b^n c^n: n>0\}$ is not context free using the concept of pumping lemma. 7

b) What is CFG? Design CFG for language $L= \{a^m b^n: m>=1, n>=1\}$. Test the grammar for derivation of aaaabbb and also draw equivalent parse tree. 8

OR,

PDA is stronger than FA and for every CFG there is an equivalent PDA. Justify this statement with an example.

5. a) Design a TM for $L= \{WW^R : W^R$ is reverse of $W \in (a,b)^*$ for both even and odd palindrome. 7

OR,

Define Turing Machine. Design a Turing machine that accepts the language $L= \{a^n b^n c^n: n>=0\}$.

b) Describe the concept of "accepting state" and "halting state" in a Turing Machine. Show that the function $f(n)=2n$ is Turing computable. 8

6. a) State the halting theorem and give outline of its proof. 7

b) What is P, NP and NP-complete problems? Explain with examples. 8

7. Write short notes on **(Any Two)** 2×5

a) Simplification of CFG.

b) Universal Turing Machine

c) Church-Turing Thesis

GANDAKI COLLEGE OF ENGINEERING AND SCIENCE

Level: Bachelor | Semester: Spring | Year : 2025
Programme: BE CE IV | Full Marks: 100
Course: **Applied Mathematics** | 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. Show that the function $u = y^3 - 3x^2y$ is harmonic then find harmonic conjugate and corresponding analytic function. 7

   b) State Cauchy- Residue theorem, then evaluate the following integrals. 8

   $\int_C \frac{Z-23}{Z^2-4Z-5} . dz \quad C: |Z-2| = 4$

2. a) Define bilinear transformation. Find the bilinear transformation which maps $Z_1 = 0, Z_2 = 1, Z_3 = \infty$ into $W_1 = i, W_2 = -1, W_3 = -i$. 7

   b) Define analytic function. If $f(z) = u(x,y) + iv(x,y)$ is analytic in Domain D, then the partial derivatives u_x, V_x, u_y, V_y exists and satisfy $u_x = V_y$ and $u_y = - V_x$. 8

3. a) State and prove first shifting theorem of z- transform. Using it evaluate the z- transform of $a^n \cos bt$ and $a^n \sin bt$. 7

   b) Solve the difference equation by using z-transform: $y_{n+2} - 4y_{n+1} + 4y_n = 2^n$ with $y_0=0, y_1=1$ 8

   OR

   State and prove Initial and final value theorem.

4. a) Derive fourier integral from fourier series. 7

   OR

   Find the fourier integral in complex form.

b) Define fourier cosine and sine transform. Find the fourier sine transform of e^{-x} (x> 0) and hence show that. 8

$$\int_0^{\infty} \frac{x \sin mx}{x^2+1} \, dx = \frac{\pi}{2} \cdot e^{-m}$$

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

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 $\frac{\partial u}{\partial t}|_{t=0} = g(x)$. 8

6. a) The ends A and B of a rod 20 cm long temperature at 30^0 c and 80^0 c until steady state prevails. If the change consists of raising the temperature of A to 40^0 c and reducing that of B to 60^0. Find the temperature distribution in the bar at time t. 7

b) Express the Laplacian. 8

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

7. Write short notes on (Any Two) 2×5

a) Solve the partial differential equation $u_{xy} - u = 0$.

b) Check the analyticity of the function f(z) = *arg* z

c) Verify the given function.

$u = \sin 9t \cdot \sin \frac{x}{4}$, satisfy one dimensional wave equation.

GANDAKI COLLEGE OF ENGINEERING AND SCIENCE

Semester: Spring

Level: Bachelor
Programme: BE CE & SE IV
Course: **Numerical Methods**

Year : 2025
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

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

1. a) What are the different types of errors ? Solve the following equation $f(x)= xe^x-\cos x$ by Newton Raphson Method upto 4 decimal places. (2+6)

   b) Using secant method, find a positive real roots of the equation $x^3 - 2x+1=0$, correct to 4 decimal places. 7

2. a) From the given data find the lagrange polynomial and evaluate f(2.5). 8

x	1	2	4	5	7
F(x)	1	1.414	1.732	2.00	2.6

OR

Explain difference between interpolation and extrapolation ? Find the value of y(1.5) using cubic interpolation.

x	1	2	3	4
y	1	2	5	11

7

b) Use the suitable method to fit a curve $y=ae^{bx}$ for the following data.

x	-2	-1	0	1	2	3	4
y	38	6	0	-5	-11	130	300

3. a) Compute the following using Simpson's 1/3 rule for n= 8 with an accuracy to five digit. 8

$$\int_1^5 e^{-x^2}\,dx$$

OR

Use Romberg integration to evaluate the following.

$$\int_4^{5.2} \log x \, dx$$

7

b) Evaluate the following using Gaussian three point Integration formula

$$\int_2^4 (x^4 + 1), dx$$

4 a) Solve the following system of Linear equations using partial pivoting method. 8

$x + y + z = 4,\ x + 4y + 3z = 8,\ x + 6y + 2z = 6$

b) Solve the following system of equations using Gauss Seidel method. 7

$3x + 2y + z = 10,\ 2x + 3y + 2z = 14,\ x + 2y + 3z = 14$

5 a) From the following differential equation estimate the value of y(1) using RK 4th order. 8

$dy/dx + 2x^2y = 4$ with $y(0) = 1$ take $h = 0.5$

b) Find the dominant eigen value and corresponding eigen vectors of the matrix below using Power method. 7

$$\begin{pmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix}.$$

6 a) Solve the Poisson equation $\nabla^2 f = -10(x^2 + y^2 + 10)$ over the square with $0 \le x \le 3; 0 \le y \le 3$ and $f = 0$ on boundary. Use $h = 1$. 8

b) Solve the following differential equation for $y(0.4)$ using Heun's method. 7

$d^2y/dx^2 + 2dy/dx - 3y = 6x$; with $y(0) = 0$ and $y'(0) = 1$ (take $h = 0.2$).

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

a) Shooting Method

b) Algorithm for Matrix factorization method

c) Schimidit method for Heat equation.

GANDAKI COLLEGE OF EINGINEERING AND SCIENCE

Level: Bachelor | Semester: Spring | Year : 2025
Programme: BE CE IV | Full Marks: 100
Course: **Advanced Programming with 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. Explain the Java architecture and significance of class path. Differentiate between error and exception. 7

   b. Define Collection Framework in Java. Explain the different components of java collection framework. 8

2. a. Define interface. Write Java program that override methods (getUserValue()) and (displayUserDetail()), where getUserValue() is defined to get user detail(name, address, age) and displayUserDetail() to display user detail. 8

Or

What are the implications in Java when defining a variable, method and class as final? Explain the various access modifiers in Java and their significance.

b. Why do we need swing components? Explain the uses of check boxes and radio buttons in GUI programming. 7

3. a. Write a program to create a Frame that has two TextField components, one Label and a Button. When the user clicks on the button, calculate the sum of the values entered in the first and second TextField and display the result on the third Label. 8

b. Create a TCP client server application where the client sends a string and the server responds by echoing the same string in upper case. 7

4. a. Define RMI stubs and skeleton. Create an RMI application where a client can remotely invoke a method that sends the sum of any two given integers. 7

b. Define Java Socket Programming. Write java program to create own client and server. 8

5. a. Briefly describe JDBC-ODBC types of bridge and driver in java. 8

Or

Write a program(WAP) to insert data of any students with schemas(name, age, semester, university, status). By default SQL connector is to be used(if comfortable with any database connector. Free to describe and use accordingly)

b. Explain the life cycle of servlet. 7

6. a. Why do we need design patterns? Explain Singleton Pattern and Factory Method Pattern in detail. 7

b. Explain the importance of concurrency and multithreading in Java. How multithreading is performed in Java? 8

7. Write short notes on **(Any Two)** 2×5

a. ORM

b. UDP Socket

c. JavaMail

GANDAKI COLLEGE OF ENGINEERING AND SCIENCE

Level: Bachelor | Semester: Spring | Year : 2025
Programme: BE CE & SE IV | Full Marks: 100
Course: **Research Fundamentals** | Pass Marks: 45
Time : 3hrs.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are the types of Research? Explain each with their characteristics and applications. 8

   b) What are the 6 P's of the Research? Explain in brief.. 7

2. a) What is the role of Literature Review? How do you organize the literature review? Explain. 8

   b) What do you mean by research question? Why is it crucial for the research? 7

   OR

   A bank wants to conduct research to evaluate the user experience of its mobile application. Suggest two suitable research strategies for this context and explain in brief..

3. a) Define Plagiarism in the context of academic research and discuss its consequences. 8

   b) What is Quantitative Research? What are the various data analysis techniques for Quantitative Research? 7

   OR

   What do you mean by the conceptual framework of a research process model? Discuss briefly about data generation methods.

4. a) What are the responsibilities of Ethical researcher? 7

   b) What do you mean by participants? Explain the right of the participants. 8

5. a) Why is Research Proposal needed? Explain the components of the methodology in Research Proposal. 8

b) How does a well-written proposal contribute to the success of a research project? Explain in detail. 7

6. a) Why do we need Research Report? How Research Findings are presented in Research Report? Explain. 8

b) What information should be included while writing an Abstract of a research paper? Illustrate the way of writing citations and references in IEEE style with examples. 7

7 Write short notes on **any two**: 5x2

a) Research Objective

b) Action Research

c) Ethnography

COSMOS COLLEGE
OF MANAGEMENT AND TECHNOLOGY

Term Test II

Date: 2082/04/04			
Level	BE	Full Marks	70
Programme	BEIT, BCE	Time	
Semester	IV	2 hrs	

Subject: - Applied Mathematics

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *Attempt 70 marks questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

1 a) Define analytic function. Show that the function $u(x, y) = 3x^2y + x^2 - y^3 - y^2$ is a harmonic function. Also fond the harmonic conjugate of u. [8]

b) State Cauchy's Residue theorem and use it to evaluate $\oint_C Tan\, z\, dz$, where c: $|z| = 2$ [7]

2 a) Evaluate $\oint_C \frac{\cot z}{\left(z - \frac{\pi}{2}\right)^2} dz$, where C is the ellipse $4x^2 + 9y^2 = 36$. [7]

b) State Taylor series. Expand the function $f(z) = \frac{1}{z - z^3}$ in the region [8]

(i) $1 < |z+1| < 2$. (ii) $|z+1| > 2$

OR

Show that bilinear transformation $w = \frac{5-4z}{4z-2}$ maps the circle $|z| = 1$ in Z plane onto the circle $u^2 + v^2 + u - \frac{3}{4} = 0$ in w plane

3 a) Show that $Z[nf(t)] = -z\frac{d}{dz}[F(z),]$ where $F(z) = Z[f(t)]$.

Find $Z^{-1}\left[\frac{z}{(z+1)^2(z-1)}\right]$ [7]

b) Solve $y_{n+2} - 3y_{n+1} + 2y_n = 0$ where $y(0) = 0$, $y_1(0) = 1$, by using z-transform. [8]

4 a) State the first shifting theorem for Z transformation and hence find $Z[e^{-at}t]$. [7]

b) Find Fourier cosine transform of $f(x) = e^{-mx}$ for $m > 0$. [8]

Then prove that $\int_0^\infty \frac{\cos kx}{1+x^2} dx = \frac{\pi}{2} e^{-k}$

OR

Define convolution of the two functions. If f(x) and g(x) are piecewise continuous, bounded absolutely integrable on the x- axis. Prove that $F(f*g) = \sqrt{2\pi}\, F(f).F(g)$

5 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 solution of one -dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, under boundary and initial condition. [8]

6 a) Solve: $u_{xx} + u_{yy} = 0$ by using separation of variables method [7]

OR

Find the solution of one -dimensional wave equation with initial deflection $\frac{1}{2}\sin 3x + \sin x$ and initial velocity is zero.

b) Show that the Laplacian in u in polar coordinate is $\nabla^2 u = u_{rr} + \frac{1}{r}u_r + \frac{1}{r^2}u_{00}$. [8]

7 a) Find Maclaurin expansion of the function $f(z) = \frac{z+2}{1-z^2}$. [2.5]

b) Show that $\oint_C \frac{dz}{z} = 2\pi i$, where C is the unit circle, counter-clockwise. [2.5]

c) Solve the differential equation: [2.5]
$u_{xy} - u = 0$.

d) Find z–transform of na^n [2.5]

COSMOS COLLEGE
OF MANAGEMENT AND TECHNOLOGY

Term Test II

Date: 2082/04/05			
Level	BE	Full Marks	70
Programme	BCE	Time	
Semester	IV	2 hrs	

Subject: - Numerical Methods

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ ***Attempt 70 Marks questions.***
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Derive the iterative formula for NR method. Use the **Newton-Raphson method** to find a root of the equation $x\sin(x) + \cos(x)$ near $x_0=\pi$. Perform four iterations. [2+5]

   b) Differentiate between false position method and bisection method. Find a real root of the equation $x^3-4x-9=0$ using the **Bisection method**, correct to three decimal places. [8]

2. a) The function f(x) is known only at the following unequal intervals:

x	5	7	11	13	17
f(x)	12	16	28	36	60

   Use **Newton's Divided Difference Interpolation Formula** to compute f (9). [7]

   b) The following data relates temperature x and the resistance R of a thermistor.

x(°C)	0	10	20	30	40
R(Ω)	100	80	65	50	40

   *Fit a **linear regression** model of the form: $\log_{10}R=a+bx$ using least square method. Find the estimated resistance at 25°C.* [8]

3. a) Use Romberg integration to estimate $\int_0^1 \frac{1}{1+x^2}dx$ to a tolerance of 10^{-4}. Compare the estimated solution with the true solution. [7]

   b) What are the needs of using numerical differentiation? A car's distance (in meters) after every 2 seconds is recorded:

Time(s)	0	2	4	6
Distance(m)	0	4	16	36

   Find the **speed and acceleration of the car at 4 seconds using central difference formula.** [8]

4. a) What are limitations of Naïve Gauss elimination method? Use partial pivoting method to solve the following simultaneous algebraic equations. [7]

   $x+2y+z=9$
   $2x+3y+3z=21$
   $3x+y+2z=17$

   b) Solve the system of equations using Jauss-jacobi method and **Gauss-Seidel method (up to four iterations) with the same initial guess and comments on speed of convergence.** [8]

   $10x+y+z=6$
   $x+10y+z=6$
   $x+y+10z=6$

5. a) Solve the same equation $\frac{dy}{dx} = x + y;\ y(0) = 1$ using the **Improved Euler method** with step size h=0.2, find y (0.4). [7]

b) Use the **Runge-Kutta 4th order method** to solve: $\frac{dy}{dx} = x^2 + y; y(0) = 1$

Find y (0.2) using step size h=0.1. [8]

6. a) Consider the one-dimensional heat equation $u_t = u_{xx}$
Solve this equation for a rod of length 1, subject to the conditions: Boundary conditions:
$u(0, t)=0$, $u(1, t)=0$ and Initial condition: $u(x, 0) = 100\sin(\pi x)$ [7]

b) A square plate of size 1m x 1m is governed by the Laplace equation, $uxx+uyy=0$, representing its steady-state temperature distribution. The boundary conditions are as follows: **Top Edge:** $u(x,1)= 100°C$ **,Left Edge:** $u(0,y)= 0°C$ **,Bottom Edge:** $u(x,0)= 0°C$, **Right Edge:** $u(1,y)=0°C$. Use a square mesh with step size $h=\Delta x=\Delta y=1/3$ [8]

7. Write short notes on: (***any two***) [5*2=10]
   a) Algorithm of secant method
   b) Shooting method
   c) Lagrange Interpolation

COSMOS COLLEGE
OF MANAGEMENT AND TECHNOLOGY

Term Test II

Date: 2082/04/06			
Level	BE	Full Marks	70
Programme	BCE	Time	
Semester	IV	2 hrs	

Subject: - Research Fundamentals

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ ***Attempt any five questions with short notes mandatory.***
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define research and explain its key characteristics. Discuss how research differs from ordinary information gathering. (8)
   b) Explain the importance of research ethics with two examples of ethical violations in academic research. (7)

2. a) Describe the essential components of a research proposal. Why is the "Problem Statement" considered the backbone of a proposal? (8)
   b) Compare and contrast qualitative and quantitative research methods. Provide one example where each method would be most appropriate. (7)

3. a) What is a research design? Explain the key elements that constitute a robust research design. (8)
   b) What are the 6P's of research? Explain in brief. (7)

4. a) Discuss the importance of formulating clear research objectives. How do they guide the research process? (7)
   b) Explain the purpose and significance of a literature review in research. What are the key steps involved in conducting a comprehensive literature review? (8)

5. a) Explain the importance of data analysis in research. Briefly describe any two data analysis techniques. (8)
   b) Describe the primary methods of data collection in research. Discuss the advantages and disadvantages of any two methods. (7)

6. a) Compare exploratory, descriptive and experimental research designs. Provide examples where each would be most appropriate. (8)
   b) Why is proper citation and referencing important in academic writing? Discuss any four commonly used citation styles. (7)

7. Write short notes on: (***any two***) [5*2=10]
   a) Hypothesis in Research
   b) Plagiarism
   c) Primary vs Secondary Data
   d) Significance of Research Objectives

COSMOS COLLEGE
OF MANAGEMENT AND TECHNOLOGY

Term Test II

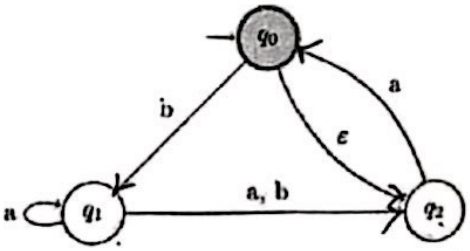
Date: 2082/04/07			
Level	BE	Full Marks	70
Programme	BCE	Time	
Semester	IV	2 hrs	

Subject: - Theory of Computation

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ ***Attempt 70 mark questions.***
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Draw the block diagram of a finite state automata and also formally define DFA. [7]
   b) Define Finite State Automata. Construct a DFA that recognizes. language L that accepts the set of strings that contains neither aa nor bb as substring over $\sum$= {a, b} and test your design with a valid string. [8]

2. a) Convert the following NFA to its equivalent DFA. [7]



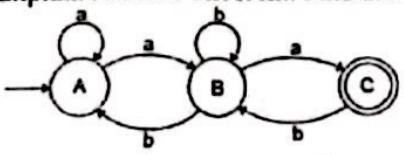
   b) Define pumping Lemma for regular language. Show that $L = \{a^n b^{2n}: n>1\}$ is not regular using pumping lemma for regular language [8]

3. a) What are the decision properties of regular language? Explain in detail. [7]
   b) Describe Context free grammar with its formal definition. Convert the following grammar into Chomsky Normal form. [8]
   S → bA/aB, A→ bAA/aS/a, B→ aBB/bS/b

4. a) Show that the language $L=\{a^n b^n c^n: n>0\}$ is not context free using the concept of pumping lemma. [7]
   b) Design a PDA which accepts the language given by
   $L=\{w \varepsilon \{a,b\}^* : wcw^R$ .Consider Z_0 to be the bottom of the stack. [8]

5. a) Design a Turing machine for computing function: [7]
   F (x, y) = x + y and show your validation for x = 2 and y = 4.
   b) Design a Turing machine which replaces each occurrence of a by b and vice versa and validate your design using #aabba#. [8]

6. a) Explain Arden's Theorem. Find the expression for the following FSA. [7]



   b) Explain the Halting Paradox in Turing Machine. What are Space and Time complexity? [8]

7. Write short notes on (Any Two): [2*5=10]
   a) P class and NP class problems
   b) Church-Turing Thesis
   c) Recursive and Recursively Enumerable Language

C-103

COSMOS COLLEGE
OF MANAGEMENT AND TECHNOLOGY

Term Test II

Date: 2082/04/09			
Level	BE	Full Marks	70
Programme	BCE	Time	
Semester	IV	2 hrs	

Subject: *- Advance Programming in Java*

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ ***Attempt any seven questions.***
- ✓ *The figures in the margin indicate* ***Full Marks.***
- ✓ *Assume suitable data if necessary.*

1. How Java is Platform Independent. Explain about JVM, JRE, and JDK? [10]
2. What is inheritance? Does Java support direct multiple inheritance? Explain with an example [10]
3. Explain exception handling. How can we create a user-defined exception [10]
4. What is the interface? Create an interface Bank with three methods: deposit, withdraw, and showBalance). Create a class AbcBank that should inherit from the Bank interface. [10]
5. WAP to create a swing application with 3 text fields and 1 button, when the button is clicked. Show the sum of the value of the first and second text fields in the third text field [10]
6. Define various layout managers used in JavaFX. Write a program to show the usage of one layout manager. [10]
7. Define JDBC. What are the steps for JDBC? [10]
8. Write a program to send "Hello Java" from client to server using TCP. [10]
9. What is Multithreading in Java? Create a program to show the usage of multi-threading. [10]
10. Write short notes (any 2) [2*5=10]

    a) URL b) JSP Request

    c) Java Mail API d) RMI

COSMOS COLLEGE
OF MANAGEMENT AND TECHNOLOGY

Term Test II

Date: 2082/04/11			
Level	BE	Full Marks	70
Programme	BCE	Time	
Semester	IV	2 hrs	

Subject: - Computer Architecture

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ ***Attempt all questions.***
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1) a. Explain in detail about the four stage instruction pipeline with necessary diagrams. [10]
   b. What is Parallel Processing? Show that the Speed up factor of a pipelined processor is equal to the number of stages in a pipeline. [10]
2) a. Explain about Direct Mapping in detail. Explain about Array Processing and its types. [10]
   b. What is System Bus? Draw the block diagram of micro programmed Control unit and explain in detail. [10]
3) a. Explain how data transfer is performed with Direct Memory Access (DMA) technique with necessary diagram. [10]
   b. Explain about the Conflicts that can be seen in instruction pipeline. How can they be resolved? Explain. [10]
4) Write Short Notes on: (Any ONE) [2*5=10]
   a. CPU-IOP Communication
   b. Interconnection structures in multiprocessors

Madan Bhandari College of Engineering
Urlabari-3, Morang
Final Internal Examination

Level: Bachelor
Programme:B.E Computer
Year/Part:II/II

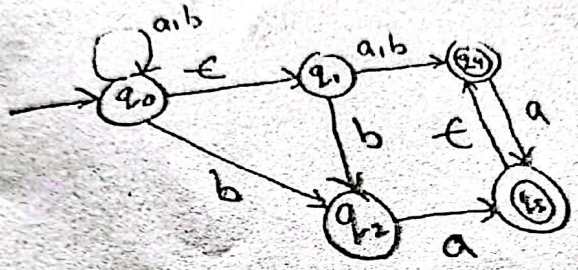
Full Marks: 100
Pass Marks: 45
Time: 3 hrs

Subject: - Theory Of Computation

- ✓ *Candidates are required to give their answers in their own words as far as possible.*
- ✓ *Attempt all questions*

1 A) Differentiate between DFA and NDFA. Design DFA for language of strings over {a,b} in which all strings end with "aba". [8]

B) Convert a DFA equivalent to NFA as shown. [7]

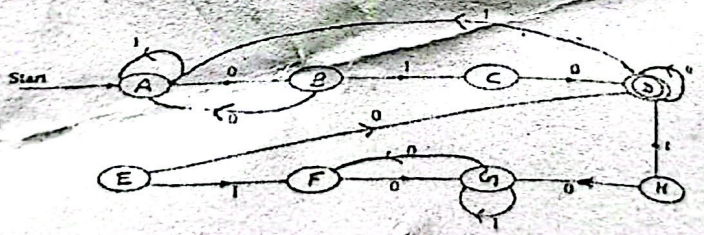


2.A) What is Set? Give the regular expression for the following languages over alphabet {a, b} [7]

a. Set of all strings starting with substring "ab"

b. Set of all strings with ending with "bb"

B)Convert the following DFA into minimum-state equivalent DFA. [8]



3.A)Define Pumping Lemma. Show that $L=\{1^n 2^{2n} ; n>1\}$ is not regular using pumping lemma for regular language. [7]

B) Explain about the closure properties of RL. Show that for any regular languages L1 and L2, L1∩L2 is also regular. [8]

4. A)Define PDA with block diagram? Design a PDA which accepts the language $L=\{a^n b^{2n} : n>=1\}$ and test for strings aabbbb and aab. [8]

B)Convert following grammar into equivalent PDA [7]

$$S \rightarrow AAC,\ A \rightarrow aAb \mid \varepsilon,\ C \rightarrow ac \mid b \mid ab$$

5.A)Explain the closure properties of context free languages with example. [7]

B)What do you mean by Ambiguous Grammar? Explain with example. Define Parse tree, leftmost and rightmost derivation with example. [8]

6..A)Reduce the following CFG to CNF [8]

S→aB/bX

A→Bad/bSX/a

B→aSB/bBX

X→SB/aBx/ad/B

B)Explain in brief the P and NP complete problems with suitable examples. [7]

7. Write short notes on any two [2*5=10]

a Chomsky's hierarchy

b tractable and Intractable problems

c pigeon hole principle

Madan Bhandari College of Engineering
Urlabari-3, Morang
Final Internal Examination (Spring 2025)

Level: Bachelor — Full Marks: 100
Programme: B.E. (Computer) — Pass Marks: 45
Year/Part: II/II — Time: 3 hrs

Subject: - Advanced Java Programming

- ✓ *Candidates are required to give their answers in their own words as far as possible.*
- ✓ *Attempt all question*

1. a) Define Class Path? Write a program with custom exception handler that handle arithmetic Exception. 7
   b) Explain the architecture of Java, including the role of the JVM, JRE, and JDK. 8

   OR

   Define collection framework in java. Explain the different components of java collection Framework.

2. a). What are the implications in Java when defining a variable, method, and class as final? -Explain in the various access modifiers in Java and their significance. 8
   b). Define abstraction. Write Java program that override methods (getUserValue() and displayUserDetail()). Where getUserValue() is defined to get user detail (name, address, age) and displayUserDetail() to display user detail. 7

3. a). Pros and Cons of JavaFX. Create GUI application with two buttons "RED" and "Green". When Clicking "RED" button change background of "GREEN" button to red and clicking "Green" Button change background of "RED" button to green. Also, console button clicked Message. 8
   b). Define stage and scene in JavaFX. Explain any two JavaFX layout managers. 7

4. a) Explain RMI architecture. Develop RMI application where client request to identify given Number is Odd or Even. 8
   b). Write a TCP client server program, where a client sends an integer value and server responds by sending the squared value of that integer. 7

5. a). Differentiate between Statement and PreparedStatement. Consider db_college and tbl_student as database name and table respectively where a tbl_student has columns name, faculty and batch. Write Console application with CREATE, READ, UPDATE and DELETE queries only using Prepared Statement. 8
   b). What is a JDBC driver? Explain the different JDBC drive types and their configurations?

   OR

   Write all the steps to connect Java application with any Database. Insert student detail (roll, Name, address, age) into table "student_tbl". 7

6. a). Describe the life cycle of a servlet. Explain the use of doGet() and doPost() methods of the Servlet with an example. 8
   b). Create a Servlet application to showcase the concept of session and cookies. 7

7. Write short notes on: (Any two) 10
   a). Design patterns.
   b). Over view of ORM
   c). RMI vs . CORBA

POKHARA UNIVERSITY

Level: Bachelor
Program: BE
Course: Applied Mathematics

Semester: Spring

Year: 2025
Full Marks: 100
Pass Marks: 45
Time: 3 hrs.

Candidates are required to answer 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. Determine the value of 'a' , when u = cosax .cosh2y ia harmonic and also, find its harmonic conjugate . 8

   b) State Cauchy's integral formula and using it integrate : $\oint_c \frac{z^2}{(z^4-1)} dz$,where c is the circle $|z + i| = 1$ in counter clockwise 7

2. a) Find the image of triangular region of the z-plane bounded by the lines $x = 0, y = 0$ and $x + y = 1$ under the transformation of $w = z\,e^{i\pi/4}$ and show the sketch in the diagram. 8

   b) Define singularities of a function $f(z)$. Find the residue of a function $f(z) = \frac{z^3}{(z-3)(z-2)(z-1)^4}$ at z = 1.

   OR

   Define Laurent series. find laurent series of the function $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in the region given by i) $0 < |z + 1| < 1$ ii) when $1 < |z + 1| < 3$ 7

3. a) State and prove second shifting theorem of z-transform. Find z-transform of e^{-iat} and hence find Z(cos at) 8

   b) Use z-transform to solve the difference equation : $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$, where $y_0 = 0$ and $y_1 = 0$ 7

4. a) Using fourier cosine integral, show that 8

$$\int_0^\infty \frac{\sin\omega\cos\omega\, d\omega}{\omega} = \begin{cases} \pi/2 & \text{if } 0 \le x < 1 \\ \pi/4 & \text{if } x = 1 \\ 0 & \text{if } x > 1 \end{cases}$$

   b) Find fourier sine transform of f(x) = e^{-x} for x > 0 and then show that $\int_0^\infty \frac{x \sin mx}{1+x^2} dx = \frac{\pi}{2} e^{-m}$ $for\ m > 0.$ 7

5. a) A tightly stretched string of length L, fixed at its ends, is initially in a position given by u(x,0) = $u_0 \sin^3\left(\frac{x\pi}{L}\right)$. If it is released from the rest from this position, find the displacement at any point x at time t. 8

   b) Find the temperature in a laterally insulated bar of length L=10cm whose ends are kept at zero temperature, 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

   OR

State one dimensional wave equation and Derive it.

6. a) Find the solution of differential equation $xu_x + 2yu = 0$ using separation of variables. 7

b) Express the Laplacian $\nabla^2 u = \frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 u}{\delta y^2}$ into polar coordinates. 8

7. **Attempt any two of the questions** $2 * 5$

a) Check the analyticity of $y = \mathrm{Re}\,(z)^3$

b) Find the poles of the function $f(z) = \frac{\sinh z}{(z-i\pi)}$

c) Find the z-transform of $Z(n.a^n)$

Madan Bhandari College of Engineering
Internal Assessment-2082

Level: Bachelor | **Course: Numerical Methods** | **Full Mark: 100**
Programme: BE | **Time: 3 hours** | **Pass Mark: 45**

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

1. a) Find the root of the equation $f(x) = x^2 - 4x - 10$ correct to three decimal places by using False Position method. 7

   b) Estimate the root of the equation $f(x) = xe^x - cosx$ using Newton Raphson method correct to three decimal places. 8

2. a) From the data given below, find the number of students whose weight is between 60 and 70. 7

Weight in lbs	0-40	40-60	60-80	80-100	100-120
No. of students	250	120	100	70	50

   b) Using the method of least square, fit the curves $ax^2 + \frac{b}{x}$ to the following data 8

x	1	2	3	4
y	-1.52	0.96	8.88	7.66

OR

If P is pull required to lift a load W by means of a pulley, find the laws of form P=mW+C, (Where m and c are constants) using least square method for the following data:

P	12	15	21	25
W	50	70	100	120

3. a) Evaluate $\int_1^5 \frac{1}{x}\,dx$ using Gaussian Integration formula for n=3 and compare the value with the exact solution. 7

   b) Using the Romberg integration find the solution correct up to three decimal places. 8

$$I = \int_0^1 \frac{1}{1+x^2}\,dx$$

4. a) Solve the following system of equations using Gauss Jacobi's method. 7
   $3x+2y+z=10$, $2x+3y+2z=14$, $x+2y+3z=14$

   b) Solve the following system of linear equations using partial pivoting method. 8
   $x+y+z=4$; $x+4y+3z=8$; $x+6y+2z=6$

5. a) Find the largest eigen value and the corresponding eigen vector of the matrix 7
   $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using power method.

   b) Using the R-K 1st order method , find an approximate value of y corresponding to x=1, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$ and y=1, when x=0 and h=0.02 8

6. a) Torsion on a square bar of size 15cm*15cm. If two of the sides are held at 100^0C and the other two sides are held at 0^0C.Calculate the steady state temperature at interior points. Assume a grid size of 5cm*5cm. 7

   b) Solve the poisson equation $\nabla^2 f = 2x^2 + y$, over the square domain $1 \le x \le 4, 1 \le y \le 4$ with f=0 on the boundary. Take step size in x and y, h=k=1 8

7. Write short notes on: (Any two) 10
   a) Error in Numerical method.
   b) Ill conditioned and well-conditioned systems
   c) Cubic spline.

Best of Luck

Madan Bhandari College of Engineering
Urlabari-3, Morang
Final Internal Examination (Spring 2025)

Level: Bachelor
Programme: Computer Engineering
Year/Part: II/II

Full Marks: 100
Pass Marks: 45
Time: 3 hrs

Subject: - Research Fundamentals

- ✓ *Candidates are required to give their answers in their own words as far as possible.*
- ✓ *Attempt all questions*

1. What is research? Explain various features of research [2+8]
2. Discuss the types of research with their advantages and disadvantages [10]
3. What do you mean by the term "literature review"? Why it should be done by the researcher? Explain in detail with example [2+8]
4. Explain conceptual framework and its components with respect to any research topic with diagram [10]
5. What is case study research? Explain in detail with any suitable case study. Also mention its advantages and disadvantages [2+5+3]
6. Differentiate primary and secondary data in research. Briefly explain different techniques for data collection in research work [3+7]
7. What do you mean by data analysis? What are the methods for data analysis? Explain with suitable examples [2+8]
8. State and briefly explain different responsibilities of Ethical researcher [10]

   OR

9. Discuss the features of an Ethical researcher with example [10]
10. What is research proposal? Discuss the need and importance of research proposal [2+8]
11. Briefly explain the components of research proposal [10]

Madan Bhandari College of Engineering
Urlabari-3, Morang
Final Internal Examination

Level: Bachelor of Computer Eng. | Full Marks: 100
Programme: BE | Pass Marks: 45
Year/Part: II/II | Time: 3 hrs

Subject: - Computer Architecture

1. a) Define instruction. Explain the Addressing mode of 8085 with an example. (8)
   b) Define RTL, Explain the term SSI and VLSI. (7)

2. a) Draw internal CPU structure and explain each part. (7)
   b) Define micro-operation? Explain the basic component used in register organization.(8)

3. a) Draw flowchart of Booth's algorithm and use it to multiply $(-3)_{10} * (-7)_{10}$.
   b) Draw the flowchart of Unsigned Binary Division Algorithm and use to divide 8 by 3.

4. a) Differentiate between Hardwired and Micro-programmed control unit. Which one is Preferable and why? Illustrate. (8)
   b) Evaluated the segments using arithmetic pipeline. Let the mathematical operation is $Ai * Bi + Ci$ for i=1,2,3.....7. (7)

5. a) What is cache coherence? Explain Direct mapping technique. (8)
   b) Differentiate between HDL and VHDL (7)

6. Define Associative memory. Explain any two type of micro- instruction sequencing technique. (2+8)

7. Write short notes on: (7.5x2=15)
   a) RISC vs CISC
   b) Cache Replacement Algorithm

THE END

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Universal Engineering & Science College

Affiliated to Pokhara University

Chakupat, Lalitpur

Level: Bachelor | Semester: 4th | Year : 2025

Programme : BE Computer | Time : 3 hours | Full Marks: 100

Subject: Numerical Methods | Pass Marks: 45

Pre-Board Examination-2082 (Spring 2025)

Candidates are required to give their answer in their own words as far as possible. The figure in the margin indicate full marks

Attempt all the questions:

1. a) Write algorithm for bisection method and solve $e^{-x} - x$ correct upto 3 decimal place. [8]

   b) Derive Newton's Raphson method formula for solving non-linear equations and use this method to solve $x^3 - 4x - 9 = 0$ up to four decimal places. [7]

   OR

   Solve above question by secant method correct upto four decimal places.

2. a. Given the following data points, estimate f(0.45) using suitable backward interpolation: [8]

X	0.1	0.2	0.3	0.4	0.5
y	2.68	3.04	3.38	3.69	3.97

   b. Find f (1.6) using cubic spline method. [7]

X	1	2	3	4
Y	1	1.414	1.732	2

3. a. Evaluate $\int_{0.2}^{1.5} e^{-x^2} dx$ by Romberg method correct up-to 3 decimal place taking n=2,4,8. [8]

   b. Compute $\int_1^3 sinx\ dx$ using Simpson's 1/3 and 3/8 rule taking suitable sub interval. [7]

4. a. Solve the following system of linear equations using the Gauss-Seidel method. [7]

$$5x + y - z = 10$$
$$2x + 8y + z = 11$$
$$-x + y + 4z = 3$$

b. Solve the following system of linear equations using gauss elimination method: [8]

$x+2y+z=9,\ 2x-y+z=3,\ 3x+2y+3z=14$

OR

Use power method to find largest eigen value and its corresponding eigen vector

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

5. a. Solve $\frac{dy}{dx} = \frac{y}{x}$, $y(1)=2$, at $x=1.5$ using the RK-2 method. [7]

b. Solve $y'' + y = x$, $y(0)=0$, $y(1)=2$ and find $y(0.75)$ by shooting method. [8]

6. a. Solve the Laplace equation $\nabla^2 u=0$, $0\le x\le 1$, $0\le y\le 1$ with boundary conditions: $(0,y) = 0$, $u(x,0) = 0$, $u(1,y) = 100$, $u(x,1) = 100$ and $h = 1/3$. [7]

b. Solve the Poisson equation $\nabla^2 u = 2x^2y^2$ over the square region $0 \le x \le 3$ *and* $0 \le y \le 3$. given $(x,y)=0$ on boundary and $h=1$. [8]

7. Write short notes on any two: (2*5=10)

a) What is interpolation and curve fitting? Write its application and difference.

b) Why iterative method is better than direct method for solving system of linear equations? How gauss seidal method is different than Jacobi method?

c) Code of false position method.

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Universal Engineering & Science College

Affiliated to Pokhara University

Chakupat, Lalitpur

Level: Bachelor | Semester: 4th | Year : 2025

Programme : BE Computer | Time : 3 hours | Full Marks: 100

Subject: Computer Architecture | Pass Marks: 45

Pre-Board Examination-2082 (Spring 2025)

Candidates are required to give their answer in their own words as far as possible. The figure in the margin indicate full marks

Attempt all the questions:

1. a) What do you mean by addressing modes? Explain the different types of addressing modes with suitable examples and diagrams. [7]

   b) Evaluate the expression: X = (A + B) * (C + D) / E using three-address, two-address, one-address, and zero-address instructions. [8]

OR

Explain the hierarchical structure of a computer system in detail. Also, briefly describe the future trends in computing.

2. a) What is an instruction cycle? Briefly explain the design principles of modern computer systems. [8]

   b) Write the basic structure of a VHDL program. Also, provide the VHDL code for a full adder using component instantiation. [7]

3. a) Define RTL. Explain bus and register transfer operations in RTL. [7]

   b) Registers in the CPU perform two major roles. Identify the various types of registers involved in fulfilling these roles. Draw a labeled diagram of the IAS computer. [8]

4. a) Define control memory. Explain the working of a microprogrammed control unit. Differentiate between horizontal and vertical microprogrammed control units. [8]

   b) Describe the hardwired control unit in detail with a block diagram. Why is it faster than the microprogrammed control unit? [7]

OR

Why is microinstruction sequencing important? Explain the variable address field sequencing technique with a necessary block diagram.

5. a) Use Booth's Algorithm to multiply 17 by 4. Also, differentiate between RISC and CISC architectures. [7]

   b) How are floating-point numbers represented in a computer? Also, explain how floating-point addition and subtraction are performed. [8]

6. a) Prove that the "speedup factor for a pipelined processor is equal to the number of pipeline stages." Assume the pipeline has K=8 segments and executes n=212 tasks in sequence. Let the time taken to process each sub-operation in a segment be 35 ns. Calculate the speedup ratio. [8]

   b) What are pipeline hazards? How can they be eliminated? [7]

OR

DMA overcomes the limitations of programmed I/O and interrupt-driven I/O. Justify this statement.

7. Write short notes on **any two** of the following: [5 × 2 = 10]

   a) GPU vs. TPU

   b) Flynn's Classification

   c) Direct Mapping

   d) Register Renaming and Register Windowing

*****

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Universal Engineering & Science College

Affiliated to Pokhara University

Chakupat, Lalitpur

Level: Bachelor | Semester: 4th | Year : 2025

Programme : BE Computer | Time : 3 hours | Full Marks: 100

Subject: Advanced Programming with Java | Pass Marks: 45

Pre-Board Examination-2082 (Spring 2025)

Candidates are required to give their answer in their own words as far as possible. The figure in the margin indicate full marks

Attempt all question.

1. a) Explain the java architecture also discuss about platform independence in java and how it is achieved. [5+3]

b) Differentiate between throw and throws keyword. Write a java program to throw custom exception when a user enter the "age" <18 with message "invalid user". [2+5]

2. a) Define inheritance and its type. Why java doesn't support multiple inheritance? Show an example of how can we achieve it using simple program? [4+4]

b) Describe abstract class and interface in java with sample program example. Also mention difference between them. [4+3]

3. a) Define applet and show the lifecycle of applet. Also demonstrate lifecycle using sample program. [4 +4]

b) What do you mean by event delegation? Write a program to make a sample form with "email", "password" and "login button" using null layout. [2+5]

OR

b) What do you mean by layout manager? List out different layout manager supported in swing and show a sample program to represent flow layout. [1+1+5]

a) Differentiate between TCP and UDP. Write a TCP socket programming to send two values 4 and 5 to server with server responding the calculated sum of two number and display result on client side. [2+6]

b) Discuss the working of CORBA? [7]

a) Define JDBC. List out different types of JDBC drivers and explain about type 1 driver in detail. [1+1+6]

b) Write a JDBC program to display records: id, name and email from the table "student" with "id=8". [2+5]

a) Define Servlet. Explain the lifecycle of Servlet in detail. [2+6]

b) Write a Servlet program to send response "Welcome to world of JAVA". [7]

Write short notes on: **(Any two)** **[2*5=10]**

a) Design Pattern and its types
b) SQL Injection
c) Multithreading in java

Universal Engineering & Science College

Affiliated to Pokhara University

Chakupat, Lalitpur

Level: Bachelor	Semester: 4th	Year : 2025
Programme : BE Computer	Time : 3 hours	Full Marks: 100
Subject: Theory of Computation		Pass Marks: 45

Pre-Board Examination-2082 (Spring 2025)

Candidates are required to give their answer in their own words as far as possible. The figure in the margin indicate full marks

Attempt all the questions:

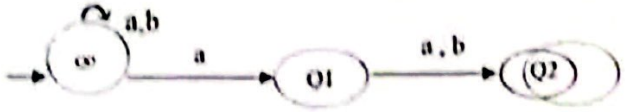
1. a) Give formal definition of DFA.Design a FA that accepts a set of string such that every string starts and ends with same symbol over ∑{a,b} [hint aba,bab,bbab,abaa,babb..] (8)

b)Define regular expression write regular expression for language L={w∈{a,b}: number of a is divisible by 3} (7)

OR

Explain diagonalization principle.

2. a) Convert the following NFA to its equivalent DFA. (8)



b)State the pumping lemma for regular language Show that L ={0^n1^n for n≥ 1} is not regular (7)

3. a)What is regular grammar? Show that the grammar S→aB|ab, A→aAB|a, B→ABb|b is ambiguous grammar. (7)

b) Convert the following grammar into CNF. (8)

S→1A/0B
A→1AA/0S/0
B→0BB/1

4. a) State closure properties of CFL. Show that CFL are not closed under complementation (7)

b) Define PDA formally. Design a PDA for L= { $a^{3n}b^n$: n >0 }. (8)

5. a)State Church Turing thesis. Explain tractable and intractable problem with suitable example (8)

b) Design a Turing machine for the following language: L = {w∈{a,b}*|w has equal number of a's, and b's }. (7)

OR

Design a Turing machine which works as a Copying machine for eg w#w [hint w is copied after blank symbol]

6. a)Explain about halting problem with suitable example and universal turing machine. (8)

OR

What is recursive and recursively enumerable language?Show that union of two recursive language is also recursive.

b) Define computational complexity theory. Explain Class P, Class NP and NP complete with suitable examples. (7)

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

a) Elimination of useless symbols

b) function and its types

c) alphabet and language

d) Ardens theorem

Universal Engineering & Science College

Affiliated to Pokhara University

Chakupat, Lalitpur

Level: Bachelor	Semester: IV	Year: 2025
Programme : BE Computer	Time: 3 hours	Full Marks: 100
Course:Applied Mathematics		Pass Marks: 45

Pre-Board Examination - 2082 (Spring 2025)

Candidates are requested to give their answers in their own words as far as practicable. Figure in the margin indicates full marks.

Attempt **All** the questions:

1. a. Define the Laplace equation and harmonic function. Is $v = (x^2 - y^2)^2$ harmonic? If yes find its harmonic conjugate. 8

   b. State Cauchy Integral formula for derivative. Evaluate 7

   $$\oint_c \frac{z^6}{(2z-1)^6}\,dz$$, where c is the unit circle $|z|=1$, counter clockwise

2. a. State Laurent's theorem. Find Laurent's series for 7

   $$f(z) = \frac{1}{(z-z^3)}$$ in the region $01 < |z+1| < 2$.

   b. Define singularity, zeros, and poles of a function. Evaluate 8

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

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

   OR

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

   b. Solve $U_{n+2} - 2\cos\alpha\, U_{n+1} + U_n = 0$ where, by using z-transform 8

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

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

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

5. a. 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

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 endpoints and initial temperature 8

6. a. Derive two-dimensional heat equation with required assumption. 7

b. Find the deflection u(x,y,t) of a square membrane with a = b=1 with c=1if the initial velocity is zero and the initial deflection is $0.1\sin 3\pi x \sin 4\pi y$ 8

7. Attempt all.

a. Express f(z) = sinz in the form u + iv 2

b. Find z–transform of na^n 2

c. solve $u_{xx}-u_{yy}=0$ 2

d. Find the unit tangent vector to the curve $\vec{r}(t)=2\cos t\vec{i}+\sin t\vec{j}$ at $(\sqrt{2},\sqrt{2},0)$. 2

e. Sketch the paraboloid $z=x^2+y^2$. 2

Universal Engineering & Science College

Affiliated to Pokhara University

Chakupat, Lalitpur

Level: Bachelor | Semester: 4th | Year : 2025
Programme : BE Computer | Time : 3 hours | Full Marks: 100
Subject: Research Fundamantals | Pass Marks: 45

Pre-Board Examination-2082 (Spring 2025)

Candidates are required to give their answer in their own words as far as possible. The figure in the margin indicate full marks

Attempt all question.

1. a) Define and explain the term "Research". Explain its importance and objectives. 7
   b) What are the types of research? Explain with their characteristics and applications. 8

2. a) What is a literature review? Explain its purpose and how it is conducted. 7
   b) Explain the components and significance of a conceptual framework in research. 8

Or

3. a) Discuss various data generation methods and mention which are most suitable for IT research. 8

Or

A bank wants to conduct research to evaluate the user experience of its mobile banking application. Suggest two suitable research strategies for this context and explain in brief.

   b) What are the different types of referencing systems? Discuss the importance of citation and the consequences of plagiarism. 7

4. a) What do you mean by participant? Explain the rights of participants. 7
   b) What are the ethical responsibilities of a researcher when involving human participants in a study? 8
5. a) What is a research proposal? Why is it important before starting a research? 7
   b) What are the components of research proposal? Explain the components of the methodology in Research proposal. 8

6. a) What is research report and research paper? Why is it important to include sections like "Findings", "Conclusion", and "Future Work" in a research report? 7

b) Explain *the* key components of a research report and their role in research. 8

7. Write short notes on (any two) 2*5=10
   a. 6P's of research
   b. Types of data analysis
   c. Ethnography

*****

g Hazards

terrupts

POKHARA ENGINEERING COLLEGE
Final Assessment

Level: Bachelor (4th Sem)
Programme: BE (Computer/IT)
Course: Applied Mathematics

Year :2025
Full Marks: 100
Pass Marks: 45
Time :3:00 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 $u(x,y) = 3x^2y + x^2 - y^3 - y^2$ is harmonic function.Find the function $v(x,y)$ such that $u + iv$ is analytic function. -7

   b) State and prove cauchy integral formula.Integrate $\oint_c \frac{z^3}{2z-i} dz$ counterclockwise around the unit circle. -8

2. a) Find the Laurent series for $f(z) = \frac{z^2}{z^2+5z+6}$ in the region $2 < |z| < 3$. -7

   b). State Cauchy residue theorem. Integrate $f(z) = \frac{z+1}{z^4-2z^3}$ around $c: |z| = \frac{1}{2}$ using cauchy residue theorem. -8

   OR

   Define a Bilinear map.Find the bilinear transformation which maps $z_1 = 0, z_2 = 1, z_3 = \infty$ into $w_1 = i, w_1 = -1, w_3 = -i$

3. a) Define Fourier integral of $f(x)$.Choosing a suitable function, show that -7

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

   b) Find Fourier sine and cosine transform of $f(x) = 2e^{-5x} + 5e^{-2x}$ -8

   OR

   Find the Fourier sine transform of e^{-x} for $x > 0$ and then by using parseval's identity show that:

$$\int_0^\infty \frac{x^2}{(1+x^2)^2}dx = \frac{\pi}{4}$$

4. a) State and prove first shifting theorem on Z −transform.Find the Z −transform of $e^{\frac{in\pi}{2}}$ and then find$Z\left(\cos\frac{n\pi}{2}\right)$ and $Z\left(\sin\frac{n\pi}{2}\right)$ -7

ii) Use Z −transform to solve the difference equation $y_{n+2} - 3y_{n+1} + 2y_n = 4^n, y_0 = 0, y_1 = 1.$ -8

5.a)Derive onedimensional heat equation with necessary assumptions. -7

b) Change the Laplacian$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ into polar form$r^2 u_{rr} + r u_r + u_{\theta\theta} = 0.$ -8

5.a) Find the solution of one dimensional wave equation$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ with initial velocity$g(x)$, initial deflection$f(x)$ and boundary conditions$u(0, L) = 0$ and $u(L; t) = 0.$ -7

b) Find the temperature distribution in a laterally insulated thin copper bar $(c^2 = 1.158\, cm^2/sec)$,$100cm$ long and of constant cross section whose endpoints at $x = 0$ and $x = 100$ are kept at $0°C$ and whose initial temperature is -8

i. $f(x) = \sin(0.01)\pi x$

ii. $f(x) = \sin^3(0.01)\pi x$

7. **Write Short notes on (Any two) $2\times 5 = 10$**

a) Show that $f(z) = z^3$ is analytic for all z.

b) Determine the location and order of zeros of $f(z) = \tan \pi z$

c) Verify the function$u = \sin 9t \sin\frac{x}{4}$ to satisfy one dimensional wave equation.

NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Assessment Fall/Spring 2025

Level: Bachelor | Year : 2025

Program: BE SE_Com (D_M) | Full Marks: 100

Course: : Numerical methods | Pass Marks: 45

Semester: II | Time : 2 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) Solve: $\log x - \cos x = 0$ by secant method correct to four decimal places. 7

   b) Solve: $3x + \sin x - e^x = 0$ by Newton- Raphson method correct to four decimal places. 8

2. (a) From the following table, estimate the number of students who obtained the marks between 60 and 65: 8

Marks	30-40	40-50	50-60	60-70	70-80
No of Students	31	42	51	35	31

(b) The following are data from steam table: 7

Temperature t	140	150	160	170	180
Pressure P	3.685	4.854	6.302	8.076	10.225

Using Newton's formula, find pressure of the steam for t=145.

OR

Find the second degree least square curve to the following observations

x	0	1	2	4	
y	-1	3	9	27	

3. a) Evaluate $\int_{0.2}^{1.5} e^{-x^2} dx$ by Romberg method. 8

b) Evaluate $\int_{-1.5}^{2.7} x^4 \sin(x) dx$ by Gaussian two and three-point formula. 7

4. a)

$$3x+2y+7z=32$$

Solve : $2x+3y+z=40$ 8

$$3x+4y+z=56$$

By Crout's method.

(b) Find dominant Eigen value and corresponding Eigen vector of the matrix

$$\begin{bmatrix} 1 & 4 & 4 \\ 4 & 1 & 8 \\ 4 & 8 & 1 \end{bmatrix}$$

$$x+10y+z=28$$ 7

5. a) Solve: $10x+y-z=11.19$ 7

$$-x+y+10z=35.61$$

By Gauss-Seidal method.

b) The mathematical model of an electric circuit is given by the equation $0.25\frac{d^2Q}{dt^2}+3\frac{dQ}{dt}+5Q=24\sin 20t$ with Q=0 and $\frac{dQ}{dt}=0$ at t=0. Using Range Kutta fourth order method find Q and $\frac{dQ}{dt}$ when t=0.2 8

6. (a) Solve: $\frac{dy}{dx}=\sin x+y, y(0)=1$ for y(1) by Heun's method taking h=0.5 7

b) Solve: $\nabla^2 u = -10(x^2 + y^2)$ over the square mesh with sides x= 0=y, x=3= y with u=0 on the Boundary and h=1. 8

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

a) Classification of second order partial differential equations.

b) Cubic spline interpolating polynomial

c) Convergence of fixed point iterative method.

Nepal College of Information Technology
Final Assessment

Semester	:	IV	Year	:	2025
Level	:	Bachelor	Full Marks:		100
Program	:	BE Computer	Pass Marks:		45
Subject	:	Theory of Computation	Time	:	3 hrs.

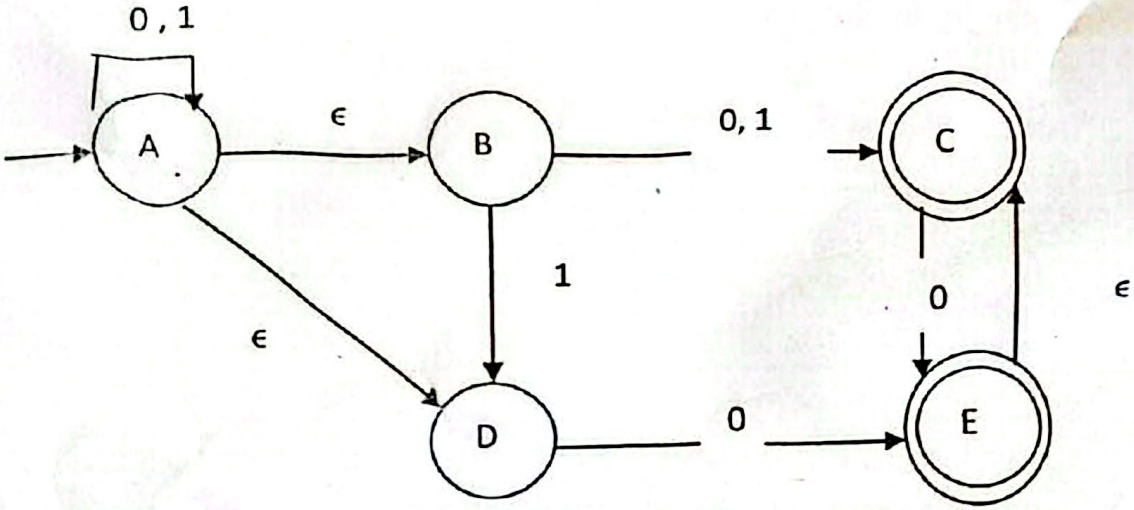
- ✓ *Candidates are required to give their answer in their own words as far as practicable.*
- ✓ *The figures in the margin indicate the full marks*
- ✓ *Attempt ALL questions*

1. a) What is a finite automaton? Design a NFA that accepts the language given by L={w∈{a,b}* : w contains the pattern "abba" or "baab" }. Hence test your design for abaaba. [8]

OR

a) Differentiate DFA and NFA. Design a DFA that accepts the language given by L={w∈{0,1}* : w does not contains substrings "00" or "11"}. Hence test your design for abaaba. [8]

b) Construct a DFA equivalent to NFA as shown: [7]



2. a) What is CFG? Design CFG for language L(G)={$a^m b^n$:m>=n} along with parse tree. And also test your design for strings 'aaabb' and 'aabbb'. [7]

S→ ·

b) What is CNF? Convert following CFG into CNF, G=(V,Σ,R,S) [8]
where
V={S,A,B},
Σ={a,b},
R={S→bA|aB, A→bAA|aS|a, B→aBB|bS|b}

3. a) What is instantaneous description of PDA? Design a PDA which accepts the language L={$0^{3n}1^n$: n>=1} and also test your design for '00000011' and '00001'. [8]

OR

a) Design a PDA which accepts the language L={$a^ib^jc^k$: k = i+j} and also test your design for strings *"aaabccc"* and *"bbbccc"*. [8]

b) State pumping lemma for context free language. Show that L= { $a^nb^nc^n$ | n>=1 } is not context free language. [7]

4. a) Design a Turing machine that accepts the language L=$a^nb^nc^n$ | n>=0. Also test your design for strings 'aabbcc' and 'aabcc' .[8]

b) Explain different proof techniques with examples.. [7]

5. a) Explain Turing Machine with storage in states. Design a model of Turing Machine that recognize a language L={ w ∈ {0,1}* } where it sees a first symbol either 0 or 1 and then checks that it does not appear elsewhere in string. [8]

b) Write about church turing thesis and universal turing machine [7]

6. a) *"For every regular expression there is a finite automaton and for every finite automaton there is regular expression."* Justify this statement with examples. [8]

b) Differentiate between tractable and intractable problems. What are P, NP and NP-Complete problems? [7]

7. Write short notes on : (any two) [2X5]
   a) Properties of Recursive Language.
   b) Ambiguous Grammar
   c) Closure properties of regular language.

NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Assessment Spring 2025

Level: Bachelor
Program: B.E.CE(IV_Mor and Day)
Course: **Computer Architecture**

Total Marks: 100
Pass Marks: 45
Time: 3 hrs

Attempt all the questions.

1) a) What are the functional requirements of a computer that leads to design the architecture of a computer system? Explain with their components. 8

   b) What are the principles that are required to design today's modern system? Explain in detail. 7 micro instructions, performance speed

2) a) Ordinary representation of number is not suitable in computer. Explain the way how they can be represented. 7

   b) Perform 16*5 multiplications using Booth's Algorithm. 8

3) a) Write control signal to involve various micro operations involved executing a instruction with help of data path diagram of a simple CPU. 7

   b) Differentiate hardwired control unit and micro programmed control unit in detail. 8

4) a) What is associative memory? Explain about read write operation in associative memory? 7

   b) Explain the role of an I/O module in computer architecture. Compare programmed I/O, interrupt-driven I/O, and direct memory access. 8

5) a) What is pipelining? What are the hazards of instruction pipelining and how can they be resolved? 8

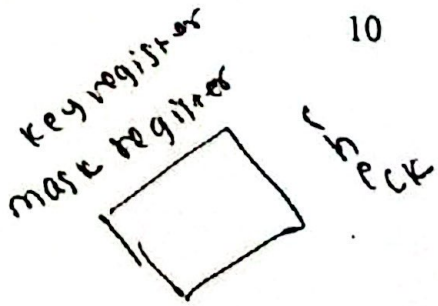
   b) Differentiate dual core, quad core and octa core processors. 7

6) a) Perform unsigned binary division of 11/9. 8

   b) What is VHDL? Write VHDL code for 4 to 1 mux. 7

7. Write Short notes on (any two): 10

   a) Register Organization
   b) Multithreaded architecture
   c) Vector Processors



NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Assessment Spring 2025

Level: Bachelor
Programme: BE SE/CE
Course: Research Fundamentals

Year: 2025
Full Marks: 100
Pass Marks: 45
Time: 3 hrs.

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

Attempt all the questions.

1. What is Research? Differentiate between research and project.
2. What are the types of Research? Explain each with its characteristics and application.
3. What are 6P's of research? Explain briefly.

Or

Explain the various range of sources you can use in a literature review.

4. What do you mean by research question? Why is it important in research?
5. Draw and explain the research process model diagram.
6. Explain briefly various strategies used in research with examples.

Or

What is Plagiarism? Suggest a few ways to avoid plagiarism.

7. What are the steps for conducting literature review in research? Explain each step briefly.
8. What is a research proposal? Explain various components of a research proposal.
9. What is a research report? Explain the need for a research report.
10. Write short notes:
    a. Citation and its types
    b. Ethnography
    c. Grounded Theory

NEPAL COLLEGE OF INFORMATION TECHNOLOGY
Assessment Spring 2025

Level: Bachelor | Semester – Spring | Year: 2025
Programme: BE_COM(M & D)_IT(DAY) | Full Marks : 100
Course: Applied Mathematics | 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	State and prove cauchy-Reimann euation as necessary conditions for function to be analytic.	5
	b.	Define Harmonic function.show that u=cosx coshy is harmonicand find corresponding analytic function.	5
	c.	State and prove cauchy –integral formuia	5
2.	a	Solve:$\oint_C \frac{1}{z^2-1}\,dz$,the counter clockwise around the circle |z-1|=1.(chapter-1)	5
	b.	Define Laurent series.Find the Laurent expansion for f(z)=$\frac{1}{z-z^3}$ $in\ the\ region\ given\ by\ 1<|z+1|<2$	5
	c.	Define Cauchy –Residue theorem. By using Cauchy residue theorem evalute the integration $\oint_c \frac{z-23}{z^2-4z-5}dz, where\ C is\ the\ circle\ |z|=6$	5
3.	a	Define bilinear transformation as well as fixed point.Find the bilinear transformation which makes the pointz=1.i.-i onto w=i,0,-1.$Also\ find\ the\ image\ of\ unit\ circle\ z=1$	5
	b.	State and prove first shifting theorem of Z transform.Using it o find the z_transform of Z($e^{-at}coswt$)	5
	c.	State and prove Initial and final value problem of Z-transform.Find the z-transform of Z($a^n sinbt$).	5
4.	a.	Prove that Z(y_{n+K})=$z^k(\bar{y}-y_0-\frac{y_1}{z}-\cdots-\frac{y_{k-1}}{z^{k-1}})$	5
	b.	Solve the difference equation: $y_{n+2}+6y_{n+1}+9y_n=2^n \quad with\ y_0=y_1=0$	5
5	a	Using Fourier integral representation ,show that $\int_0^\infty \frac{cosxw+wsinxw}{1+w^2}dw=0\ if\ x<0$ $=\frac{\pi}{2}\ if\ x=0$ $=\pi e^{-x}\ if\ x>0$	5
	b.	Find the Fourier sine transform of f(x)=e^{-x} $for\ x>0.Then\ prove\ that\ \int_0^\infty \frac{sinmx}{1+x^2}dx=\frac{\pi}{2}e^{-m}\ for\ m>0$	5
6	a.	Solve the following equation: $\frac{\partial^2 z}{\partial x^2}-2\frac{\partial z}{\partial x}+\frac{\partial z}{\partial y}=0$ $by\ the\ seperation\ of\ variables.$	5

b. A tightly stretche string with fixed end points x=0 and x=L is initially in a position given by u(x,0)=$sinx^3\left(\frac{\pi x}{L}\right)$.If it is realesed from rest from this position. Find the deflection u(x,t). 5

OR

Derive one dimensional Heat equation.

c. Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial 2_u}{\partial x^2}$ 5
Subject to the boundary condition u(0,t)=u(L,t)=0 and initial condition is u(x,0)=L ,being the length of the bar

OR

Derive one dimensional Wave equation with required assumptions.

7 a.. When two dimensional Heat equation $\frac{\partial u}{\partial t} = c^2\left(\frac{\partial 2_u}{\partial x^2} + \frac{\partial 2_u}{\partial y^2}\right)$ become Laplace equation.By the concepr of solution of laplace equation with rectangular boundaries,solve the problem: 1+7
A rectangular plate with insulated surface is 8 cm wide so long compared to its width that it may be considered infinite in length without introducing an appreciable.if the temperature along the short edge y=o is given by
u(x,0)=100 $\sin\frac{\pi x}{8}$, $0 < x < 8$
while two long edges x=0 and x=8 as well as the other short edge are kept at o^0c.
Show that steady state temperature at any point of the plate is given by
u(x,y)=$100e^{-\pi y/8}\, sin\frac{\pi x}{8}$

OR

Derive two dimensional heat equation with required assumptions.

b. Derive polar form of Laplace equation. 7

OR

Aplate was insulated surface has the shape of quadrant of a circle of radius 10 cm.The bounding raddi $\theta = 0\ and \theta = \frac{\pi}{2}$ are kept at 0^0c and temperature along the circular quadrant is kept at $100(\pi\theta - 2\theta^2)^0 c$ for $0 \leq \theta \leq \frac{\pi}{2}$

$e^{\alpha x}(c_1 \sin \beta x + c_2 \cos \beta x)$

$c_3 e^{-c^2 p^2 t}$

NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Assessment Spring 2025

Level: **Bachelor** Year: **2025**

Programme: **BECE/IT** Full Marks: **100**

Course: **Advanced Programming with Java** Pass Marks: **45**

Time: **3 hrs.**

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

1. a) Explain the Java architecture and also the significance of bytecode. 7
   b) Explain inheritance and its types. Why is multiple inheritance not allowed in java using classes and how can we achieve it? 8

   Or

   Define error and exception. Create a custom exception class.

2. a) Differentiate between Java abstract class and interface with a sample program 7

   b) Define inheritance and its types. Why Java doesn't support multiple inheritance? 8

3. a) How are events handled in swing? Create a GUI application that asks for user's confirmation when the user tries to close the window. 7
   b) What are the pros and cons of JavaFX. Explain any two JavaFX layout managers. 8

4. a) Create a TCP client server application where the client sends a string and the server responds by returning the length of the string. 7
   b) Differentiate between RMI and CORBA. Create an RMI application where a client can remotely invoke a method that checks whether the number given by the client is even or odd. 8

5. a) A table student consists of id, name, and program. Write a program to ask the user to enter the details and save them in the table. After every successful entry, the user must be prompted either to continue or quit 7

Or

Differentiate between Statement and PreparedStatement. Write a sample program to illustrate the usage of RowSet. 8

b) Write a program to display all the average marks and total number of records in a SQL database.

6. a) Explain Servlet lifecylce. Create a servlet application where users send a string and the server checks if the string is palindrome or not. 7

b) Define design pattern and its importance. With a sample code explain Singleton pattern. 8

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

a) ORM

b) Session vs Cookies

c) SQL injection

Nepal Engineering College

Final Assessment

Level:	Bachelor	Year:	2025
Programme:	BCT	Full Marks:	100
Year/Part:	II/II	Pass Marks:	45
Subject:	Advanced Programming with Java	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 is the use of package in Java? Explain. Write a java program to create following types of multidimensional array and print the values as follows: [8]

   1
   2 3 4
   5 6

   b. What do you understand by Collections in Java? Explain Map interface in java illustrating data addition and reading from map. [7]
2. a. Explain the advantage of inheritance. Does java support multiple inheritance? Explain [8]
   b. Differentiate between method overloading and method overriding. Explain runtime polymorphism with an example. [7]
3. a. What do you understand by event handling? Write a java program to create a swing application that has two radio buttons labelled as male and female. On clicking the radio buttons, create a pop-up message using optionpane saying **Hello sir** if radio button labelled male is clicked and **Hello madam** if radio button labelled female is checked. [8]
   b. Explain the lifecycle of a JavaFX application. Explain about Box Layout and StackPane Layout in JavaFX. [7]
4. a. Differentiate between TCP and UDP. Write a TCP client server application where client sends two number and server replies calculating the product of the numbers. [7]
   b. What is stub and skeleton in RMI? Write an RMI application to read two words from user. If both the words begin with **A** then reply by concatenating the uppercase value of both words else by concatenating the reverse of both words. [8]
5. a. Differentiate between statement and preparedstatement. Explain different types of JDBC drivers. [7]
   b. Consider **db_college** and **tbl_student** as database name and table name respectively where tbl_student has columns **name**, **faculty** and **batch**. Create console application illustrating CRUD using prepared statement. [8]

6. a. Differentiate between doGet() and doPost(). Write a servlet program to read a number from user and display whether that is perfect square or not. [8]

   b. Differentiate between JSP and servlet. Explain the elements of JSP. [7]

7. Write short notes on: ***(any two)*** [2*5=10]

   a. ORM

   b. MVC

   c. CORBA

NEPAL ENGINEERING COLLEGE

Changunarayan, Bhaktapur

(Assessment Spring Semester 2025)

Level: Bachelor | Full Marks: 100
Programme: BE | Pass Marks: 45
Course: .Applied Mathematics | 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) Show that $e^x(x\cos y - y\sin y)$ is a harmonic function. Find the analytic function for which $e^x(x\cos y - y\sin y)$ is imaginary part. 8

   b) State Cauchy integral formula. Evaluate $\oint_C \frac{z+1}{z^3-2z^2}dz$, where C is the $|z| = 1$,counterclockwise. 7

2. a) Find the bilinear transformation which maps the points $z = 0, -1, i$ onto $w = i, 0, \infty$. Also find the image of the unit circle |z|=1. 8

   b) Find the Laurent series for $f(z) = \frac{7z-2}{z^3-z^2-2z}$ in the region given by (i) $0 < |z+1| < 1$ (ii) $1 < |z+1| < 3$ 7

3. a) State Cauchy Residue Theorem. By applying Cauchy Residue Theorem, evaluate $\oint_C \frac{4-3z}{z(z-1)(z-2)}dz$ where $C: |z| = \frac{3}{2}$. 8

   b) State and prove first shifting theorem of Z transform. Obtain $Z^{-1}\left(\frac{3z^2-18z+26}{(z-2)(z-3)(z-4)}\right)$. 7

4. a) Using Z transform and inverse Z transform solve the equation $y_{n+2} - 2y_{n+1} + y_n = 2^n; y_0 = 2, y_1 = 1$ 7

   b) Show that $\int_0^\infty \frac{\sin \pi w \sin xw}{1-w^2}\, dw = \begin{cases} \frac{\pi}{2}\sin x & if\ 0 \le x \le \pi \\ 0 & if\ x > \pi \end{cases}$ 8

5.

a) Find the Fourier transform of $e^{-|x|}$.

Hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx$. 8

OR

Find the fourier cosine transform of $f(x) = e^{-mx}$ for $m > 0$, and then show that $\int_0^\infty \frac{coskx}{1+x^2} dx = \frac{\pi}{2} e^{-k}$

b) A tightly stretched string with fixed end points $x = 0, and\ x = l$ is initially at rest in its equilibrium position. If it is set vibrating by giving to each of its points a velocity $kx(l - x)$, find the displacement of the string at any distance x from one end at any time t. 7

6.

a) Derive the one dimensional heat equation with necessary assumption 7

b) Solve; $r^2 \frac{\partial^2 u}{\partial r^2} + r \frac{\partial u}{\partial r} + \frac{\partial^2 u}{\partial \theta^2} = 0$. 8

OR

A square plate is bounded by the lines $x = 0, y = 0,\quad x = 20, y = 20,$ its faces are insulated. The temperature along the upper horizontal edge is given by $U(x, 20) = x(20 - x)$ when $0 < x < 20$ which other three edges are kept at 0^0 C. Find the steady state temperature in the plate.

7. Solve any two (2×5= 10)

a) Find the fixed point(s) and nature of the fixed point(s) of $f(z) = \frac{2-2z}{z+1}$.

b) Prove that $Z[nf(t)] = -z \frac{d}{dz} F(z)$,where F(z) = Z[f(t)] .

c) Solve $xU_{xy} + 2yU = 0$, using variable separation.

THE END

NEPAL ENGINEERING COLLEGE
INTERNAL ASSESSMENT

Level: Bachelor | Semester – Spring | Year : 2025
Programme: BE (Computer 4th Sem) | Full Marks : 100
Pass Mark : 45
Course: Computer Architecture (New) | 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 is RTL? Explain about different types of RTL transfer operation.[8] OR Write a VHDL code for Half Adder and Full Adder.	8
	b.	What is the major criterion that distinguishes Computer Organization from Computer Architecture? List and briefly define some of the computer technologies that are trending presently or will be trending in the future.	7
2.	a.	What is the difference between indirect addressing and register indirect addressing mode? Explain about the general organization of registers in CPU.	8
	b.	What is a control memory? Explain the mechanism of variable format micro-instruction sequencing technique with a neat diagram.	7
3.	a.	Using Booth's algorithm, evaluate the following expression: -9 * -13.	8
	b.	Write an algorithm flowchart of restoring division algorithm and use it evaluate 7/5.	7
4.	a.	Define cache memory. Explain the types of write policy of cache memory. Give the appropriate reasons why replacement algorithm is required in associative mapping?	7
	b.	What is/are the difference(s) between isolated I/O and memory-mapped I/O? Why peripherals are not connected the system bus directly? Give at least three reasons.	8
5.	a.	Draw instruction cycle state diagram with interrupt. Describe each state briefly.	8
	b.	Draw a neat diagram of a DMA controller and describe its working	

mechanism. Why read and write control lines in a DMA controller are bidirectional? 7

OR

How parallelism occurs in uniprocessor system? What is the inter-connections structure possible in multiprocessor system?

6. a. Explain data hazard in instruction pipelining and its various types. Also determine the number of clock cycles that it takes to process 200 tasks in a six segment pipeline. 7

b. Let us suppose an arithmetic operation (Ai + Bi)*(Ci + Di) with a stream of numbers. Specify a pipeline configuration to carry out this task. List the contents of all registers in the pipeline for i = 1 through 6. 8

OR

What are the hardware and software performance issues that arise in multicore organization?

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

a) Differences between horizontal and vertical microinstruction
b) Control Memory, CAR and CBR
c) Communication between CPU and IOP with suitable diagram.
d) Flynn's classification.
e) RISC vs CISC

NEPAL ENGINEERING COLLEGE

Level: Bachelor | Semester – Spring | Year : 2025
Programme: BE, Computer-IV | Full Marks: 100
Course: Theory of Computation (New) | 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 Deterministic finite Automata with 5-tuples. Design a DFA that accepts a set of strings where the number of 0's and no. of 1's are even in each string over alphabet, $\sum = \{0,1\}$. 7

   b) Given the transition table as follows:

$\delta / \sum$	0	1
$\rightarrow q_0$	$\{ q_0, q_3 \}$	$\{ q_0, q_1 \}$
q_1	Φ	$(q_2\}$
q_2	$\{ q_2 \}$	$\{q_2\}$
q_3	$\{ q_4 \}$	Φ
$*q_4$	$\{ q_4 \}$	$\{ q_4\}$

   Draw the transition diagram and also check the NFA for the input string 01001. 8

   OR

   Construct a FA equivalent to the regular expression $a.(a+b)^*.bb$.

2. a) Define Regular Expression.State and prove pumping lemma for regular sets. 7

   b) Define Context Free Grammar. Given a CFG for the language as follows, consider a string of length at least 7 and check whether the string can be derived or not. 8

   $$\mathbf{L= \{wcw^R / w \in (a,b)^*\}}$$

   where the production rule is defined as;

   $$\mathbf{S \longrightarrow aSa/bSb/c}$$

3. a) Define the ambiguity of a Context Free Grammar. Prove that following grammar is ambiguous. 8

S→iCtS
S→iCtSeS
S→a
C→b

b) What is Push Down Automata? Construct a PDA that will accept all strings over the alphabet, ∑= {0,1} consisting of equal number of a's and b's. The acceptance of the above strings will be by empty stack rather than final state. 7

4. a) In what aspect the Non-deterministic PDA is more powerful than deterministic PDA? State and prove any five closure properties of regular languages. 7

b) Explain with neat sketches about the hierarchy of Languages and their corresponding automata as given by Noam Chomosky. Prove that the language L= $\{a^n b^n c^n / n>=1\}$ is not regular language. 8

5. a) How can you represent a Turing Machine? Show that the function, f (n) = n+3, is Turing computable (assume n= 2) 7

OR

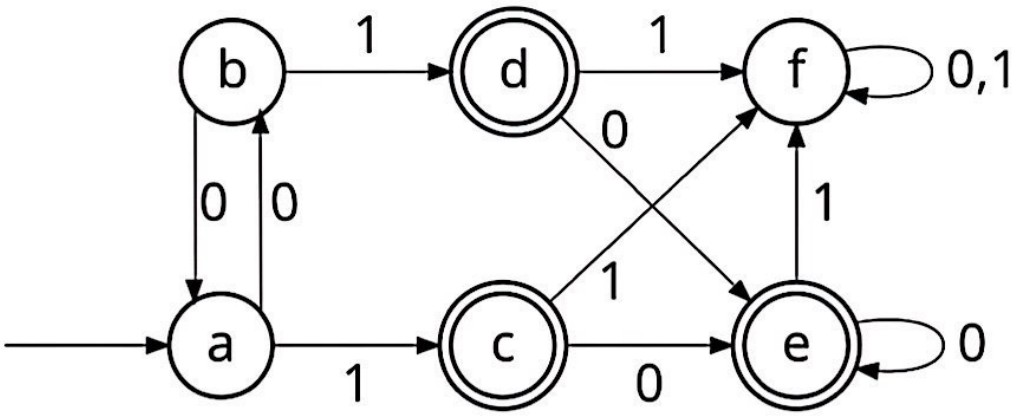
Design a Turing machine to compute the function, f(a,b) = a×b such that a = 2 and b= 3. The output will be 6. 8

b) What is normal form? Define GNF and use this definition to convert the following CNF into its equivalent GNF.

S→AA/a,
A→ SS/b

6. a) How does a function differ from a relation? Define the function and the relation for a set, A= {1.2.3}. 7

b) Minimize following DFA using any algorithm- 8



7. Write short notes on ***any two*:** 2×5

a) Alphabet and Language.

b) Computable languages and functions.

c) Church's thesis and UTM.

OR

Unrestricted grammar, G and it's language, L(G).

Nepal Engineering College

Final Assessment

Level:	Bachelor	Year:	2025
Programme:	Computer	Full Marks:	100
Year/Part:	II/II	Pass Marks:	45
Subject:	Numerical Methods	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. Find the root of xlogx – sinx = 2 correct upto 4 decimal places using Bisection Method. [7]

   b. What is Convergence and rate of convergence in Numerical Computation? Solve x^3-x-11=0 correct upto 4 decimal places using fixed point iteration method. [8]

2. a. What is a cubic spline? Use cubic spline interpolation to evaluate f(1.5) from following data: [7]

x	1	2	3	4
y=f(x)	1	5	11	8

   b. Using Divided Difference Interpolation technique, evaluate y(7) from following data. [8]

x	2	3	6	9	10
y=f(x)	11	22	31	12	9

3. a. The following table gives the displacement, x (cms) of an object at various of time, t (seconds). Find the velocity and acceleration of the object at t = 1.6 sec. Using suitable interpolation method. [7]

t	1.0	1.2	1.4	1.6	1.8
x	9.0	9.5	10.2	11.0	13.2

   b. Evaluate the integral $\int_0^6 \frac{sinx}{1+x} dx$ using Simpson's 1/3 and 3/8 rules. Also comment on your answer. [8]

4. a. Solve the following system of linear equation using Gauss Elimination with Partial Pivoting. [7]

$$a + 2b + 3c - d = 10$$
$$2a + 3b - 3c - d = 1$$
$$2a - b + 2c + 3d = 7$$
$$3a + 2b - 4c + 3d = 2$$

b. Solve the following system of linear equation using LU Factorization method. [8]

$2x + 4y - 6z = 8$

$x + 3y + z = 10$

$2x - 4y - 2z = -12$

5. a. Find the largest Eigen value and corresponding Eigen vector for following matrix. [7]

$$\begin{bmatrix} 2 & 5 & 1 \\ 5 & -2 & 3 \\ 1 & 3 & 10 \end{bmatrix}$$

b. Solve the following differential equation using RK-2 method $y'' - 4y' + 4y = e^{3x}$, $y(0)=0$, $y'(0)=-2$ at $x=2$ taking step-size $=1$. [8]

6. a. Solve the following BVP using shooting method $y'' + xy' + y = 3x^2 + 2$, $y(0) = 0$, $y(1)=1$ and $h = 0.25$ [7]

b. Solve the equation $Uxx + Uyy = 0$ over the square mesh with side $x=0=y$, $x=3=y$ with $u=0$ on boundary and mesh length=1. [8]

7. Write short notes on: (Any Two) 2*5=10

a. Errors in numerical calculations

b. Gauss Jacobi method of iteration

c. Algorithm of RK-1

NEPAL ENGILEERING COLLEGE

Level: Bachelor | Semester: Spring | Year: 2025
Program: BC | Full Marks: 100
Course: Research Fundamentals | Pass Marks: 45
Time: 3 hrs.

Candidates are required to answer 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 research? Explain its significance in the field of Computer Science and Engineering.	7
	b)	What are the 6 P's of the Research? Explain	8
2.	a)	Briefly describe the different steps involved in a research process. Explain the research process with a suitable diagram.	7
	b)	What are the objectives of conducting a literature review in research? Describe the process of conducting a systematic literature review.	8
3.	a)	Define plagiarism in the context of academic research and discuss its consequences.	7
	b)	What are the different types of triangulation that can be used to validate findings in a research project?	8
4.	a)	What legal considerations should researchers be aware of when conducting research?	7
	b)	What is intellectual property rights? Discuss the implications of intellectual property rights in research outputs.	8
5.	a)	Define a research proposal and explain its significance in the research process.	7
	b)	Discuss the purpose and contents of an abstract in a research proposal. How does it differ from the abstract in the research report?	8
6.	a)	List and describe the main components of a research report.	7
	b)	Why are methodology, data analysis, and findings are essential parts of a research report? Discuss	8
7.	Write short notes on: (**Any two**)		2×5
	a)	Quantitative vs. Qualitative	
	b)	Responsibilities of an Ethical Researcher	
	c)	Differentiate Research Proposal and Research Report	

POKHARA ENGINEERING COLLEGE
Final Assessment

Level: Bachelor (4th Sem) | Year :2025
Programme: BE (Computer/IT) | Full Marks: 100
Course: Applied Mathematics | Pass Marks: 45
Time :3:00 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 $u(x,y) = 3x^2y + x^2 - y^3 - y^2$ is harmonic function.Find the function $v(x,y)$ such that $u + iv$ is analytic function. -7

b) State and prove cauchy integral formula.Integrate $\oint_C \frac{z^3}{2z-i}dz$ counterclockwise around the unit circle. -8

2. a) Find the Laurent series for $f(z) = \frac{z^2}{z^2+5z+6}$ in the region $2 < |z| < 3$ -7

b) State Cauchy residue theorem. Integrate $f(z) = \frac{z+1}{z^4-2z^3}$ around $c: |z| = \frac{1}{2}$ using cauchy residue theorem. -8

OR

Define a Bilinear map.Find the bilinear transformation which maps $z_1 = 0, z_2 = 1, z_3 = \infty$ into $w_1 = i, w_1 = -1, w_3 = -i$

a) Define Fourier integral of $f(x)$.Choosing a suitable function, show that -7

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

b) Find Fourier sine and cosine transform of $f(x) = 2e^{-5x} + 5e^{-2x}$ -8

OR

Find the Fourier sine transform of e^{-x} for $x > 0$ and then by using parseval's identity show that:

$$\int_0^\infty \frac{x^2}{(1+x^2)^2}dx = \frac{\pi}{4}$$

4. a) State and prove first shifting theorem on Z −transform.Find the Z −transform of $e^{\frac{in\pi}{2}}$ and then find$Z\left(\cos\frac{n\pi}{2}\right)$ and $Z\left(\sin\frac{n\pi}{2}\right)$ -7

b) Use Z −transform to solve the difference equation $y_{n+2} - 3y_{n+1} + 2y_n = 4^n, y_0 = 0, y_1 = 1.$ -8

5.a)Derive onedimensional heat equation with necessary assumptions. -7

b) Change the Laplacian$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ into polar form$r^2 u_{rr} + r u_r + u_{\theta\theta} = 0.$ -8

5.a) Find the solution of one dimensional wave equation$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ with initial velocity$g(x)$, initial deflection$f(x)$ and boundary conditions$u(0, L) = 0$ and $u(L, t) = 0.$ -7

b) Find the temperature distribution in a laterally insulated thin copper bar $(c^2 = 1.158\ cm^2/sec)$,$100cm$ long and of constant cross section whose endpoints at $x = 0$ and $x = 100$ are kept at $0°C$ and whose initial temperature is -8

i. $f(x) = \sin(0.01)\pi x$

ii. $f(x) = \sin^3(0.01)\pi x$

7. **Write Short notes on (Any two) $2\times 5 = 10$**

a) Show that $f(z) = z^3$ is analytic for all z.

b) Determine the location and order of zeros of $f(z) = \tan \pi z$

c) Verify the function$u = \sin 9t \sin\frac{x}{4}$ to satisfy one dimensional wave equation.

Pokhara Engineering College

Internal Assessment-2025

Program : Computer		**FM:** 100
Level : Bachelor		**PM:** 45
Year/Part : II / II	**Subject:** Theory of Computation	**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. ***Neat and clean writing are extra credited.***

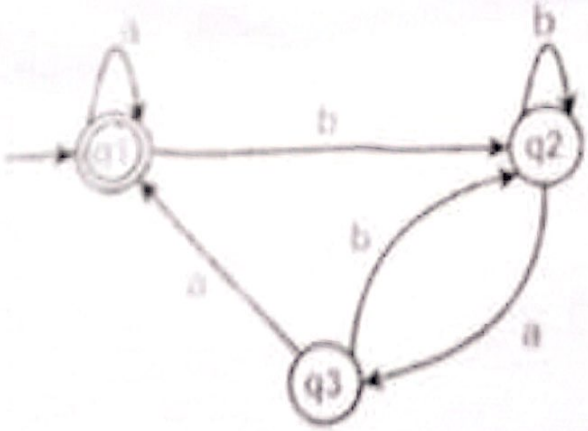
Attempt all the questions.

1. a) State Pigeon Hole principle. Using Mathematical Induction, prove that the sum of the first n odd positive integers is equal to n^2 — 7

   b) What is the primary distinction between regular languages and context-free languages? Design a DFA for a language that contains "00" as a substring or ends with "10" over the alphabet $\Sigma = \{0,1\}$. — 8

OR

Find the Regular Expression for the below DFA:



2. a) Define left-recursive grammar. Show that the grammar below is ambiguous: — 7

   $S \rightarrow aSb \mid aSSb \mid ab$

   b) List the uses of regular expressions. Construct a context-free grammar for the language $L = \{a^n b^m : n \text{ is even and } m \geq 1\}$. — 8

3. a) What is Greibach Normal Form (*GNF*)? Convert the following CFG into CNF: 7

$G = (V, \Sigma, R, S)$, where

$V = \{S, A\}$,

$\Sigma = \{a, b\}$

R: $S \rightarrow aAb \mid \varepsilon$

$A \rightarrow aA \mid b$

b) Compare and contrast PDA and Turing Machine. Design a PDA that accepts the language $L = \{w \in \{a,b\}^* : \text{number of a's} = \text{number of b's}\}$. 8

4. a) State the Pumping Lemma for regular languages. Use it to show that $L = \{a^n b^n c^n d^n : n \geq 1\}$ is not regular. 7

b) What is an Universal Turing machine? Justify whether the Halting problem can be solved using any machine model. 8

5 a) What is meant by Turing completeness? Show that the function $f(n) = 2n$ is Turing computable. 7

b) Define a multi-tape Turing Machine. Design a Turing Machine for $L = \{a^n b^n c^n : n \geq 1\}$. Also verify your design for ***aabbcc***. 8

6. a) What are Recursive and Recursive Enumerable languages? Show the relationship between them. 7

OR

What are Turing recognizable and Turing Decidable languages? Show that the union of two recursive language is recursive.

b) What are Tractable and Intractable problem? Explain the NP complete and NP hard problems with suitable examples. 8

7. Write short notes on: (any two) 10

a) Relation and function

b) State minimization of DFA.

c) Post Correspondence Problem (PCP)

All the Best

POKHARAENGINEERING COLLEGE
INTERNAL ASSESSMENT

Level: Bachelor | Semester – Spring | Year : 2025
Programme: B.E. | Full Marks: 100
Course: Research Fundamentals | 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.

1a.	/hy do we need research? Explain the types of research.	8
b.	What are the types of research question? How do you ensure data validity and reliability?	7
2a.	Differentiate between project and research. Explain 6P's in research.	7
b.	Briefly describe the different steps involved in a research process.	8
3a.	Suppose you are performing a literature review for a study. What are the considerations required for proper literature review?	8
b.	Describe different citation styles with suitable examples.	7
4a.	Define plagiarism. What are the different types of data generation methods.	8
b.	Define research problem. How do you select a good research problem?	7
5a.	What is qualitative data? How do you analyse the qualitative data?	8
b.	Who are the participants in research? Explain the responsibilities of an ethical researcher?	7
6a.	What is research report? What are the components of research report?	8
b.	Explain scientific research process.	7
7	Write Short notes on: (Any Two):10	
	a. Informed Consent	
	b. Characteristics of good research title	
	c. Research hypothesis	

POKHARA ENGINEERING COLLEGE

Internal Assessment Examination

Level: Bachelor | Semester – Spring | Year :2025
Programme: Computer | Full Marks: 100
Course:Computer Architecture | 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 the term Computer Architecture. Explain different addressing modes with appropriate figures and example of each.	2+6
	b)	Define RTL.Explain different microoperations used in computers.	2+5
2.	a)	Define register. Explain about the register organization in detail.	2+6
	b)	Explain in brief about different microinstructions used in different sub cycles of instruction cycle.	7
3.	a)	Perform -12*-15 using Booth's algorithm.	7
	b)	How do we represent floating point numbers in computer? Explain floating point operation using Arithmetic Pipelining.	8
4.	a)	Compare and Contrast between RISC and CISC architecture.	7
	b)	Explain the different sequencing techniques applicable in Microprogrammed Control Unit.	8
5.	a)	Why is Cache Memory called influential memory? Explain how Set Associative Mapping overcomes the drawbacks of Associative and Direct Mapping.	2+6
	b)	Define DMA? explain how DMA performs the control, transfer and execution of data accompanying CPU.	1+6
6.	a)	A non-pipeline system takes 100 ns to process a task. The same task can be processed in a six-segment pipeline with time delay of each segment in the pipeline is as follows; 30 ns, 35 ns, 40 ns. Determine the speed of ratio of pipeline for 50 tasks.	7
	b)	Define multiprocessing. Classify and explain computers in accordance to Flynn's classification.	2+6

7. Write short notes on **any two:**

a) Pipelining Hazards

b) VHDL

c) Types of Interrupts

Good Luck

POKHARA ENGINEERING COLLEGE
Internal Assessment Examination

Level: Bachelor Semester – Spring Year : 2025
Programme: Computer Full Marks: 100
Course: Advance 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 abstraction. Write a Java program that overrides methods getUserValue() and displayUserDetail(). Where getUserValue() is defined to get user details (name, address, age) and displayUserDetail() to display user details. (8)

   b) Explain the architecture of Java, including the roles of the JVM, JRE, and JDK. (7)

2. a) Define the Collection framework in Java. Explain the different components of the Java Collection framework with examples of when to use each. (8)

   b) Differentiate between checked and unchecked exceptions in Java. Explain the try-catch-finally block for Java exception handling with a suitable code example. (7)

3. a) Explain RMI architecture. Develop an RMI application where the client requests the server to identify if a given number is Odd or Even. (8)

   b) Write a TCP client-server program in Java. The client should send a text message(e.g., "Hello Server") to the server, and the server should respond by converting the message to uppercase and sending it back to the client. (7)

4. a) What is a JDBC driver? Explain the different types of JDBC drivers and their configurations, highlighting the advantages and disadvantages of each type. (8)

   b) Differentiate between Statement and PreparedStatement in JDBC. Write a console application using PreparedStatement to insert a new student record (name, faculty, batch) into a table named tbl_student within a database named db_college. (7)

5. a) Explain the Servlet life cycle in detail. What are the advantages of Java Servlets over CGI? (8)

   b) Explain JSP (JavaServer Pages) with its syntax, advantages, disadvantages, and a life cycle diagram. (7)

6. a) Briefly explain about MVC (Model-View-Controller) programming architecture. Compare Thick client with Thin client applications. (8)

   b) What are ASP.NET server controls? Explain the typical request life cycle of an ASP.NET application. (7)

7. Write short notes on: (any two)5*2

   1. Servlet vs. JSP
   2. RMI vs. CORBA
   3. Design Patterns

POKHARA ENGINEERING COLLEGE
ASSESSMENT EXAM

Level: Bachelor | Semester – Fall | Year : 2025
Programme: BE | Full Marks: 100
Course: Numerical Methods | 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) Find the root of the equation $f(x) = x^3-2x-5$ with accuracy of 0.08% by using Bisection method. 7

   b) Estimate the root of the equation $f(x) = 3x+\sin x-e^x$ using Secant method. 8

2. a) Use appropriate method of interpolation to get f(3) from given table. 8

x	0	1	2	4	5	6
F(x)	1.0	14	15	5	6	19

   b) Use least square method for the following set of data to fit a parabolic curve and find f(2). 7

X	0	1	2	3	4
Y	-4	-1	4	11	20

3. a) Evaluate the integral $I = \int_0^{\frac{\pi}{2}} \sin x dx$. Compare the result in both conditions for Simpson1/3 and 3/8 rule. 7

   b) The following data gives corresponding values of distance(D) travelled by a car at various time interval (T). 8

T	5	6	7	8	9
D	10	14.5	19.5	25.5	32

Find the velocity and acceleration at T =5 ,7.

3. a) Using power method, find the smallest Eigen value and Eigen vector of the following matrix. $A = \begin{bmatrix} -2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ 8

b. Find the inverse of matrix using LU Decomposition method $[A] = \begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 1 & 1 \end{bmatrix}$ 7

4. a) Use the Heun's method to estimate at x=2 for dy/dx = 2Y/X and y(1)= 2. Assume h = 0.25. 8

b) Solve the given differential equation for y(0.25) using R-K 4th order method: 7

$10\, d^2y/dx^2 + (dy/dx)^2 + 6x = 0$ with y(0)=1 and Y'(0)=0 take h=0.2

5. a) Torsion on a square bar of size 15cm* 15cm. If two of the sides are held at 100° C and the other two sides are held at 0°C. Calculate the steady state temperature at interior points. Assume a grid size of 5cm * 5cm. 8

b) Solve the following system by using complete pivoting:

$$2x_1 + 7x_2 + 3x_3 = 5$$
$$3x_1 + 4x_2 + 9x_3 = 15$$
$$2x_1 + 3x_2 + x_3 = 9$$

7

6. Write short notes on any two: 2×5

a) Error in Numerical method

b) Cubic Spline.

c) Laplacian equation

Computer Architecture (new), Ashar 31st, Spring 2025
Total marks: 100, Pass marks: 45
BoCE IV semester

Attempt all the questions.

1. a) What are the advantages of the Harvard architecture in relation to the Von Neumann architecture? Explain. (7)
b) Explain the terms. (4x2)
i) addressing modes ii) instruction set architecture iii) instruction cycle iv) micro-operation

2. a) What is CPU organization? Describe Register Organization in details (7)
b) What is Booth's Algorithm in Computer Architecture? Explain (8)

3. a) What is Cache Mapping? Explain Cache Replacement Algorithm with a suitable example. (2+5)

OR

Explain various storage devices of memory hierarchy.

b) What is the difference between hardwired control unit and a micro programmed control unit? Explain the relative difference of each. (8)

4. a) DMA is a hardware-based transfer. Justify (7)
b) Why I/O module is necessary? Explain the communication process between CPU and I/O channel. (8)

5. a) What is register transfer language? Compare and contrast between arithmetic and logical micro-operation. (2+5)

b) How can we improve performance on hardware and software while designing a processor? Explain. (8)

OR

What is power efficient processor? Explain dual core processor with respect to quad core processor.

6. a) Explain instruction pipelining with suitable example. (7)
b) Discuss about RISC pipeline with example. (8)

7. Write short notes on (Any Two): (2X5)
i) GPU and TPU
ii) Floating point representation
iii) Cache Write Policy

POKHARA UNIVERSITY
FACULTY OF SCINCE AND TECHNOLOGY
SCHOOL OF ENGINEERING

Exam	Final Internal Examination 2025 Spring		
Level	B.E.	F M	100
Program	Computer	PM	45
Year/ Part	II/II	Time	3 Hrs

Subject: Theory of Computation (new course)

Candidates are required to give answers in their own words as far as practicable.
The figure in the margin indicates full marks. Assume suitable data if necessary.
Attempt all the questions.

1. a) What are the different proof techniques? Prove the given statement L For any natural number n, $2^{2n} - 1$ is divisible by 3. 8
   b) Define DFA. Design a DFA that accepts a set of strings having even number of a's and even number of b's over the alphabet {a,b}. 7
2. a) State the pumping lemma for regular set. Show that L = $\{0^i1^i \mid i>0\}$ is not regular. 8
   b) Define regular expression. Construct a finite automata equivalent to the following regular expression. (a(a+b)b* + bb(a)*. 7
3. a) Define Context Free Grammar. Check whether the given grammar S→aB|ab, A-→aAB | a, B→AB|b is ambiguous or not. 7
   OR
   Design a CFG to for the language $a^nba^{n+1} \mid n>=0$. 8
   b) Convert the following CFG into Chomsky Normal Form.

   S →Sbb|aabb|Aa|Bb
   A →Aa|a
   B →Bb|b|Ɛ
4. a) Design a PDA for the language L={a^nb^{2n}, where n>=1}. 7
   b) Explain the possible extensions of basic model of Turing Machine. 8
   OR
   Define Turing Machine. Design a Turing machine that accepts the language L= {$a^n b^n c^n$: n>=0}.
5. a) Define Turing Machine. Design a Turing Machine which compute the function f(m) = m+1 for each m that belongs to set of natural numbers. 8
   b) Convert the following CFG to equivalent PDA. 7
   S→0S1 |00 | 11
6. a) Write about Church Turing thesis and universal Turing machine. 5
   b) Differentiate between Recursive and Recursively enumerable languages. 5
   c) Define class P, NP and NP complete problems with suitable examples. 5
7. Write short notes on: *(Any two)* 2 × 5
   a) Halting problem
   b) Decision properties of regular sets
   c) Chomsky's hierarchy

*** ***Best of Luck*** ***

POKHARA UNIVERSITY
FACULTY OF SCIENCE & TECHNOLOGY
SCHOOL OF ENGINEERING

Exam	Final Internal Examination 2025 Spring		
Level	B.E.	F M	100
Program	BoCE & BSE	PM	45
Year/ Part	II/II	Time	3 Hrs

Subject: Numerical Methods

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

Attempt all the questions.

1.a) Find the real root of $e^x - 2x - 1 = 0$ using the bisection method. 7

b) Find the root of the equation $x^3 - 2x + 5 = 0$, correct to four places of decimal using fixed point iterative method. 8

2.a) Find the missing value from the following table using Lagrange's interpolation formula:

x:	1	2	4	5	6
f(x):	14	15	5	-	9

7

b) Find the polynomial f(x) and hence find f(6) from the following table, using Newton's divided difference

x	3	7	9	10
f(x)	160	120	72	63

8

3. a) The following data gives the melting point of an alloy of lead and zinc, t is the temperature in degrees Celsius and P is the percentage of lead in the alloy. Using Newton's interpolation formula, find the melting point of an alloy containing 75% lead.

P:	40	50	60	70	80
t:	184	204	226	250	276

7

b) Growth of bacteria (N) in culture after t hours is given in the following table:

t	1	2	3	4	5
N	130	150	175	190	240

Find the equation to best fitting curve of the form $N = ab^t$ to the data and estimate N when t = 0. 8

4.a) Evaluate the integral using the Gaussian 2-point and 3-point formula $\int_2^5 \frac{\sin x + e^x}{1+x}\,dx$. 7

b) Solve by Doolittle's method: $3x + 2y + 7z = 4,\ 2x + 3y + z = 5,\ 3x + 4y + z = 7$. 8

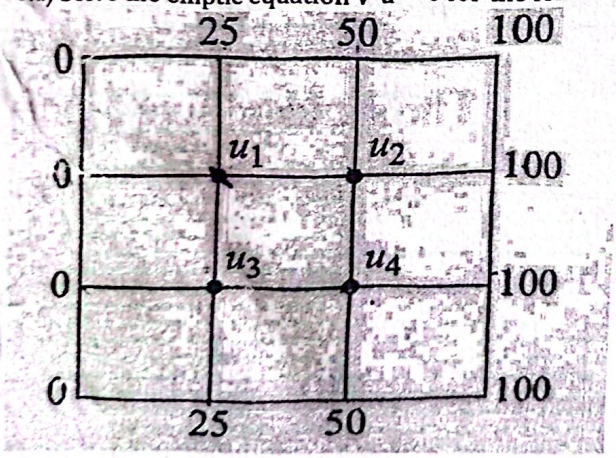
OR

Find the largest (dominant) eigenvalue and corresponding eigenvector of the matrix by the power method $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. 8

5.a) Solve the IVP by using the RK-4 method: $y' = \frac{x^2+y^2}{x+y}$, $y(0) = 1$ with step size 0.2 for $y(0.4)$. 7

b) Solve the second order differential equation using RK-2 method: $y'' + 2y' - 3y = 0,\ y(0) = 1,$ $y'(0) = 1$ with step size 0.2, for $y(0.4)$. 8

6.a) Solve the elliptic equation $\nabla^2 u = 0$ for the following square, using the Gauss-Seidel method



7

OR

Solve the equation $\nabla^2 u = -81xy$ over the square domain $0 < x < 1,\ 0 < y < 1$, given that $u(0, y) = 0$, $u(x, 0) = 0, u(1, y) = 100, u(x, 1) = 100$ and mesh length $h = \frac{1}{3}$. 7

b) Solve the heat equation $u_t = u_{xx},\ 0 \le x \le 1,\ 0 \le t \le 0.1$ with boundary conditions $u(0, t) = 0 = u(1, t)$ and initial condition $u(x, 0) = \sin \pi x$, taking $h = 0.2$ and $\alpha = \frac{1}{2}$. 8

7. Write a short note on any two: (2×5 = 10)

a) Importance and use of numerical methods in science and engineering.

b) Errors in numerical computation

c) Partial differential equations

Pokhara University

Level: Bachelor — Full Marks:100
Programme: Research Fundamentals — Pass Marks:45
Course: Software IV

Candidate are required to give their answers in their own words as for as practicable
Figure in the margin indicate full marks
Attempts all the questions

1 a.	What is research? Explain the process of selecting research objectives, and illustrate the difference between general and specific research objectives.	7
1.b	What are the various types of research design? Justify which research design you would select to conduct a study on mobile phone addiction and its impact on sleeping patterns in the modern age.	8
2.a	What are the 6 Ps that need to be addressed while conducting research?	7
2.b	What is a literature review, and how does it help in identifying the research gap?	8
3.a	Differentiate between citation and bibliography. Illustrate with suitable examples from your field.	7
3.b	What are research questions? Explain their significance and discuss why a hypothesis is important before designing a research study	8
4.a	What are research ethics? Explain the concept and illustrate it with an example of plagiarism. Or What is sampling? Explain its various types and how a researcher determines the sample size.	7
4.b	Generate the APA and IEEE citation formats for the following article: Author – Yagyanath Rimal, Anil Shree Vastab, Bhesh Thapa Title – 'Machine Learning Hyperparameter Tuning: Effectiveness on Modern Heart Disease', Published – July 14, 2024, in Scientific Journal, Volume 23, Page 345." Or Differentiate between descriptive and inferential statistics in the context of research data analysis.	8
5.a	What is research triangulation? Explain its significance in modern research.	7
5.b	Differentiate between qualitative and quantitative research designs.	8
6.a	Explain and justify the statement 'rights of people directly involved in research'	7
6.b	What are the components of a research report? Illustrate each component and its structure.	8
7.	ANY two	
A	Abstract	5
B	Methodology	5
C	Mandley and Zotero	5

Pokhara University

School of Engineering

Final Internal assessment

Program: BE — Full Marks : 100

Course: Applied Mathematics — Pass marks: 45

Attempt all the questions

1. a. Define harmonic function. Show that v = e^x (xcosy − y siny) is a harmonic function. Find harmonic conjugate u of v 8

   b. State and prove Cauchy–integral formula and hence evaluate $\oint_C \frac{2z^2+4z}{z-2}dz$; $c: |z|=1$ 7

2. a. Define conformal mapping with examples. Find the bilinear transformation that maps $i,1,2+i$ into $4i,3-i,\infty$. 7

   b. Define singularity, zeros and pole of a function. State Cauchy Residue theorem. Evaluate $\oint_C \left(\frac{z^2\sin z}{4z^2-1}\right)dz$ where $c: |z| = 2$, counter-clockwise 8

   Or

   Find the Laurentz expansion for $f(z)=\frac{1}{z^2+4z+3}$ in the region

   (i) $1<|z|<3$ (ii) $0<|z+1|<2$ (iii) $|z|>1$

3. a. Using the Fourier integral show that $\int_0^\infty \frac{\cos xw}{1+w^2}dw=\frac{\pi}{2}e^{-x}$ for x > 0

   b. Define Fourier transform. Define Fourier sine & cosine transforms. If f(x) in continuous piecewise in each finite interval and absolutely integrable on x-axis, $f(x)\to 0$ *as* $x\to\infty$ *then* 8

   (i) $\hat{f}_c\{f'(x)\} = w\,\hat{f}_s\{f(x)\}-\sqrt{\frac{2}{\pi}}f(0)$

   (ii) $F_c\{f'(x)\} = w\,F_s\{f(x)\}-\sqrt{\frac{2}{\pi}}f(0)$

4. a. Define Z - transform. State and prove first shifting theorem of Z-transform. Using it evaluate $Z(te^{2t})$, $Z(ne^{-2t})$ Z(e^{-at}), Z(te^{-at}) and Z($e^{-at}/n!$). 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

5. a. Solve the partial differential equation $x^2U_y+y^3U_x=0$. 7

   b. Derive one dimensional wave equation and solve it 8

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

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

   temperature is 8

   b. Solve the equation of circular membrane completely 7

7. Attempt all questions 2.5x4=10

   a. If f(z)= $z+\frac{1}{z}$, check analyticity of f(z)

   b. Expand $\frac{1}{z}$ *at* $z=2$ as Taylor's series.

   c. Find the inverse Z – transform of $\frac{z}{z^2-2z+2}$.

   d. Verify that $U=e^{-3t}\cos 5x$ satisfy one dimensional heat equation.

SCHOOL OF ENGINEERING

Level: Bachelor
Programme: BE
Course: Advanced Programming with Java

Year : 2025
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) List features of Java. Write all the necessary steps to compile and execute a simple java program. 8
   b) Why is exception handling important? Explain the use of throw and throws keyword with suitable programming examples. 7
2. a) Distinguish between classes, interfaces, and inheritance. Why does Java restrict multiple inheritance with classes but allow it with interfaces? Support your explanation with a programming example. 8 7
   b) Differentiate between overloading and overriding. Explain final class and method in java.
3. a) Write a program to demonstrate a login form using JavaFX with username and password field with a sign in button. Upon clicking the button, display suitable welcome message if the user provides valid login credentials. Assumptions can be made if necessary. 7
   b) Design the following menu structure: 8
      File → Close
      Color → Red, Blue
      When the user clicks "Close", the application should exit. Selecting a color from the "Color" menu should change the background color of the frame accordingly.
4. a) Write TCP socket program to input a string in client, the server check if the string is palindrome or not and sends result back to client, the client then displays the result. 7
   b) What is distributed application? Explain the architecture of RMI. 8
5. a) Explain the concepts of IDL and provide a simple CORBA program example. 8

50

b) What is the importance of JDBC driver? WAP to display all the student records in JTable when user clicks Display Button. Assumptions can be made if necessary. 7

6. a) Create suitable student HTML registration form with details like id name and roll. When user clicks the submit button store this information in the database using Servlet or JSP. Assumption can be made if necessary. 8

Or

Define session and cookies. Explain Session with suitable programming example. 7

b) Define Design Pattern. Differentiate between Factory and Abstract Factory Design Pattern.

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

a) GET vs POST

b) SQL Injection attack

c) Java Collection

UNITED TECHNICAL COLLEGE

Level: Bachelor
Programme: BE
Course: Advanced Programming with Java

Semester: Fourth

Year : 2025
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 meant by Path and CLASSPATH variable? Explain characteristics of java in brief 7

b) How interfaces are different from class? Explain interface extension and implementation with example. 8

a) Why do we need to handle the exception? Distinguish error and exception. write a program to demonstrate your own exception class. 8

b) What are different states of an applet? Explain applet Life Cycle with suitable state diagram.

c) Design a GUI form using swing with a text field, a text label for displaying the input message "Input any String" and two buttons with caption CheckPalindrome and FindVowels. Write a complete program for above scenario and for checking palindrome display whether a string is palindrome or not after clicking in first button, and extract the vowels from it after clicking second button.

d) Compare and contrast JavaFX with swing. Explain HBox and VBox layouts of JavaFX with suitable examples.

a) What is URL and what are its components? Write a program to extract different components of a URL and display them. 7

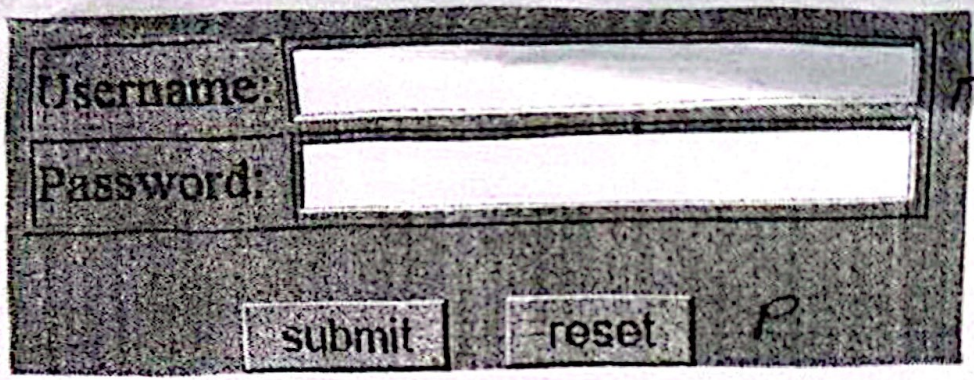
b) What is purpose of Java mail API? Explain the steps used in sending email by using Java mail API. 8

OR

What is RMI? Write server and client program by using RMI such that the program finds factorial of n.

a) A database "testdb" contains a table "employee" with some records having id, name, post, salary. Write a java program to display only those employees whose salary is more than 45000. 7

b) Create a simple servlet that reads and displays data from HTML form. Assume form with two fields username and password 8



6. a) What are the differences between get and post method? Explain the usages of cookies to maintain session in servlet with suitable example. 7

b) What is MVC architecture framework? Explain its layers with suitable example including java code. 8

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

a) Hibernate

b) Life cycle of Servlet

c) CORBA

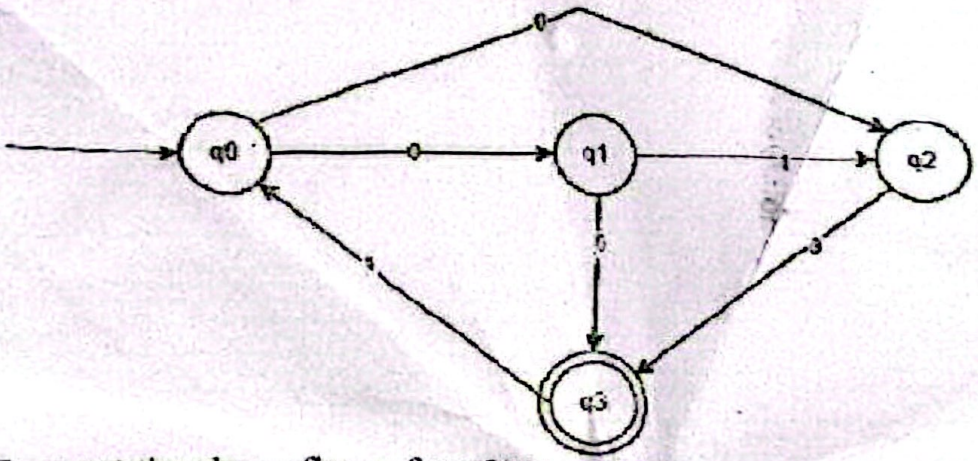
d) Row Set

UNITED TECHNICAL COLLEGE

Level:Bachelor | Semester: Spring | Year : 2025
Programme: BE | Full Marks : 50
Course: Theory of Computation | Pass Marks : 23
Time :1.5hrs.

1 a. Design a FA that accepts a set of string such that every string has starts with 00 and ends with 11,over alphabet {a,b}. 7

b. Find the regular expression for the following finite automata 8



2 a. Convert the above figure from NFA to DFA. 7

b. State and explain Arden's theorem with example. Also convert the following regular expression to finite automata: 00*(0*0+1). 8

3 a. Define Parse tree. When a grammar is called ambiguous? Explain with example 8

b. Give the formal definition of pushdown automata. Construct a PDA accepting the language 7
$L = \{a^n b^n \mid n>0\}$.

4 a. State pumping lemma for context free language. Prove that language $L = \{a^n b^n c^n \mid n>0\}$ is not context free language. 8

b. Define Turing machine. Construct a TM machine for checking the even palindrome of the string with strings $\{a,b\}^*$ 8

5 a. How can you represent Turing machine for computing function? Show that the function $f(n) = n+1$, is Turing computable. 8

b. Discuss the recursive function theory. Prove that the union of two recursive languages is recursive. 7

6 a. Write about church Turing thesis and universal Turing machine.

b. Define computability theory. Difference between P complete problem and NP complete problem with example. Does P problem equal to NP problem?

7 Write a short note on (ANY ONE)

a. Relation and function

b. Time and space complexity

c. Halting problem

UNITED TECHNICAL COLLEGE

Level: Bachelor | Semester – Spring | Year: 2025
Programme: BE | Full Marks: 100
Course: Computer Architecture | 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) The term "computer architecture" and "computer organization" are same or different, explain with examples. 7
   b) Explain the functional view of the computer system with reference to each component. 8

2. a) Define RTL. Write RTL for fetch, indirect and interrupt cycle. 7
   b) Write a VHDL program for half and full adder. 8

3. a) Explain the operation of microprogram sequencer used in microprogramming CU with block diagram. 8
   b) Explain Booth algorithm and use it to multiply $(-5)_{10}*(-7)_{10}$. 7

4. a) Differentiate between Hardwired and Micro-programmed control unit. Explain the logic of Hardwired unit. 7
   b) What is pipelining? Explain arithmetic pipelining. 8

5. a) Explain various communication techniques for I/O devices. 8
   b) How instruction pipelining supports in parallelism? Explain. 7

6. a) What is cache mapping? Explain cache replacement algorithm with a suitable example. 7
   b) Describe in brief about Flynn's Taxonomy. Also explain how parallelism can be experienced in uniprocessor systems. 8

7. Write short notes **(Any Two)**: 2 × 5
   a) Vector processors and Array processors
   b) Control Unit
   c) DMA

UNITED TECHNICAL COLLEGE

Level: Bachelor Semester: Spring Year : 2025
Programme: B.E.Computer Full Marks: 50
Course: Applied Mathematics Pass Marks: 23
Time : 1.5hrs.

Attempt only 50 marks questions.

1 a. show that the necessary condition for analytic of $f(z) = u + iv$ is 8
$u_x = v_y$ and $u_y = -v_x$

b. Define Laplace equation. If $u = 3x^2y+x^2-y^3-y^2$ show that there exist a function $v(x, y)$ such that $f(z) = u + iv$ is analytic . 7

2 a. State and prove Cauchy's Integral formula. 8
Integrate $\oint_C \frac{dz}{z^2+4}$ where C: $4x^2+ (y -2)^2 = 4$

OR

Find the Laurent's series for $f(z) = \frac{1}{z-2^3}$ *in* $1 < |z + 1| < 2$

b. Define conformal mapping. Determine the region of Transformation $w = 3z$ in the w-plane where the region in z-plane enclosed by the lines 7
$y = 1 , y = 2 , x = 1 , x = 2 .$

3 a. Solve: $Y_{n+2}+ 6Y_{n+1}+9Y_n=2^n$ When $Y_0 = Y_1 = 0$. b) Find 8
$Z^{-1}\left(\frac{z^2+1}{z^2-2z+2}\right)$
7

4 a. if $f(n)= 0$ for $n<0$ such that $Z(f(t)) =F(z)$ then $Z(f(t- kT)) = z^{-k} F(z)$ for $n>0$,$k>0$ 8

b. *Derive two dimensional wave equation with necessary assumptions.* 7

OR

A uniform rod of length 100cm has its ends maintained at a temp. 0° and initial temp. of rod is $f(x) = sin^3(0.01)\pi x$.

5 a. *find the deflection* $u(x , y , t)$ of the square membrane with 8
$a = b = c = 1$. *If initial velocity is zero and initial deflection is* $k \sin\pi x \sin\pi y$.

OR

Find the solution of one –dimensional wave equation by D-Alembert's Method.

b. Solve : $U_{xx} + U_{yy} = 0$ separating variables.. 7

6 a. State and Prove Convolution Theorem for Fourier transform 8

b. find the Fourier cosine integral of $f(x) = e^{-x} + e^{-2x}$ $x > 0$. 7

7 a. Find the Z- transform of $n2^n$ and $e^{-at} - e^{-bt}$ 8

b. Find the Fourier sine and cosine transforms of $f(x) = e^{-mx}, m > 0$ 7

UNITED TECHNICAL COLLEGE
QUALIFYING TEST

Level: Bachelor Year: 2025
Programme: BE Full Marks: 100
Course: Research Fundamental 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 questions:

a) Define research? What is the research aim and objectives? 8
b) What are the characteristics of research? Explain. 7

a) What are different types of research? Differentiate fundamental and applied research with examples. 8
b) What are the 6Ps of research? Explain. 7

a) What is a literature review? How can a literature review support the research? Explain its importance. What is the purpose of citations in academic writing? Explain the different types of citations with examples. 8
b) 7

a) Describe the different types of data generation methods with their advantages and possible constraints of different data generation techniques. What is a research proposal? Why is a research proposal needed? Explain the reason why the research proposal is rejected sometimes? What is a research report? Explain the different components of the research report. Define research participants. Describe the rights of people directly involved in research. What are the various responsibilities of an ethical researcher? Explain. 8
b) 7

Differentiate between bibliographic detail and referencing system. 8

Write short Notes (Any Two) (5×2 =10)

a) Research Hypothesis
b) Product of research
c) Plagiarism

UNITED TECHNICAL COLLEGE

Level: Bachelor | Semester: Spring | Year : 2025
Programme: BE | Full Marks : 50
Course: Numerical Methods | Pass Marks : 23
Time : 1.5hrs.

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

Attempt any four questions. Q.N. 7 is compulsory.

1 a Find the positive root of the equation $x^2 sinx - e^x + 2 = 0$ correct to 3 decimal places using Bisection method 7

b Evaluate the real root of $f(x) = 4\sin(x) - e^x$, using Newton's Raphson Method. The absolute error of root in consecutive iteration should be less than 0.01%. 8

2 a Estimate f (1.732) and f (2.646) from following set of data using Newton's divided difference interpolation. 7

x	-2	-1	0	1	2	3
f(x)	64	-5.5	-10	-9.5	56	366.5

b Fit an exponential function of the type $y = ae^{bx}$ to the following data. 8

x	0	0.5	1.0	1.5	2.0	2.5
y	0.10	0.45	2.15	9.15	40.35	180.75

3 a Using Gauss 2- point and 3- point formula evaluate $\int_2^4 (x^4 + 1)dx$ 7

b Using Romberg integration method evaluate $\int_0^1 \frac{1}{1+x} dx$ 8

4 a Solve the differential equation within $0 \leq x \leq 0.5$ using RK 4^{th} order method. 7

$20\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 4y = 5$, y (0) = 0, y' (0) = 0. Take h=0.25.

b Find the distance moved moved by a particle and its acceleration at the end of 4 seconds, if the time versus velocity data is as follows. 8

t:	0	1	3	4
v:	21	15	12	12

5 a Find out the largest Eigen value and corresponding Eigen vector from the following square matrix 7

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

b Solve the system of equations by applying gauss- seidel method 8

2x-7y-10z=-17

5x+y+3z=14

x+10y+9z=7

6 a Solve the poison's equation $U_{xx} + U_{yy} = 243(x^2 + y^2)$ over a square domain $0 \le x \le 1, 0 \le y \le 1$ with step size $h = \frac{1}{3}$ with $u = 100$ on the boundary. 7

b Given that $y' = x + y^2$, y(0)=1. Calculate the second approximation and hence fine the value at x=0.5 using Picard's method. 8

7 Attempt Any One (5×1=5)

a *Lagrange's Interpolation*

b *Algorithm of Simpson's 3/8 Method*

c *Algorithm of Gauss Jordan Method*