

**POKHARA UNIVERSITY
FACULTY OF SCIENCE AND
TECHNOLOGY
SCHOOL OF ENGINEERING**

Final Internal Examination 2081					
Exam Level	B. E. Computer Bachelor	F M	100		
Programme Year/Part	2 nd year/3 rd semester	PM	45		
Time	3 Hrs				

Subject: Calculus II

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. Evaluate the given integral: $\int_0^{\pi} \int_x^{\pi} \left(\frac{\sin y}{y} \right) dx dy .$ 5×3=15

- b. Evaluate the integral: $\iiint_V x^2 yz dx dy dz$ throughout the volume bounded by the plane $x=0,$

$$y=0, z=0 \text{ and } \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$$

- c. Find the volume of the solid whose base is the region in xy -plane that is bounded by the parabola $y = 3-x^2$, $y=2x$ while top is bounded by the plane $z=x+1.$

2. a. Solve by using power series: $(1-x^2)y'' - 2xy' + 2y = 0.$ 7.

- b. (i) State the Rodrigue formula. Sketch the graph of $P_1(x)$ and $P_2(x)$ with its formulas.

$$(ii) \text{ Show that: } J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x . \quad 4+4$$

OR

Find the solution of Bessel's Equation.

$$x^2 y'' + xy' + (x^2 - \nu^2) y = 0$$

8

3. a. (i) Find the Laplace Transform of $t \cos at$ and $\frac{\sin t}{t}$

- (ii) Find the inverse Laplace transform of the function $\frac{s+1}{s^2(s+3)} .$ 2+2+4.

- b. Solve the given initial value problem using the Laplace transform $y''' + 2y'' - y' - 2y = 0$
 $y(0) = y'(0) = 0 \text{ & } y''(0) = 6 .$ 7

4. a. Prove that the necessary and sufficient condition for a vector function $\vec{r} = \vec{r}(t)$ to have

$$\text{constant direction is } \vec{r} \times \frac{d\vec{r}}{dt} = 0$$

- b. If $\phi = \ln(x^2+y^2+z^2)$ then find $\text{grad } \phi$ and $\text{Curl}(\text{grad } \phi).$

- c. If $\vec{f} = 2x \vec{i} + 4y \vec{j} + 8z \vec{k} ,$ Show that \vec{f} is irrotational and the scalar potential function ϕ
 $\text{so that } \vec{f} = \text{grad } \phi .$ 5×3=15

POKHARA UNIVERSITY
SCHOOL OF ENGINEERING

Level: Bachelor	Semester - Fall	Year : 2024
Programme: BoCE III		Full Marks: 100
Course: Operating Systems		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 OS. Discuss the different functions of operating system. 7
 b) How CPU switches from one process to another? Illustrate with a diagram. What is switching overhead?

OR

Explain Dining Philosopher Problem in process synchronization and give solutions to it.

2. a) Consider the following set of processes, with the arrival times and the CPU-burst times given in milliseconds. Calculate the average waiting time and average TAT using SRTN, FCFS and RR(quantum=3ms). 8

Process	Arrival Time	Brust Time
A	1	5 3 2
B	3	3
C	4	3
D	2	1 0

- b) Define process. Explain PCB, process states and its transition with figures 7
3. a) Define page fault. Consider the following page reference strings: 1,3, 8,4,5,3,1,6,7. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame in each case calculate fault ratio. 8

- Second Chance page replacement algorithm
- LRU page replacement algorithm
- Optimal page replacement algorithm

7

- b) Define Relocation and Protection. With suitable diagram explain Inverted Page Table.

OR

Mention the differences between Paging and Segmentation. What are different page-table structures? Explain any one.

4. a) What is Internal and External Fragmentation. Explain TLB in detail. 7

- b) Considering a system with five processes P0 through P4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t_0 following snapshot of the system has been taken:

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P ₀	0	1	0	7	5	3	3	3	2
P ₁	2	0	0	3	2	2			
P ₂	3	0	2	9	0	2			
P ₃	2	1	1	2	2	2			
P ₄	0	0	2	4	3	3			

- What will be the content of need matrix?
- Is the system in a safe state? If Yes, then what is the safe sequence?

5. a) What do you understand by design principles in OS? Explain different Input output techniques with diagrams 8
- b) Why we need to organize the file? Explain the ways of file organization with suitable diagrams. 7

6. a) Portray the characteristics of Cloud Operating System as well as mention the different security issues in OS. 8
- b) Define Memory Wall and explain its impacts in OS. 7

7. Write short notes on any two:

- a) Kernel and its Types
- b) Memory hierarchy
- c) Bottleneck in OS

Exam Level Programme Semester	B.E. Computer III	F M PM Time	Final Internal Examination 2081 100 45 3 hrs
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Subject: Microprocessor and ALP

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. Differentiate microprocessor and microcontroller. Explain instruction cycle in detail. 7
b. Explain block diagram of 8085 microprocessor in detail. 8
- 2 a. Describe data transfer group of instructions in 8085. 8
b. Draw a labelled timing diagram for the instruction LDA. 7
- 3 a. Write an assembly program for 8085 to find the square of the given numbers from memory location 6000 H and store the result in memory location 7000 H. 7
b. Explain programmable interrupt controller (8259) in detail. 8
- 4 a. Draw a circuit for 8085 to interface 4K X 8 ROM and 1K X 8 RAM. 8
b. Write an 8086 ALP to display the string "UNIVERSITY" in reverse order. 7
- 5 a. What are different pre-defined interrupts in 8086 microprocessor? Explain with the use of Interrupt Vector Table. 8
b. What is macro assembler? Differentiate Macros and Procedure.
OR
Write 8085 program to perform 8-bit multiplication with starting address 2000 H. 7
- 6 a. Explain DMA in detail. 8
b. Explain bus structure of microprocessor. What do you mean by synchronous and asynchronous bus?
OR
Explain 8086 microprocessor with block diagram. 7
- 7 Write short note on: (any two) (5+5)
 - a. Memory mapped IO and IO mapped IO
 - b. Serial and parallel data communication.
 - c. Addressing Modes in 8085

-- Best of luck --

Data Communication, Magh 29th - Fall 2024
Total marks: 100, Pass marks: 45
BoCE III semester

Attempt all the questions.

1. a) Draw a generic block diagram of digital communication system and briefly explain the function for each block. (4+4)
- b) Differentiate between parallel and serial transmission. Briefly explain RS232C interface standards. (7)
2. a) Explain deterministic and random signal with example. Justify whether unit step signal is energy signal or power signal. [4+3]
- b) Define linear, stable, time invariant and causal system with examples. (8)
3. a) What is PDU? Differentiate between LLC and MAC sub layer of datalink layer of OSI reference model. (2+6)
- b) What is meant by "Open System Interconnection"? Briefly explain the layers of OSI reference model. (7)

OR

Briefly explain the protocols and services offered by TCP/IP layers.

4. a) What do you mean by guided media? Mention the advantages of optical fiber over co-axial cables and twisted pair cables. (2+6)
- b) Describe the transmission impairments for communication system with suitable example. (7)
- c) Define flow control. Briefly explain stop and wait, go-back-N, selective-repeat request ARQ. (2+5)
- b) Compare and contrast between circuit switching, packet switching and message switching. (8)

OR

What do you mean by multiplexing? Explain FDM hierarchy in telephone system.

6. a) Differentiate between AM and FM. Why is FM superior over AM in communication? (4+4)
- b) What are the benefits of modulation? Explain ASK, FSK and PSK with mathematical expression and necessary diagram. (8)
7. Write short notes on (Any Two): (2X5)
i) HDLC protocol
ii) Lossy Compression
iii) Bit Rate / Baud Rate

Exam	Final Internal Examination 2025		
Level	B.E	F M	100
Programme	BCE	PM	45
Year/Part		Time	3 Hrs

Subject: Computer Graphics

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

Attempt all the questions

1.	a) Explain application areas of computer graphics. b) Rasterize the line from (0,0) to (6,7) using bressenham line drawing algorithm.	7 8
2.	a) Explain flood fill techniques with its algorithm. b) Derive a transformation matrix due to perspective projection.	8 7
3.	a) Perform a 45 degree rotation of triangle A(0,0),B(1,1),C(5,2) about fixed point (-1,-1). b) Obtain a window to viewport transformation matrix explaining each steps.	7 8
4.	a) Describe the rotation of an object about an axis , which is not parallel to any of three coordinate axes of coordinate system. b) Explain scan line method for visible surface determination with suitable example.	9 6
5.	a) Develop an illumination model for a point source considering the effect of ambient light, diffused and specular reflection. b) Why machine independent programming language is used? Discuss any 5 file formats.	7 8
6.	a) Define Aspect ratio and bit depth. How computer graphics is different from image processing? b) Explain beam penetration and shadow mask method for color generation. c) Explain about different techniques for 3D object representation.	5 5 5
7.	Write short notes on (Any Two) a. Back face surface detection method b. CMYK color model c. Line clipping in 2D	5 x 2

-- Best of luck --

Pokhara University
School of Engineering

Level: Bachelor

Semester – Fall

Year: 2024

Program: BE Computer Engineering

Full Marks: 100

Course: Database Management System (new)

Time: 3 hrs.

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

Attempt all the questions.

1. a) What do you mean by data independence? How is schema different from instance? Justify with suitable examples. 7
- b) What do you understand by E-R model? Draw an E-R diagram for a Online Book Store including primary key, weak entity, composite attribute, derived attribute and multivalued attributes in your ER diagram. 8
2. a) What is a view? Give one example of it. Write importance of data dictionary. 7
- b) Given relation schema as below 8
- Employee (emp-id, name, address, telephone, post, salary, age)
Works_ on (emp-id, dept-id, join-date)
Department (dept-id, dept-name, phone, budget)
- Write the sql commands for the following.
- i. Insert new record in Department relation.
ii. Find the name of the department on which salary of employee is greater than or equal to 20000.
iii. List the name of employees whose name starts with "A" and ends with "h"
iv. Find the employee name and department name of those employees who living in address Pokhara.
v. Increment the salary of the employee by 25% whose post is manager.
vi. List name of employee whose age is greater than average age of all employees.
vii. List employee id of all employees who joint project on "06/05/2020"
viii. List the name of employees whose name starts with N or with K.
3. a) Define normalization. Explain about 1NF, 2NF, 3NF and BCNF with suitable examples. 8
- b) What are the roles of Assertions and Triggers in SQL? Explain with examples. 7
- OR
- Explain stored procedure with an example.
4. a) Explain cryptography and its types with related diagram of each. 8
- OR
- What is NoSQL? What are the types of NoSQL databases? Explain with example.
- b) What is Query optimization? How can it be achieved? 7
5. a) Suppose we are given the following table definitions with the certain records in each table. 8

PROJ (PNO, PNAME, BUDGET)
EMP(ENO, ENAME, TITLE)
ASG(ENO, PNO, DUR)

Write the RA expression for following tasks:

i) "Find the names of employees other than Hari Karki who worked on ABC ERP project for either 2 or 3 years".

- ii) Construct **initial operator tree** and final **efficient operator tree** by following the steps in query optimization. 7
- b) Explain insertion in B+ Tree index file with related example. 7
6. a) Explain conflict and view serializability. Test conflict serializability of the following schedule 8
- | T1 | T2 | T3 |
|----------|----------|----------|
| Read(X) | | |
| | Read(Z) | |
| Read(Z) | | Read(X) |
| | Read(Y) | |
| Write(X) | | Read(Y) |
| | Write(Z) | |
| | | Write(Y) |
| | | Write(Y) |
- b) What are the various types of failures that can occur in database? Discuss the log based recovery mechanism. 7
- 7 Write short notes on (any two) 2x5
- a) Denormalization
 - b) Blockchain
 - c) Shadow Paging

Nepal Engineering College

Assessment

Level: Bachelor

Year : 2025

Programme: BE

Full Marks: 100

Course: Computer Graphics (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 do you mean by Computer Graphics? Explain the working principle of refresh CRT with figure. 8
b) Differentiate between the raster scan display and vector scan display with reference to video memory and processing technology. 7
2. a) Derive equations for Bresenham's line drawing algorithm for line with slope $|m| < 1$. 8
b) Scan convert the a circle having center at (2, 2) and the radius length 10 using mid-point algorithm. 7
3. a) What is 2D shear? Explain it with equations and figure. 5
b) Magnify a triangle with vertices A(0,0), B(2, 2) and C(6, 3) by 4 times of its size keeping the point C(6, 3) stationary. 5
c) Explain Bezier curves with necessary equations. 5
4. a) Compare Parallel Projection with Perspective Projection. Derive the equations of perspective projection with necessary figures. 7
b) What is clipping? Explain in detail about Cohen-Sutherland Line clipping algorithm. 8
5. a) Compare object space method with image space method. Explain Z-buffer algorithm for detecting visible surfaces with suitable figure. 8

Or

Compare Gouraud shading with Phong shading along with their working steps.

- b) Write down the equations of 3D rotations along with their respective figure. 7
6. a) Reflect a square of vertices A(0,0), B(0, -4), C(4, -4) and D(4, 0) about the line $2x-y+4 = 0$. 7
b) Compare Flood fill algorithm with boundary fill algorithm in the sense of its implementation. 8
 7. Write short notes. (Any Two). 2X5=10
 - a) Frame Buffer
 - b) Fractal Geometry Method
 - c) Aspect ratio and resolution
 - d) Graphics File Format

NEPAL ENGINEERING COLLEGE

Changunarayan -4, Bhaktapur.

(Assessment Spring Semester 2024)

Level: Bachelor

Full Marks: 100

Program: BE

Pass Marks: 45

Course: Operating System (New Course)

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) Explain operating system concepts and its functionality. 8
- b) Define process. Explain 5 state process model with figure.
 What happens when a process transits from ready to running
 and running to ready, explain? 7
2. a) Define Race condition. State conditions to hold to have a
 good solution to avoid race condition. Among the hardware
 and software solution to avoid mutual exclusion, which one
 do you prefer and why? 8
- b) Define Monitors. How monitors solve producer-consumer
 problem, explain with algorithms? 7
3. a) Given below are processes arriving at respective arrival time
 in the order with the length of CPU burst time. 8

<u>Process</u>	<u>Burst Time</u>	<u>Arrival Time</u>	<u>Priority</u>
P1	5	0	3
P2	12	5	2
P3	6	3	4
P4	7	8	3

Consider the FCFS, SJF, Priority (5 is lowest) and Round Robin (Quantum = 5) scheduling algorithm for this set of process. Calculate average Turnaround Time and average Waiting Time. 7

- b) Explain Threads. Why multithreading is implemented?
 Differentiate between user space and kernel space threads.
4. a) List out different memory allocation Technique. Explain
 How relocation and protection solve memory management
 issues? 8

- b) Define kernel with figure. Explain its types
5. a) Consider the following page reference string 3,5,4,7,3,1,5,5,1,4,3,7. How many page faults would occur for each of the following page replacement algorithms considering 4 frames? 8
- i. Second chance page replacement
 - ii. FIFO page replacement
 - iii. Optimal page replacement
- b) Define Paging. List out the difference between paging and segmentation with figure. 7
6. a) What is Indefinite postponement? Is unsafe state a deadlock? 8
How operating system recovers from a deadlock?
- b) Explain the goals of I/O software 7
7. Write Short Notes on Any two 2 x 5) 10
- a) Distributed OS Vs Network OS
 - b) System Calls
 - c) Peterson's algorithms
 - d) Concurrent and Parallel processes

NEPAL ENGINEERING COLLEGE

Level: Bachelor

Semester – Fall

Year : 2024

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Programme: BE

Course: Database Management System

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

The figures in the margin indicate full marks.

Attempt all the questions.

- 1 a) Discuss various types of DBMS architectures such as centralized, client-server, and distributed database. Compare their advantages and disadvantages. [7]
- b) Discuss the various types of relationships in the ER model, including one-to-one, one-to-many, and many-to-many relationships. Provide examples with ER diagrams. [8]
- 2 a) Consider the given relational schema [7.5]
Customer (*CustomerID*, Name, Email, Phone, Address)
Product (*ProductID*, ProductName, Price, Category, Stock)
Order (*OrderID*, CustomerID, OrderDate, TotalAmount)
OrderDetails (*OrderDetailID*, OrderID, ProductID, Quantity, Subtotal)
Supplier (*SupplierID*, SupplierName, Contact, ProductID)
Write the relational algebraic expression for the following tasks:
i) Retrieve the names of suppliers who supply products in the "Furniture" category.
ii) Find customers who have ordered both "Laptop" and "Smartphone".
iii) List the total revenue generated by each product.
iv) Retrieve the order details (*OrderID*, ProductName, Quantity, and CustomerName) for all orders placed on '2024-01-01'.
v) Find customers who have placed orders with a total amount greater than \$500 in a single transaction.
- b) Consider the given relational schema [7.5]
Patient (*PatientID*, Name, Age, Gender, Address, Contact)
Doctor (*DoctorID*, Name, Specialization, Contact, Department)
Appointment (*AppointmentID*, PatientID, DoctorID, Date, Time, Diagnosis)
Treatment (*TreatmentID*, PatientID, TreatmentType, Cost, StartDate, EndDate)
Medicine (*MedicineID*, Name, Manufacturer, ExpiryDate, Price)
- Appointment - FD
- Write the SQL statement for the following tasks:
- i) List all patients who have been prescribed a medicine that expires before '2025-01-01'.

- ii) Retrieve the details of treatments for patients who have an appointment with a "Neurologist".
- iii) Retrieve the patients who have an appointment but have not undergone any treatment.
- iv) Retrieve the total number of medicines prescribed for each patient.
- v) Retrieve the average cost of treatments per patient.
- 3 a) What are SQL constraints? Explain different types of constraints in SQL such as PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, and CHECK, with examples. [8]
- b) What are functional dependencies in relational database design? Explain the significance of functional dependencies in normalization, and discuss the difference between partial and transitive dependencies. [7]
- 4 a) Describe the concept of normalization in relational database design. Explain its different normal forms (1NF, 2NF and 3NF) with suitable examples. Why is normalization important? [8]
- b) Discuss concepts like data confidentiality, integrity, availability, and authentication in ensuring the security of a database. [7]
- 5 a) Explain the concept of query optimization in a relational database management system (RDBMS). Why is query optimization necessary, and what are the different types of query optimization techniques? [7]
- b) What are the different file organizations used in DBMS? Explain the differences between heap files, sorted files, and hashed files. [8]
- 6 a) What is a transaction in a database management system (DBMS)? Explain the ACID properties of a transaction (Atomicity, Consistency, Isolation, Durability) and their importance in ensuring data integrity. [8]
- OR
- Draw an ER diagram for a car rental system that includes entities like Customer, Car, Rental, Payment, and Location, with their attributes and relationships.
- b) What is the difference between undo and redo operations in crash recovery? How does the DBMS use these operations during the recovery process to maintain database consistency? [7]
- OR
- What is the concept of Blockchain and how does it relate to databases?
- 7 Write short notes on (any two) [5+5]
- i) Database user
 - ii) Extended ER diagram
 - iii) Assertion and Triggers

NEPAL ENGINEERING COLLEGE

Level: Bachelor
Programme: B.E.
Course: Microprocessor and ALP

Assessment: Fall
Year : 2024
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) | The processing speed of Harvard architecture is higher than Von Neumann machine, Explain Why? Explain fetch, decode and execute cycle in microprocessor with block diagram. | 7 |
| b) | What are the different flags of 8085 microprocessor? Explain the addressing modes of 8085 microprocessor with example of each. | 8 |
| 2.a) | Write an ALP to find out the greatest number among ten 8-bit data's stored in memory location C000H to C009H. Also store that value in D000H. | 8 |
| b) | Draw and explain a well labelled timing diagram of the instruction OUT 25H. And calculate the total execution time if clock frequency is 2 KHZ. | 7 |
| 3.a) | What is the significance of 8255 PPI? Draw and explain the control word for 8255 PPI in I/O mode. | 7 |
| b) | Differentiate between partial and absolute address decoding. Design memory interfacing circuit with 8085 for 2KB RAM, 4KB ROM and 8KB EPROM. | 8 |
| 4.a) | With a suitable diagram explain the read and write operation with SRAM cell. | 8 |
| b) | What is the purpose of memory segmentation and segment registers? What is offset or effective address? How is the physical address of a memory location computed in 8086 microprocessor? Explain all with specific examples. | 7 |
| 5.a) | Explain the operating mechanism of 8259-PIC with its well labelled functional block diagram. | 7 |
| b) | Draw the internal architecture of 8086 microprocessor and compare the functions of its two basic units. | 8 |
| 6.a) | What about the IVT? Describe 8086 interrupt vector table with its diagram. | 7 |
| b) | Specify the functions with examples of the following 8086 instructions: LAHF, AAA, MUL, LEA, CWD, IRET, RCL and MOVSB. | 8 |
| 7. | Write short notes on: (Any two) $5 \times 2 = 10$ | |
| a) | Polled vs. Chained interrupt | |
| b) | DMA controller | |
| c) | Interrupt sequence of 8085 | |

NEPAL ENGINEERING COLLEGE

Changunarayan, Bhaktapur
(Assessment Fall Semester 2024)

Level: Bachelor

Full Marks: 100

Programme: BE

Pass Marks: 45

Course: Data Communication (New)

Time: 3hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Discuss the evolution of data communication systems from early telegraph systems to modern digital networks. Explain the key differences between analog and digital data transmission. 7
- b) Compare parallel and serial transmission techniques. Explain the differences between synchronous, asynchronous, and isochronous communication. 8
2. a) Classify signals into periodic and non-periodic, deterministic and random, energy and power, and continuous and discrete-time signals. Provide examples for each category. 7
- b) Define the basic properties of a system: linearity, causality, stability, static and dynamic, and time invariance. Prove whether the system $y(t)=x(t-2)$ is linear, causal, and time-invariant. 8
3. a) Explain the primary functions of each layer in the OSI model. How does it differ from the TCP/IP model? 7
 Or
 Discuss the architecture of Local Area Networks (LAN) and the role of LLC/MAC in routing.
- b) Discuss the characteristics of twisted pair cables, coaxial cables, and optical fibers. What are the advantages of using optical fibers over other guided media? 8
4. a) A 7-bit Hamming code is transmitted as 1011101. Assume it uses even parity.
 - o Identify if an error exists in the received code.
 - o If there is an error, determine its location and correct the code. 7
- b) Explain the Sliding Window ARQ protocol. How does it improve the efficiency of data transmission compared to the Stop-and-Wait ARQ protocol? Discuss how it handles packet loss and ensures reliable data delivery. 8

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 5. a) Define Switching. Compare circuit switching and packet switching in terms of efficiency, reliability, and real-time communication. | 7 |
| b) Define PPP. How do modulation techniques affect the design of communication systems in terms of power consumption and signal bandwidth? | 3 |
| 6. a) In a high-noise environment, which modulation technique would be more suitable: Amplitude Modulation (AM), Frequency Modulation (FM), or Phase Modulation (PM)? Justify your choice based on noise immunity. | 7 |
| b) Encode the following bit stream 110100001011 using:
i) Polar NRZ-I
ii) AMI
iii) Manchester Encoding
iv) PSK | 3 |
| 7. Short Notes (2X5) | 10 |
| a) Very Small Aperture Terminal | |
| b) Crosstalk & Attenuation | |
| c) PBX | |

NEPAL ENGINEERING COLLEGE

Level: Bachelor

Semester - Fall

Year : 2024

Programme: B.E.

Full Marks : 100

Course: Calculus II

Pass Marks : 45

Time : 3 hrs.

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

Attempt all the questions.

1. a) Evaluate; $\int_0^3 \int_0^{\sqrt{9-x^2}} \int_0^{\sqrt{9-x^2-y^2}} \frac{dz dy dx}{\sqrt{9-x^2-y^2-z^2}}$ 5

b) Evaluate the integral by changing into the polar form

$$\int_0^2 \int_0^{\sqrt{4-y^2}} \frac{xy}{\sqrt{x^2+y^2}} dx dy \quad 5$$

c) Find the volume of ellipsoid $\frac{x^2}{81} + \frac{y^2}{36} + \frac{z^2}{25} = 1$ bounded by the coordinate planes. 5

2. a) Solve $(1-x^2)y'' - 2xy' + 2y = 0$ by power series method. 7

b) Let $J_n(x)$ denote Bessel's function of order 'n' then prove

$$(i) \frac{d}{dx}[x^{-n} J_n(x)] = -x^n J_{n+1}(x) \quad 4$$

$$(ii) J_{\frac{3}{2}}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{\sin x}{x} - \cos x \right) \quad 4$$

OR

Express the function $f(x) = x^3 - 5x^2 + x + 2$ in terms of Legendre polynomial by using Rodrigues formula. Sketch the graph of $P_0(x)$, $P_1(x)$, $P_2(x)$ and $P_3(x)$ in a single graph.

3. a) Solve the initial value problem by using Laplace transform

$$y'' + 2y' + 5y = e^{-2t} \sin t, \quad y(0) = y'(0) = 1 \quad 8$$

b) Find the Laplace Transform of the function

$$(i) t^5 \sinh 2t \qquad (ii) \frac{u_{\pi}(t) \sin 2t}{t} \quad 7$$

4. a) The temperature at any point on the space is represented by the function $T = 2x^2 + y^2 - 2z$. A Bee is located $(2, -1, 2)$ desire to get warm as soon as possible. In which direction should it fly? 5
- b) Find the work done by the force $\vec{F} = (2y + 3, xz, yz - x)$ along the curve $x = 2y^2$, $z = y^3 + 2$ from $(0, 0, 0)$ to $(2, 1, 3)$. 5
- c) Show that the vector $\vec{F} = (y^2 \cos x, 2y \sin x + e^{2z}, 2ye^{2z})$ is conservative and find scalar function ϕ such that $\vec{F} = \nabla\phi$. 5
5. a) State Stoke's theorem. Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = (y^3, 0, x^3)$ and C is the boundary of the triangle with vertices $(1, 0, 0), (0, 1, 0), (0, 0, 1)$. 7
- b) Let S be the hemi-sphere given by $z = \sqrt{9 - x^2 - y^2}$ and $\vec{F} = (3x, 3y, z)$. Find the flux of \vec{F} through S. 8
- OR
- State Gauss divergence theorem. Evaluate $\iint_S \vec{F} \cdot \vec{n} dA$ where $\vec{F} = (y^3, x^3, z^3)$ and S is the cylinder $x^2 + 4y^2 = 1$, $0 < z < 5$, $x > 0, y > 0$ by using it.
6. a) Find the Fourier series of $f(x) = x - |x|$, $-\pi < x < \pi$. 5
- b) Find the Fourier Sine series of $f(x) = \pi \sin \pi x$, $0 < x < 1$. 5
- c) Find the Fourier Cosine series of $f(x) = x^2$, in $(0, \pi)$ and prove that $1 - \frac{1}{4} + \frac{1}{9} - \frac{1}{25} + \dots = \frac{\pi^2}{12}$. 5
7. Attempt ANY TWO of the following ; 10
- a) Solve partial differential equation $u_t + u_x = u$, $u(t, 0) = 5$.
- b) Find the breaking time of $u_t + u^2 \cdot u_x = 0$, $u(x, 0) = \frac{1}{1+x^2}$.
- c) Find the shock wave of $u_t + u \cdot u_x = 0$ satisfying the initial condition $u(x, 0) = \begin{cases} 1 & x \leq 0 \\ 2 & x > 0 \end{cases}$.

* * *

OR

Compress "Lossless Compression" using Huffman codes and find its efficiency and redundancy

5. a) When is the Retransmission necessary? Explain about stop and wait ARQ protocol for the damaged frame. 2+5
b) What do you mean by multiplexing? How does the statistical TDM overcome the problem of synchronous TDM? 8
6. a) What is modem? Draw ASK, FSK, PSK, DPSK of the given binary sequence: 110001011. 7

OR

A carrier wave of frequency $f = 1\text{MHz}$ with a pack voltage of 20V is used for amplitude modulation with a signal of frequency 1kHz with a pack voltage of 10v. Find out the modulation index, bandwidth, and transmit Power.

- b) Consider that the bit sequence 1000000000100001101 is to be transmitted. Draw the resulting waveform if the sequence is transmitted using Polar RZ, HDB3, B8ZS and Manchester Code 8

7. Write short notes on: (Any two) 2×5
- { a) Packet Switching
b) QAM
c) Transform coding

NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Level: Bachelor

Semester: Fall

Year: 2024

Programme: Computer

Full Marks: 100

Course: Data Communication

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) Why is digital transmission preferred over analog transmission? 7
A system sends a signal that can assume 8 different voltage levels. It sends 400 of these signals per second. What are the baud and bit rates?
 - b) Explain Shannon's theorem for a noisy channel. The bandwidth of a channel is 2 MHz and its SNR is 63. Determine the appropriate bit rate and signal level. 8
2. a) What do you differentiate data and information? Verify whether the given signal is periodic. If periodic, find the fundamental period. 7

$$x(t) = 3 \cos\left(5t + \frac{\pi}{6}\right)$$

- b) Check whether the following system is linear, causal, time invariant and stable or not.
 - i. $y(t) = \log x(t)$
 - ii. $y(t) = \cos(x(t))$
 - iii. $y(t) = x(t^2)$
 3. a) Compare the OSI model with the TCP/IP model. 7
 - b) What is the purpose of cladding in an optical fibre? Explain the modes of propagation used in the optical fibre. 8
4. a) Evaluate the attenuation, if a signal travels through a transmission medium and its power is reduced to one-half. 3
 - b) Why CRC is used to detect burst error correction? If the frame is $x^7 + x^5 + 1$ by the generator polynomial $x^3 + 1$, what would be the transmitted frame? 4+8

Nepal College of Information Technology
Unit Test 2024-Fall

Program: BECE

Semester: I

Subject: MALP

Time: 2 Hours

FM: 70

PM: 32

- ✓ *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. Define microprocessor system .Enlist the greatest breakthrough in microprocessor so that microprocessors are available for the modern personal computer. 7
2. Draw and explain the internal architecture of 8085 MP . 8
3. Define addressing mode.Explain the instruction sets available in 8085 MP. 7
4. Define T-state. Draw well labelled timing diagram of instruction LXI H, AOOB H. 8
5. Write an ALP in 8085 to check whether number stored in memory location B050 H is even or odd and store it in memory location C050 H if it is odd otherwise store it in memory location D050 H. 7
6. Write an ALP in 8085 to transfer 12 bytes of data starting from memory location 2070 H to 2080 H. 7
7. Design address decoding circuit for 8KB RAM ,4KB ROM and 2KB EPROM with 8085 MP . Starting address is 0000 H. 8
8. Differentiate between :
 - i) Asynchronous Bus and Synchronous Bus
 - ii) SRAM vs DRAM8
9. Write short notes on :(Any Two) $5 * 2 = 10$
 - i) Von Neumann vs Harvard Architecture
 - ii) Memory Hierarchy
 - iii) Addressing modes in 8085

<u>Process</u>	<u>Arrival Time</u>	<u>Burst Time</u>
P ₁	0	7
P ₂	3	4
P ₃	5	2

- b) For what purpose semaphores is used? Give solution to producer-consumer problem using semaphores and explain. 7
4. a) Differentiate between Paging and Segmentation? What are different page-table structures? Explain any one. 7
- b) How many page faults occur for the following reference strings for three-page frames?
 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1
 Using LRU, FIFO and Second-Chance page replacement algorithm. 8
5. a) Differentiate between internal and external fragmentation.
 Discuss about TLB. 7
- b) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 2243. The queue of pending requests, in FIFO order, is
 586, 1470, 1913, 1774, 4948, 1509, 4022, 1750, 130 8
 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms?
 i. FCFS
 ii. SSTF
 SCAN (Initially moving downward)
 iv. C-SCAN (Initially moving upward)
6. a) Discuss about memory wall and bottleneck for operating system. 7
 b) Differentiate sequential file access method and random file access method. Explain different file allocation strategies. 8
7. Write short notes on: (Any Two) $2 \times 5 = 10$
 a) OS Services
 b) File protection
 c) RAID
 d) Memory hierarchy

NEPAL COLLEGE OF INFORMATION TECHNOLOGY
Assessment Fall 2024

Level: Bachelor

Year : 2025

Programme: BE_CE_M

Full Marks: 100

Course: :: Operating System

Pass Marks: 45

Semester: V

Time : 3 hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain various types of system calls with an example for each. 8
b) What is Process? Draw and describe process state diagram. What is the biggest advantage and disadvantage of implementing threads in user space? 7
2. a) Consider the following Snapshot of a system:

Processes	Allocation	Max	Available
P0	ABCD	ABCD	ABCD
P1	0012	0012	1520
P2	1000	1750	
P3	1354	2356	
P4	0632	0652	
	0014	0656	

Answer the following questions using the Banker's algorithm:

- i) What is the content of the matrix need?
- ii) Is the system in a safe state? Also find the safe sequence. 8
- b) Explain reader-writer problem. 7
3. a) Consider the following set of processes, along with their burst time (in milliseconds), arrival time and priorities. Calculate average waiting time and average turnaround time using following scheduling, also describe which one is best algorithm and why.
 - i) FCFS
 - ii) SRTN
 - iii) HRRN
 - iv) RR (Quantum size=2ms)8

Eid	Name	Department	Salary	City
101	Alice	HR	60,000	New York
102	Bob	IT	80,000	Chicago
103	Charlie	IT	80,000	Chicago
104	David	Finance	70,000	Boston
105	Eve	HR	60,000	New York

- i. Identify the functional dependencies in the EMPLOYEE relation.
ii. Determine the normal form of the EMPLOYEE relation and justify your answer.
iii. Does this relation suffer from insertion, deletion, or update anomalies? If so, explain.
iv. Normalize the EMPLOYEE relation to 3NF if necessary and show the resulting table(s) with sample data.
4. a) What is security? How to achieve security in DBMS. Explain types of security mechanisms also list out the differences between Discretionary Access Control (DAC) and Mandatory Access Control (MAC). [7]
b) What is query processing and optimization? Explain the steps of query processing with a figure. Also, give an example of an Optimized query tree. [8]

Or

What is a Cost estimation and how to do it? What is the evaluation and equivalence of expression? Explain Pipelining and Materialization with their differences.

5. a) What is file organization? What are the 2 methods of it? Draw a B+ tree for the following keys with order 4. [8]
1,4,7,10,17,21,31,25,19,20,28,42
Also, delete 21,31,20

Or

What are the different Organization of Records in the file? Explain all of them with proper examples. Also, mention collision-resolution techniques of the hash index with an example.

- b) What is the serial and serializable schedule? For the given schedule check whether it is a conflict serializable or not if yes then find its conflict equivalent schedule. Also, check for view serializable. [7]

S: R2(X), W2(X), R1(X), W1(X), R2(Y), R3(X), W2(Y), W3(X)

6. a) Why do we need crash recovery? Explain different kinds of failures that occur in transactions. For the given example explain how the log is operated. Also write the deferred log recovery for following. [8]

$\langle T_0 \text{ start} \rangle$	$\langle T_0 \text{ start} \rangle$	$\langle T_0 \text{ start} \rangle$
$\langle T_0, A, 1000, 950 \rangle$	$\langle T_0, A, 1000, 950 \rangle$	$\langle T_0, A, 1000, 950 \rangle$
$\langle T_0, B, 2000, 2050 \rangle$	$\langle T_0, B, 2000, 2050 \rangle$	$\langle T_0, B, 2000, 2050 \rangle$
	$\langle T_0 \text{ commit} \rangle$	$\langle T_0 \text{ commit} \rangle$
	$\langle T_1 \text{ start} \rangle$	$\langle T_1 \text{ start} \rangle$
	$\langle T_1, C, 700, 600 \rangle$	$\langle T_1, C, 700, 600 \rangle$
		$\langle T_1 \text{ commit} \rangle$

(a)

(b)

(c)

- b) A healthcare organization manages patient data stored across different locations. Analyze how distributed databases can ensure data integrity and security while providing fast access to critical information. [7]
7. Write short notes on: (Any two) [5*2=10]
- No SQL database vs SQL database
 - 2Phase and strict 2phase lock
 - Concurrency problems and isolation levels
 - Blockchain and cryptocurrency
 - Schema Diagram

NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Assessment Fall 2024

Level: Bachelor

Year: 2025

Program: BE_CE_M/D

Full Marks: 100

Course: Database Management System (New)

Pass Marks: 45

Semester: III

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) You are a Database Engineer hired to manage patient data, appointments, medical history, treatments, and billing for a hospital management system. The hospital is migrating from a file-based system to a DBMS to achieve higher performance and security. Address the following. [8]
 - i. The purpose and applications of a DBMS for managing hospital data & key differences between a database system and a file system in the healthcare context.
 - ii. How would you implement data abstraction and data independence for patient records and treatment data?
 - iii. How DDL, DML, and DCL will be used to define the structure of, manipulate, and control access to medical data by hospital personnel.
 - iv. Database architecture two-tier or three-tier you will recommend to support multiple users while ensuring the security of data.
 - b) What are the differences between logical and physical models? Draw an ER diagram for the **Online Learning Platform** using extended features like generalization, and specialization and indicate primary keys and foreign keys.[7]
2.
 - a) Write RA for following [5*1=5]
Student (Sid, Name, Gender, Address)
Result(Gid, Sid)
Grade(Gid, Marks, Grade, Stream)
 - i. Find the names and addresses of all students who score **90** marks with a grade "A" and belong to the **Science** stream.
 - ii. Increase student marks by **10%** if they belong to the "**Computer**" stream and decrease by **20%** if they belong to "**IT**".
 - iii. What is the no. of a female student whose name is "**Sita**" and score grade 'A'.
 - iv. Insert new records in the Student table with an ID 5 name "**Shiva**" whose address is the same as "**Madhay**" and whose gender is the same as "**Krishna**".
 - v. Delete the records of all students whose marks are less than **45**?
 - b) What are the constraints in the database why it is needed? Explain all integrity constraints with an example. [5]
 - c) What is key? What is its role in DBMS? Explain its types with examples.[5]
3.
 - a) Write SQL for the following [7*1=7]
Salesman (Sid, Name, Scity, Commission, Gender)
Orders (Ono, Purchase_amount, Order_date, Cid, Sid)
Customer (Cid, Name, CCity, Grade, Gender)
 - i. Find the top 3 salesmen who earns the highest commission.
 - ii. Find the 2nd highest purchase amount.
 - iii. Update salesman name and gender as 'Chitra' and 'male' who earns more than 20000 commission and serves to ram having grade 'A'.
 - iv. Delete salesman records who serve female customers with grade 'A' and name Rita.
 - v. Sort all the information of the salesman and order by commission.
 - vi. Find the name of a salesman who sells to customers of the same gender as them.
 - vii. What is the difference between Inner join and outer join?
 - b) What is normalization and denormalization? The table shows the records of an Employee [4*2=8]

5. a) Explain the logic used for forming a Quadratic Bezier curve. Use the Bezier curve equations for approximating a curve with control points $P_0(1,4)$, $P_1(2,7)$, $P_2(8,2)$ and four line segments. 8+7
b) Why is it required to visualize data sets? How is it done?
6. a) How are fractals used in computer graphics? 7+8
b) Explain the perspective projection equations. Project a point $P(2,2,2)$ on the view plane situated at $(0,0,-2)$ and the projection reference point situated at $(0,0,-8)$
7. a) Along with the APIs of OpenGL, explain how projectic formed? 5+5
b) What is language binding, what are its benefits?

NEPAL COLLEGE OF INFORMATION TECHNOLOGY
Assessment Fall 2024

Level: Bachelor

Year : 2025

Programme: BE_ CE Morning/Day_ III

Full Marks: 100

Course: : Computer Graphics

Pass Marks: 45

Semester: V

Time : 3 hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain how the use of GPU can be used for hardware acceleration? 7+8
- b) Explain the refresh logic of a video controller in case of Raster Display system with a diagram.
2. a) How does Flood fill algorithm work to fill an object? How is it different from Boundray fill algorihm? 7+8
- b) A triangle with vertices A(5,2),B(4,1),C(6,1) is required to be reflected about line $y = 2x - 2$. Find out the final coordinate positions of the triangle after performing the desired transformations.
3. a) Derive Bresenham's line drawing algorithm drawing lines with slope greater than one and use it to digitize a line with end points A(20,10) B(24,18). 7+8
- b) What is the difference between a window and a viewport? Clip a line segment with end points A(5,5) and B(120,110) against the window with its lower left corner at (10,10) and upper right corner at (100,100) using Cohen-Sutherland algorithm then transfer the clipped line segment to a viewport with its lower left corner at (-5,-8) and upper right corner at (5,10)
4. a) How does Gouraud shading work and how does it differ from Phong shading? Explain with equations. 7+8
- b) How is Z buffer technique different from Depth Sorting Technique for detecting visible surfaces?

(b) Show that vector $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$ is conservative and find a scalar function ϕ such that $\vec{F} = \nabla\phi$ 5

(c) Using Green's theorem, evaluate $\int_C (\sqrt{y}dx + \sqrt{x}dy)$ where C is triangle with vertices $(1,1), (3,1), (2,2)$ 5

5. (a) Find $\iint_S (\vec{F} \cdot \vec{n})ds$ for $\vec{F} = yzi + zxj + xyk$ and S is the surface of sphere $x^2 + y^2 + z^2 = 1$ in the first Octant. 7

(b) Evaluate $\iint_S (\vec{F} \cdot \vec{n})ds$ by using Gauss divergence theorem if

$\vec{F} = x^3\vec{i} + y^3\vec{j} + z^3\vec{k}$, S is the sphere $x^2 + y^2 + z^2 = 9$. 8

OR

Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ by using Stoke's theorem where $\vec{F} = (y^3, 0, x^3)$ and C is the boundary of the triangle with vertices $(1, 0, 0), (0, 1, 0), (0, 0, 1)$.

6. (a) Find the Fourier series of the function $f(x) = x + |x|$ if $-\pi < x < \pi$ 7

(b) Find the half range cosine series for $f(x) = \sin x$ in the interval $0 < x \leq L$ 8

7. Answer the following (Any two) $(5 \times 2 = 10)$

(a) Find solution of $u_x + u_y - u = 0$ given that $u(x, 0) = 2$

(b) State and prove second shifting theorem of Laplace Transformation.

(c) Evaluate $\int_{(0,2,3)}^{(1,1,1)} (yz \sinh xz dx + \cosh xz dy + xy \sinh xz dz)$

NEPAL COLLEGE OF INFORMATION TECHNOLOGY
Assessment Fall 2024

Level: Bachelor
 Programme: BE_CE_M_D
 Course: Calculus-II
 Semester: III

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

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. (a) Evaluate $\int_0^1 \int_0^2 \int_0^3 (xy + yz + zx) dx dy dz$ 5
 - (b) Evaluate $\int_0^a \int_0^x \frac{\cos y}{\sqrt{(a-x)(a-y)}} dy dx$ 5
 - (c) Find the volume of the solid whose base is bounded by $y = 4 - x^2$ and $y = 3x$
 and the top of the solid is bounded by $z = x + y$. 5
2. (a) Solve: $y'' + (1 - x^2)y = 0$ by power series method. 8
 - (b) Solve: $(1 - x^2)y'' - 2xy' + n(n+1)y = 0$ 7
- OR

For Bessel's function $J_v(x)$ show that $\frac{d}{dx}[x^v J_v(x)] = x^v J_{v-1}(x)$ and draw the figure of $J_0(x)$

3. (a) (i) Find Laplace transform of $t \cos at$
 (ii) Find inverse Laplace transform of $\log(\frac{s}{s^2 + 4})$ 4+4
 - (b) Solve : $y'' - 2y' + y = e^t$, $y(0) = 2$, $y'(0) = -1$ by using Laplace Transforation 7
4. (a) Find directional derivative of $f = xy^2 + yz^3$ at $(2, -1, 1)$ along the normal to the surface
 $x \log z - y^2 + 4 = 0$, at $(-1, 2, 1)$ 5

Date: 2081/09/01	Level BE	Full Marks 50
Programme BCE		Time
Semester III		1.5 hrs

Subject: - Database Management System

- ✓ 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) What is DBMS. State advantages of DBMS over file processing system. [8]
- 2.a) Define the role of relational algebra and its associated basic operators with necessary notations. [8]
- b) Draw an E-R diagram for hospital management system. (Use DOCTOR, PATIENT, HOSPITAL and MEDICAL_RECORD Entity) [6]
- 3) Define Normalization and state the advantages of normalization. Normalize database
Employee(emp_id,emp_name,phone,skill,salary,deptno,dept_name,jobno,job_title)
upto 3NF. [8]
- 4) Consider the following relations:
EMP(empno , deptno, ename ,salary,city) [10]

Write SQL query for the following cases:

- I. Display employee number and name in an increasing order of salary.
- II. Display employee name starting with "S" and working in deptno 105
- III. Delete all employee of department 100.
- IV. Display number of employees department wise
- V. Insert the new employee as 500, 102, rohit, 50000, kathmandu.

5. Write short notes on: (any two)
- a) Keys .
b) Integrity Constraints
c) Aggregate Functions

2x5

Date:	2081/10/25	Full Marks	100
Level	BE	Time	
Programme	BCE		

Subject: - Database Management Systems

- ✓ 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. What are the three levels of DBMS architecture? Explain each. [7]
2. Draw an ERD (Entity-Relationship Diagram) for a library management system that keeps the information about user, admin, login, book and book record. Assume suitable relationships and attributes. [8]
- a) Derive the relational schema from E-R diagram that you designed in question no 2.a) [7]
- b) [8]
3. Consider the following relations:
employee (employee-name, street, city)
works (employee-name, company-name, salary)
company (company-name, city)
manages (employee-name, manager-name)
- Write the SQL commands for the following
- I. Find the names and cities of residence of all employees who work for "ABC Bank".
- II. Find all employees in the database who live in the same cities as the companies for which they work.
- III. Modify the database so that Janardan now lives in Butwal.
- IV. Delete all tuples in the works relation for employees of "XYZ Bank".
4. What are triggers? Explain the concept of referential integrity constraint in relational databases with a suitable example. [7]
- a) Define BCNF. Given the following relation R and the set of functional dependencies F that hold on R, find all candidate keys for R. [8]
- R (A, B, C, D, E, F)
 $F = \{AB \rightarrow C, AC \rightarrow B, AD \rightarrow E, BC \rightarrow A, E \rightarrow F\}$
5. How do views help in maintaining database security? Explain the granting and revoking of privileges to database users. [7]

6. For the following banking database schema:

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

account (account number, branch-name, balance)

depositor (customer name, account number)

[8]

Write down an expression in the relational algebra for query:

- Find the names of all depositors who have an account in "Satdobato" branch with a balance greater than 60,000

Construct an initial operator tree and final efficient operator tree after applying transformation rules.

7. Define B+ tree structure used for indexing. Briefly explain how variable length records are stored in the databases.

[7]

8. a) What are the properties that must be hold by transaction. Explain the usefulness of each.

[8]

b) Explain briefly two-phase locking protocol for concurrency control. Write the different types of failure that may occur in a system. Define the role of checkpoint in system recovery.

[7]

9. Compare between a traditional RDBMS and a distributed NoSQL database. How does Blockchain technology ensure secure and tamper-proof databases?

[8]

10. a) Write short notes on:

Strong and Weak Entity Sets

Stored Procedures

Query Processing

[2*5=10]

Term Test I

Date:	2081/09/02	Full Marks	50
Level	BE	Time	
Programme	BCE		

Semester III

Subject: - Operating Systems

- ✓ 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. Define process. Explain the different structures of os along with its evolution. [8]
2. Explain producer consumer problems. Provide a solution using busy wait. Is it a proper solution? Give your opinions. [8]
3. Define threads. Differentiate between user level threads and kernel level threads. [7]
4. Draw a Gantt Chart and find average turnaround time and waiting time of the following process applying SJF(Preemptive), FCFS and Round Robin (quantum=3) scheduling algorithm. [8]

Process	A	B	C	D	E
Arrival Time	0	2	4	7	9
Burst Time	7	6	8	5	4

5. Consider the following page reference strings: a, b, c, d, b, a, e, f, b, a, b, c, g, f, c, b, a, b, c, f. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame? In each case calculate the fault ratio. [7]
 - FIFO Page Replacement
 - LRU Page Replacement
 - Second Chance Page Replacement
6. Given five memory partitions of 200KB, 500KB, 200KB, 300KB and 600KB (in order), how would each of the first fit, best fit and worst fit algorithms place process of 212KB, 417KB, 112KB and 426KB (in order)? Which algorithm makes the most efficient use of memory? [7]

$$[2.5*2=5]$$
7. Write short notes on: (**Any two**)
 - Translation Lookaside Buffer
 - PCB
 - Multithreading Models Kernel, CPU

Term Test II

Date:	2081/10/27		
Level	BE	Full Marks	100
Programme	BCE	Time	
Semester	III	3 hrs	

Subject: - Operating Systems

- ✓ 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. Define Operating System (OS). Explain the concept of OS as a Resource Manager. [8]
2. Explain the Process Control Block (PCB) and the different process states in detail. [7]
3. Define Race Condition. What causes race conditions? Explain the Test-and-Set Lock (TSL) solution for race conditions. [8]
4. Explain the Producer-Consumer Problem in process synchronization and provide solutions using semaphores. [7]
5. Define threads. Explain multithreading models with appropriate figures. [7]
6. Define the Critical Section. Consider the following state snapshot:

Process	Allocation (A, B, C, D)	Max (A, B, C, D)	Available (A, B, C, D)
P0	3, 0, 1, 4	5, 1, 1, 7	1, 0, 0, 2
P1	2, 2, 1, 0	3, 2, 1, 1	
P2	3, 1, 2, 1	3, 3, 2, 1	
P3	0, 5, 1, 0	4, 6, 1, 2	
P4	4, 2, 1, 2	6, 3, 2, 5	

Determine whether the system is in a safe state. If yes, find the safe sequence. [8]

7. Compute average waiting time and turnaround time for the given processes using:
 - (i) Round Robin (Quantum = 5),
 - (ii) SJF,
 - (iii) Priority Scheduling (High = 1).

Process	P1	P2	P3	P4	P5	P6
Burst Time	30	7	5	18	5	8
Priority	2	6	1	3	5	4

8. Given five memory partitions of 200KB, 500KB, 200KB, 300KB, and 600KB, analyze how the First Fit, Best Fit, and Worst Fit algorithms would allocate memory to processes of 212KB, 417KB, 112KB, and 426KB (in order). Which algorithm makes the most efficient use of memory? [7]
9. Given the page reference string:
1, 3, 5, 3, 7, 1, 5, 3, 1, 2, 3, 7, 6, 3, 4, 1, 8,
calculate the number of page faults for the following page replacement algorithms (assuming 4-page frames) and compute the fault ratio:
(i) FIFO Page Replacement
(ii) LRU Page Replacement
(iii) Second Chance Page Replacement
10. Define file descriptor. Explain the various file system implementations with appropriate figures. [7]
11. Define directory. Explain the working of the access control matrix contrasting with the access control list. [7]
12. Consider the disk track requests: 123, 250, 298, 120, 13, 300, 224. Assume the last request was at track 150, and the head is moving towards track 0. Calculate the total seek time for the following disk scheduling algorithms:
(i) SSF, (ii) C-SCAN, (iii) FIFO. [6]
13. Define the term memory wall. Explain the cloud operating system. [8]
14. Write short notes on: (any two) [7]
a. Thrashing
b. Convoy Effect
c. Starvation

$$[2.5 * 2 = 5]$$

Term Test I

Date:	20/1/09/05	Full Marks:	50
Level:	BE	Time:	
Programme:	BCE		

Semester: III

1.5 hrs

Subject: - Data Communication

- ✓ 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) Why do we need data communication system? Draw and explain the model of data communication system. 6
- b) Define bit rate and baud rate. Explain the RS-232 standards with ^{asynch} randomising 8
- handshake signals.
2. a) State Shannon channel capacity theorem. Consider that a 100-kbps data stream is to be transmitted on a voice-grade telephone circuit (with a bandwidth of 3kHz). Is it possible to approach error-free transmission with a SNR of 10 dB? Justify your answer. 7
- b) Comment on the linearity, stability, time invariance and causality for the following system:
 $y(t) = t^2 x(t)$. 10
3. a) Differentiate between energy and power signal. 5
- b) Compare and contrast between OSI reference model and TCP/IP model. 9
4. Write short note: (Any one) 5
 - a) Modes of data transmission
 - b. ALOHA

user to host
 - non
 - relay
 - dup
 - connect
 - disconnect
 - timer
 - queue
 - idle
 - wait
 - wire & user
 - netw. the
 - autonomous

1. OSI
 2. model is
 than proto

Term Test II

Date:	2081/11/04		
Level	BE	Full Marks	100
Programme	BCE	Time	
Semester	III		3 hrs

Subject: - Data Communication

- ✓ 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) How did people communicate in the past and how does it differ from today? Which method do you think is more reliable and why? 7
- b) Define bit rate and baud rate. A TV channel has a signal with bandwidth of 18MHZ and it is transmitted with average power of 6W. This signal has to travel through a channel which introduces an average noise of 0.1mW. If this TV signal is digitized and sent, find the maximum data rate of the channel. 8
2. a) Find whether the given signal is energy or power signal. 8
 $x(t)=e^{-2t}u(t)$.
OR
 a) Check for linearity, causality, stability and time variance for the following signal.
 $y(t)=t * x(t)$
 b) How do you classify a signal? Explain any four classification of signals. 7
3. a) Name the layers of TCP/IP model. Compare and contrast CSMA/CD and CSMA/CA in terms of their working mechanisms and applications. 1+6
 b) Among all the guided transmission media, which do you think is the best? Explain. *wire*. 8
4. a) Given the message, BCCABBDDAECCBBAED, find
 - i. Huffman code for each character
 - ii. Compression ratio if original character is represented by 8 bits.
 - iii. Encode the message.**OR**
 a) A bit stream 1100110 is transmitted using CRC method. The generator polynomial is x^3+1 . Calculate error free message at receiver. If the third bit from the left is inverted then show that error is detected at receiver's end. 8

 b) What is Hamming code? A 7-bit hamming code is received as 1110101. 7
 What will be the correct code?
5. a) What are the data link layer design issues? How does Go-Back-N ARQ improve stop-and-wait protocol? 8

 b) Is multiplexing and switching same? Explain the different types of switching. 7
6. a) How is QPSK better than PSK? Explain in detail. 7

 b) Define line coding. Represent the given sequence of bits 11001000011001 using:
 - i. AMI
 - ii. HDB3
 - iii. Unipolar NRZ
 - iv. NRZ-I

7. a) Write short note: (Any two)
- a. Amplitude modulation
 - b. Cellular telephony
 - c. Analog Hierarchy

Term Test I

Date: 2081/09/03			
Level	BE	Full Marks	50
Programme	BCE	Time	
Semester	III	1.5 hrs	

Subject: - Microprocessor & Assembly Language Programming

- ✓ 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. Draw a well labeled timing diagram of instruction MVI C, 24H. Describe about the bus and signals used in the diagram. [7]
- b. Design an interfacing circuit to interface 2 RAM chips of 8 KB each with starting address C000H [8]
2. a. Draw the pin configuration of 8085 microprocessor and explain about the pins related with Interrupts. [7]
- b. Show the READ and WRITE operation of Static RAM with its advantages and disadvantages. [8]
3. a. Write an assembly language program in 8085 multiply two numbers. First number is 09H and second number is located in memory location [D055]- 08H. Store the result in memory location E056H. [7]
- b. Explain briefly about Von-Newmann and Harvard Architecture along with diagram. [8]
4. Write short notes on: (**any one**) [1*5=5]
 - a. Microprocessor vs microcontroller
 - b. Synchronous and Asynchronous Bus

Term Test II

Date:	2081/10/29	Full Marks	100
Level	BE	Time	
Programme	BCE		

Semester III

3 hrs

Subject: - Microprocessor & Assembly Language Programming

- ✓ 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.

- CPU MUL INT JNTR DAA ADD SUB
1. a) Define Microprocessor. Explain the types of Architecture according to storage and memory. 7
 - b) What are the interrupt pins of 8085 microprocessor? Explain the different methods of handling multiple interrupts 8
 2. a) Write an assembly language program in 8085 to count the number of 1's in the number F3H and store the count value in the memory location EFEF. Comments in program indicate full marks. 7
 - b) Draw and explain a well-labelled timing diagram of the instruction IN 05H and calculate the time required to execute this instruction if the crystal frequency is 6MHz. 8
 3. a) What is the importance of DAA instruction? Explain it with an appropriate example along with the necessary calculations. 7
 - b) Design an Addressing Decoding circuit to interface 2¹⁶ RAM chips each of size 256 bytes with starting address 5300H. 8
 4. a) Explain the architecture of 8255A controller and explain the selection of ports available in it. 7
 - b) What do you mean by addressing modes? Explain the types of addressing modes on 8086 microprocessors. 8
 5. a) Discuss the advantage of 8086 over 8085 and explain the concept of pipelining and segmentation. 7
 - b) Write an assembly language program in 8086 to find the largest number among 10 blocks of data and store the largest value in location "largest" 8
 6. a) What is Macro assembler? Differentiate between Macros and Procedures. 7
 - b) Explain simplex, Half-duplex and Full duplex mode in serial communication. 8
 7. Write short notes on: (Any Two) 2x5
 - a) Memory hierarchy
 - b) Interrupt Vector Table
 - c) Static and Dynamic RAM

Term Test I

Date: 2081/09/04			
Level	BE	Full Marks	50
Programme	BCE	Time	
Semester	III	1.5 hrs	

Subject: - Computer Graphics

- ✓ 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)** What is Computer Graphics? Differentiate between raster and random display with its architecture [8]
 - b) Define Frame buffer? Suppose an RGB raster system is to be designed using an 8 inch x 10 inch screen with a resolution of 100 pixels per inch in each direction. If we want to store 6 bits per pixel in the frame buffer, how much storage in bytes do we need for the frame buffer? Also find out the aspect ratio of the raster system. [7]
 2. a) Derive an equation for line drawing using Bresenham's algorithm for slope less than one? [7]
- OR**
- Digitize a circle using mid point circle algorithm for $(X-2)^2/25 + (Y-3)^2/36 = 1$
- b)** Explain the boundary fill algorithm in detail and how this approach differs from flood fill. [8]
 3. a) What is composite transformation. Explain why do we need homogeneous coordinate system for transformation of computation in computer graphics. [7]
- OR**
- What is transformation? Magnify the triangle with vertices A (0,0) B(1,1) and C(5,2) to thrice its size while keeping C(5,2) fixed. [8]
- b) Explain the shadow mask method with neat figure.
 4. Write short notes on **(Any one)** 5 marks
 - a) Video controller
 - b)** DDA vs Bresenham's

Date:	2081/11/01		
Level	BE	Full Marks	100
Programme	BCE	Time	

Semester III

3 hrs

Subject: - Computer Graphics

- ✓ 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) What is Computer Graphics? Differentiate between raster and random display with its architecture. [8]
- b) Define Frame buffer? Suppose an RGB raster system is to be designed using an 8 inch x 10 inch screen with a resolution of 100 pixels per inch in each direction. If we want to store 6 bits per pixel in the frame buffer, how much storage in bytes do we need for the frame buffer? Also find out the aspect ratio of the raster system. [7]
- 2 a) Derive an equation for line drawing using Bresenham's algorithm for slope less than one? [7]

OR

- Digitize a circle using mid point circle algorithm for $(X-2)^2/25 + (Y-3)^2/36 = 1$
- b) Explain the boundary fill algorithm in detail and how this approach differs from flood fill. [8]

- 3 a) What is composite transformation. Explain why do we need homogeneous coordinate system for transformation of computation in computer graphics. [7]

OR

- What is window and viewport? Magnify the triangle with vertices A(0,0) B(1,1) and C(5,2) to thrice its size while keeping C(5,2) fixed.
- b) Explain the Sutherland Hodgeman polygon clipping algorithm considering the four different cases with example. [8]

OR

- Let R be the rectangular window whose lower left hand corner is at L (-3, 1) and upper right-hand corner is at R (2, 6). Use Cohen -Sutherland algorithm to clip the line segments A (-4, 2) and B (-1, 7).

- 4 a) What do you mean by Interpolated and Approximated spline. Derive an expression to specify a cubic Bezier curve segment controlled by the point P_0, P_1, P_2, P_3 [8]
- b) Derive the transformation matrix formed by Oblique and Orthographic projection. [7]

- 5 a) Explain the Painter's algorithm with necessary figure for removing hidden surface problem. [7]
- b) Explain Gouraud shading with its disadvantage and which method would be applicable to remove the drawback of Gouraud shading and how? [8]

Date:	2081/08/30	Full Marks	50
Level	BE	Time	
Programme	BEIT, BCE, BCV		
Semester	III		1.5 hrs

Subject: - Calculus II

- ✓ 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) Prove that the necessary and sufficient condition for the vector function \vec{a} of scalar variable t to have a constant direction is $\vec{a} \times \frac{d\vec{a}}{dt} = \vec{0}$. [8]

OR

State Stoke's Theorem. Using Stokes theorem evaluate $\int_C \vec{F} \cdot d\vec{r}$ where

$\vec{F} = (y, \frac{z}{2}, \frac{3y}{2})$ and C is the ellipse $x^2 + y^2 + z^2 = 6z, z = x + 3$.

- b) State Green's Theorem. Using it evaluate $\oint_C [(x^3 - 3y)dx + (x + \sin y)dy]$, C : the boundary of the triangle with vertices $(0,0), (1,0), (0,2)$. [7]

2. a) Find the Fourier cosine series of the function

$$f(x) = \begin{cases} kx & \text{for } 0 \leq x \leq \frac{l}{2} \\ k(l-x) & \text{for } \frac{l}{2} \leq x \leq l \end{cases} \text{ and show that } \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}. \quad [8]$$

- b) Find the Fourier series expansion of $f(x) = x + |x|$ for $-\pi < x < \pi$. [7]

3. a) Evaluate the integral $\int_0^2 \int_0^{4-x^2} \frac{xe^{xy}}{4-y} dy dx$ by changing the order of integration if necessary. [8]

- b) Find the volume in the first octant bounded by the co-ordinate planes, the cylinder $x^2 + y^2 = 4$ and the plane $z = x + 4$. [7]

[2 × 2.5 = 5]

4. Short Questions:

- (b) Evaluate $\int_0^1 \int_0^y \int_0^{x+y} dz dx dy$.

- (c) Define directional derivative of ϕ in the direction of \vec{a} . Find the directional derivative of $\phi = x^2 + y^2 - z^2$ at the point $A(1,3,-2)$ in the direction of \overrightarrow{AB} where B is the point $(4,7,3)$.

Term Test II

Date: 2081/10/23

Level BE

Programme BEIT, BCE, BCV

Semester III

Full Marks 100

Time

3 hrs

Subject: - Calculus II

- ✓ 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. Evaluate the integral

$$\int_0^z \int_x^2 y^2 \sin(xy) dy dx$$

by changing the order of integration. [5]

- b. Evaluate

$$\iiint_V (xy + yz + zx) dx dy dz$$

where V is the region bounded by

$x = 0, x = 1, y = 0, y = 2, z = 0$ and $z = 3$. [5]

- c. Find the volume in the first octant bounded by the co-ordinate planes, the cylinder $x^2 + y^2 = 4$ and the plane $z + y = 3$. [5]

2. a. Solve $(1 - x^2)y'' - 2xy' + 2y = 0$ by using power series method. [7]

- b. State Legendre polynomial. Express $10x^3 + 2x^2 - 5x - 3$ in terms of Legendre polynomials by using Rodrigues formula. [8]

OR

Define Bessel's differential equation of order n . Show that

$$J_{\frac{5}{2}}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{3-x^2}{x^2} \sin x - \frac{3}{x} \cos x \right)$$

3. a. Solve the following differential equation by using Laplace transform
 $y'' + 4y' + 4y = \sin t, y(0) = 1, y'(0) = 3$. [7]

- b. Define inverse Laplace transform. Find the inverse Laplace Transform of

i) $\frac{1}{(s-3)^3}$

ii) $\frac{s^2 - \pi^2}{(s^2 + \pi^2)^2}$

[8]

4. a. If $\phi = \ln(x^2 + y^2 + z^2)$, find $\text{div}(\text{grad } \phi)$ and $\text{curl}(\text{grad } \phi)$. [7]

OR

Let S be the part of the graph of $z = 9 - x^2 - y^2$ with $z \geq 0$. If

$\vec{F} = 3x\vec{i} + 3y\vec{j} + z\vec{k}$, find the flux of \vec{F} through S .

- b. State Gauss divergence theorem. Evaluate $\iiint_V \text{div } \vec{F} dv$ where

$\vec{F} = (x^3, y^3, z^3)$, S is the sphere $x^2 + y^2 + z^2 = 9$. [8]

5. a. State Green's theorem. Using Green's theorem, calculate
 $\int \{(x^2 + y^2)i - 2xyj\} \cdot d\vec{r}$
along the rectangle bounded by
 $y = 0, y = b, x = 0, x = a.$ [7]
- b. Evaluate $\iint_S \vec{F} \cdot \hat{n} dA$ where $\vec{F} = (y^2, x^2, z^2), S: x^2 + 4y^2 = 1, x \geq 0, y \geq 0, 0 \leq z \leq h.$ [8]
6. a. Find the Fourier series for the function
 $f(x) = x$ in the interval $0 < x < 2\pi.$ [7]
- b. Find the Fourier sine as well as cosine series representation of the half range
function $f(x) = x^2$ for $0 < x < 1.$ [8]
7. Attempt all the questions: [4*2.5=10]
- Find the general solution of $2u_{xx} + 2u_{yy} - u = 0.$
 - Define unit step function and find its Laplace transform.
 - If $P_n(x)$ is the Legendre polynomial, prove that $P_n(1) = 1.$
 - Find the acceleration of the curve $\vec{r} = (t, t^2, t^3)$ at $t = 1.$

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY
(Affiliated to Pokhara University)

Dhangadhi, Kailali

Pre-University Examination

Semester: III_Fall

el: Bachelor

gramme: B.E. Computer

urse: Microprocessors and ALP

Year : 2024
F.M. : 100
P.M. : 45
Time : 3hrs

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

Answer all questions.

- a) Suppose you need a processor for your project. Between microprocessor and microcontroller, what would you choose? How would you decide? 7
- b) Why do you think implementation of flags are necessary in microprocessor? Explain it with the help of flags implemented in 8085. 8
- c) Explain the addressing modes in 8085 microprocessor. 3
- d) Define T-state. Draw the labeled timing diagram of the instruction ORI 50H. 7
- e) How will you interface 4KB RAM and 2KB ROM with 8085? 3
- f) How multiple interrupts can be handled using 8259 PIC? Explain with necessary block diagram. 7
- g) Write a program to add two 32-bit numbers. 8
- h) Explain the control word format of 8255 PPI. 7
- i) Explain about IVT of 8086. 7
- j) Define assembler directives. Explain the following assembler directives along with their format: The memory model definition, The PROC directive, The DB directive, OFFSET. 8
- a) Write an ALP for 8086 to implement Pythagoras theorem. 8
- b) What is macro assembler? Differentiate between macros and procedures. 7
- Write short notes on any two: 7
- a) Memory mapped I/O vs I/O mapped I/O 2×5
- b) Fetch, decode and execute
- c) Pipelining in 8085

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

Dhangadhi, Kailali

Pre-University Examination

Level: Bachelor.

Semester : FALL_III

Year:2024

Program: B.E.Computer

F.M.: 100

Course: Data Communication

Time: 3 hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) How data are sent from source to destination? Explain digital communication system with the help of general block diagram. 8
b) What is serial and parallel data transmission? Differentiate between synchronous and asynchronous data transmission. 7

OR

- Explain Shannon's theorem for a noisy channel. Find the maximum bit rate for a channel having bandwidth 3100 Hz and SNR ratio of 20 dB. 7
- a) Define continuous and discrete time signals. Illustrate graphically unit step signal, ramp signal, impulse signal, sinusoidal signal and signum signal with their mathematical relation. 7
b) Differentiate between energy and power signal. Calculate whether ramp signal is power signal or energy signal. 8
- a) What are impairments in data communication. Explain in brief. 7
b) Differentiate between OSI layers and TCP/IP layers. 8
- a) What are guided and unguided transmission media? Discuss the advantages of fiber optics over other guided media. 7
b) A bit stream 1101011011 is transmitted using the cyclic redundancy check (CRC) method. The generator polynomial is $x^4 + x + 1$. Determine the transmitted codeword. 8
- a) What are the data link layer design issues? How does Go-Back-N Automatic Repeat Request (ARQ) improve the Stop-and-Wait Protocol? 8

- b) Explain the multiplexing technique applied in digital telephony .
6. a) Explain Frequency Modulation and Phase Modulation with waveforms of message signal, carrier signal and modulated wave. 8
b) What is multilevel modulation? Briefly explain with a suitable example.
- OR
- What is a modem? Show NRZ and HDB3 encoding pattern for the bit stream 1011100001100001.
7. Write short notes on: (Any two)
- a) ATM and Frame Relay
 - b) Optical fiber
 - c) Very Small Aperture Terminal (VSAT)

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

(Affiliated to Pokhara University)

Dhangadhi, Kailali

Pre-University Examination

Level: Bachelor

Semester: III_Fall

Year : 2024

Programme: B.E. Computer

F.M. : 100

Course: Database Management System

P.M. : 45

Time : 3hrs

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

Attempt all questions.

1. a) Define database schema and Instances. Explain the levels of data abstraction. 7
b) Design an ER diagram for an Library management System where:
 1. Members borrow books, which have attributes like ISBN, title, and author.
 2. Each member has a unique ID, name, and membership expiry date.
 3. A member can borrow multiple books, and each book can be borrowed by multiple members.
 4. The system tracks borrow dates and return dates. 8

Assume relevant assumption for the given system.

2. a) Consider the relational database
 Employee(Empname, street,city)
 Works(Empname,post,cmpname,Salary)
 Company(cmpname,location) 7
 Write relational algebraic expression for
 i. An employee named Robert is promoted from Assistant manager to manager.
 ii. Update the relation Company so that all companies located in Dhangadhi is shifted to Kathmandu.
 iii. Remove all the records of employee who lives in Butwal.
 iv. Display name of name,street,city of employee who works for 'Iris Company'.
b) Consider the following relational database.
 Customer (CustID, Name, Address, Phone)
 Orders (OrderID, CustID, OrderDate, TotalAmount)
 Product (ProdID, Name, Price) 8

OrderDetails (OrderID, ProdID, Quantity)

Write the SQL statements for the following queries.

- i) Write a command to create the Orders table with appropriate constraints.
 - ii) Display the details of products that have never been ordered.
 - iii) Modify the database to change the price of a product named "IPhone" to 150000.
 - iv) Retrieve the names of customers who have placed orders worth more than 5000.
3. a) What is a referential integrity constraint? Explain trigger and assertion with examples. 7
- b) Why do we need normalization? Explain types with suitable examples. 8
4. a) Discuss the importance of database security. How do authentication and authorization mechanisms ensure database security? 7
- b) What is Query Processing? Explain the steps involved in query processing. 8
5. a) Explain the concept of indexing in databases. How does a B+ tree index work? Illustrate with a diagram. 7
- b) What is concurrency control? Explain how timestamp-based protocols and 2PL are used to control concurrency in DBMS. 8
- OR
- Define Serializability. Explain conflict serializability and view serializability with examples.
6. a) What is shadow paging? Explain the log based recovery with suitable example. 8
- b) What is NoSQL database? How does it bridge the gap between object-oriented programming and relational databases? 7
- OR
- What is Distributed Database? Explain the advantages and disadvantages of distributed database.
7. Write short notes on:(Any Two) 2 x 5
- a) Stored Procedure
 - b) ACID Properties
 - c) Database Architecture

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

(Affiliated to Pokhara University)

Dhangadhi, Kailali

Pre-University Examination

Level: Bachelor

Semester: III_Fall

Year : 2024

Programme: B.E. Computer

F.M. : 100

Course: Operating System

P.M. : 45

Time : 3hrs.

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

Attempt all the questions.

1. a) Define Operating System. Explain Different Types of OS Structure. 7
b) Define process with its Process Model in detail. 8
2. a) Define Race Condition. Explain sleeping barber problem with its Solution. 7
b) Find the Average Waiting time and Turn Around Time for the following Processes using Round Robin Scheduling Algorithm. 8
Time quantum: - 2ms.

Process	Arrival Time	Burst Time
P1	0	4
P2	1	9
P3	5	4
P4	2	2
P5	3	7

3. a) Define Swapping. Explain Paging in detail. 7
b) Consider a system that contains five processes P1, P2, P3, P4, P5 and the three resource types A, B and C. Find out the system is safe or not.

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P1	0	1	0	7	5	3	3	3	2
P2	2	0	0	3	2	2			
P3	3	0	2	9	0	2			
P4	2	1	1	2	2	2			
P5	0	0	2	4	3	3			

4. a) For the following partition of 150K, 400K, 300K, 50K, and 500K in order place the process 210 K, 415K, 122K and 40K to: First fit and Next fit, best fit and Worst Fit. 7
- b) Consider the Pages referenced by the CPU in the order are 7, 6, 5, 7, 6, 9, 2, 7, 8, 1, 7, 5, 4. Find the Page fault and Page hit ratio Using FIFO, Optimal, LRU and MRU Page Replacement Algorithms. 8
7 ref; frame size = 3
5. a) Define File system in OS. Explain the Process of File Implementation System in OS. 7
- b) Suppose a disk drive has 200 cylinders, numbered 0 to 199. The drive head is at 50. The queue of pending requests in FIFO order is 82, 170, 40, 130, 34, 20, 190. Starting from the current head position what is the total distance that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms? 8
- FCFS
 - SSTF
 - C-Scan (Initially moving downwards)
 - LOOK
- “OR”
- Define I/O Device Management. Explain About Memory Mapped I/O and DMA
6. a) Explain about Mobile OS in detail. 8
- b) Define Mutual Exclusion. Explain Dekkers Algorithm in detail. 7
7. Write Short Notes on Following (Any Two) 5x2
- System Call in OS
 - Context Switching in Kernel
 - Fragmentation

Good Luck!!!

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

(Affiliated to Pokhara University)

Dhangadhi, Kailali

Pre-University Examination

Level: Bachelor

Semester: III_Fall

Year : 2024

Programme: B.E. Computer

F.M. : 100

Course: Computer Graphics

P.M. : 45

Time : 3hrs.

Candidates are required to give their 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 need and use of graphics in the field of IT. 7
b) Explain the architecture of the Raster scan system with the importance of the video controller. 8
2. a) What is scan conversion? Derive Bresenham's line drawing algorithm for $|m| < 1$. 8
b) Derive the midpoint Ellipse algorithm of Region 1. 7
3. a) Why do we need clipping? Explain the Cohen-Sutherland Line Clipping algorithm. 8
b) What will be the final coordinates of a polygon with vertices A(3,4) B(5,4) C(5,2) D(3,4) after it is rotated about a 45-degree angle and fixed point (2,3)? 7
4. a) Differentiate between 2D and 3D graphics? In computer graphics which dimensional is more suitable? 8
b) Derive quadratic cubic bezier curve. and explain the Bezier curve properties. 7
5. a) Explain Gouraud and Phong shading methods and their advantages and disadvantages. 8
b) What is ambient light and various light reflections? Derive illumination model. 7
6. a) Explain GKS and the different kinds of graphics file formats. 8
b) What is the working mechanism of OpenGL API? 7
7. Write short notes on the following (Any Two) 5x2
 - a) Video controller
 - b) DDA
 - c) Visualization of Data set

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY
(Affiliated to Pokhara University)
Dhangadhi, Kailali

Pre-University Examination

Dhangadhi, Kailali

Pre-University Examination

Level: Bachelor

Semester: III Fall

Year : 2024

Programme: B.E. (Computer/Civil)

F.M. : 100

Course: Calculus II

P.M. : 45

Time : 3 hrs

Time : 3 hrs.

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

Attempt all the questions.

- . a) Evaluate $\int_0^2 \int_{y^2}^4 y \cos(x^2) dx dy.$ [5]

b) Evaluate the triple integral: $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$
 [5]

c) Find the volume in the first octant bounded by the coordinate planes, the cylinder $x^2 + y^2 = 4$ and the plane $z + y = 3.$
 [5]

a) Using power series method, solve:
 $y'' - 4xy' + (4x^2 - 2)y = 0.$ [7]

b) Derive the solution of Legendre's equation. [8]

OR

i) If $J_n(x)$ is the Bessel's function of order $n,$

Show that: $J_{-1/2}(x) = \sqrt{\left(\frac{2}{\pi x}\right)} \cos x.$

iii) Express $2x^3 - x^2 - 3x + 2$ as Legendre polynomial.

OR

- i) If $J_n(x)$ is the Bessel's function of order n ,

Show that: $J_{-1/2}(x) = \sqrt{\left(\frac{2}{\pi x}\right)} \cos x.$

- ii) Express $2x^3 - x^2 - 3x + 2$ as Legendre polynomial.

- 3 a) Evaluate:

$$i) \quad L\{e^{-t} t \sinh 2t\}$$

$$\text{ii) } L^{-1} \left\{ \frac{s+2}{(s^2 - 4s + 13)} \right\}$$

- b) Using Laplace transform, solve the initial value problem: $y'' - 2y' + y = e^t$, $y(0) = 2$, $y'(0) = -1$. [7]

1

4. a) A particle moves along the curve $x = t^3 + 1$, $y = t^2$ and $z = 2t + 5$. Find the component of the velocity and acceleration at $t = 1$ along $\hat{i} + 2\hat{j} + 3\hat{k}$. [5]

b) If $f = \ln(x^2 + y^2 + z^2)$, find $\operatorname{div}(\operatorname{grad}f)$ at $(1, 2, 3)$. [5]

c) Evaluate $\int_C \vec{F} \cdot d\vec{r}$, where, $\vec{F} = 3x^2\hat{i} + (2xz - y)\hat{j} + z\hat{k}$, C: the straight line from $(0,0,0)$ to $(2,1,3)$. [5]

5. a) Evaluate the surface integral $\iint_S (\vec{F} \cdot \hat{n}) ds$, where, $\vec{F} = (6z, -4, y)$, S: the region of the plane $x + y + z = 1$ in the first octant. [7]

b) State Gauss divergence theorem. Using Gauss divergence theorem, evaluate $\iint_S (\vec{F} \cdot \hat{n}) ds$, [8]

where, $\vec{F} = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$, S is a cube $0 \leq x \leq 1$, $0 \leq y \leq 1$ and $0 \leq z \leq 1$.

OR

State Stoke's theorem. Using Stoke's theorem, evaluate $\oint_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = y\hat{i} - xz^3\hat{j} - zy^3\hat{k}$ and C: $x^2 + y^2 = 4$, $z = 3$.

6. a) Find the Fourier series of the function [8]

$$f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2 - x), & 1 \leq x \leq 2 \end{cases}$$

$$\text{Hence show that } \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}.$$

b) Find the Fourier cosine as well as sine series of the

$$f(x) = \pi - x, \quad 0 < x < \pi. \quad [7]$$

7. Attempt Any two $[2 \times 5 = 10]$

i) Show that the value under the integral sign of $\int_{(4,0,3)}^{(-1,1,2)} [(yz + 1)dx + (xz + 1)dy + (xy + 1)dz]$ is exact and evaluate it.

ii) Derive one dimensional traffic flow model using conservation law.

iii) Find the solution of $u_x + u_y = u$, $u(x, 0) = 2$.

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

Level: Bachelor
 Programme: B.E (Computer)
 Year/Part: II/I
 Subject: - Operating System

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

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

1. a). Explain briefly about the Types of OS along with its evolution in brief. 7.
- b). What is a process? Explain various states and transitions between the states of process.
2. a). What is a deadlock? Explain with example dead lock avoidance for multiple resources using banker's algorithm? 7
- b). Consider the deadlock situation that could occur in the dinning philosopher's problem when the philosophers obtain the chopstick one at a time. Discuss how the four necessary conditions for deadlock indeed hold in this setting. Discuss how deadlock could be avoided by eliminating any one of the four conditions. 8.
3. a). Write advantages of threads over processes. Explain the advantage of multithreading.
 b). What is "Race Condition"? Illustrate its effect on the execution of a system with an example 8
4. a). Give the structure of a kernel? How Kernel mode and user mode are different?
 b). Given the following information, draw the GANTT chart for processor scheduling for preemptive Shortest Job First and Round Robin (quantum=2). Also find the average waiting time, average turnaround time and average response time for all the cases. (8)

5. a) Consider the following page reference strings: 2,3,4,5,3,2,6,7,3,2,3,4,8,7,4,3,2,3,4,7 How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame?
 - i. LRU page replacement
 - ii) FIFO page replacement
 - iii). Optimal page replacement

In each case calculate fault ration. 8
- b). Suppose a disk drive has cylinders numbered from 0 through 3999. The drive is currently serving a request in FIFO order is given by 916, 1509, 82, 1011, 1774, 130, 507, 250, 2681, 56. Calculate total distance (in cylinders) in FCFS, SSF and SCAN. Which one is best? 7
6. a) What is distributed operating system? Explain advantage of distributed system over independent PC? 8
- b). what is file system implementation? Explain link list and i-node file system implementation. 7
7. Write short notes on [Any Two] 10
 - a). Context Switching
 - b). Parallel OS
 - c). Internal and External Fragmentation

Process	Arrival Time	Burst Time
P1	0.0	3
P2	3.0	4
P3	5.0	2
P4	6.0	4

MADAN BHADARI COLLEGE OF ENGINEERING

Level: Bachelor

Programme: BE

Course: Calculus II

Semester: Fall

Time: 3hrs.

Year: 2024

Full Mark: 100

Pass Mark: 45

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

The figure in the margin indicates full marks.

1. a. Evaluate $\int_0^3 \int_0^{x\sqrt{3}} \frac{y \, dy \, dx}{\sqrt{x^2+y^2}}$ by changing into polar integral 8
 b. Find the volume of the solid whose base is the region in the xy plane that is bounded by the parabola $y = 4 - x^2$ 7 and the line $y=3x$, while the top of the solid is bounded by the plane $z=x+4$

2. a. Solve $y''+9y=0$ by power series method. 8
 b. Define Legendre's equation. Also derive the solution of Legendre's equation. 7

3. a. Define convolution of two functions. State and prove 8 convolution theorem. Using it evaluate $t * e^t$
 b. Define Laplace transform and its inverse. Solve $y'' + 2y' - 3y = 6e^{-2t}$, $y(0) = 2$, $y'(0) = -14$ 7 by using Laplace transform.

4. a. Define directional derivative. Find the directional 8 derivative of f at P in the direction of \vec{a} , when $\vec{F} = xy^2 + yz^3$ at $(2,-1,1)$ along the direction of the normal to the surface $x \log z - y^2 + 4 = 0$ at $(-1,2,1)$

- b. Show that the vector $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$ is conservative and find the scalar potential function \emptyset such that $\vec{F} = \nabla \emptyset$ 7

5. a. Find the flux of $\vec{F} = (18z, -12, 3y)$ through the surface S in the first octant portion of the plane $2x+3y+6z=12$ 8
 b. State stoke's theorem Using it evaluate $\oint_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = \left(y, \frac{z}{2}, \frac{3y}{2}\right)$: C is the circle of $x^2 + y^2 + z^2 = 6z$, $z = x + 3$ 7

6. a. Find the Fourier series of $f(x) = x + |x|$ for $-\pi < x < \pi$ 8
 b. Expand the function $f(x) = x^2$ in the interval $0 < x < \pi$ in half range Fourier cosine series and show that $\frac{\pi^2}{6} = 1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \dots$ 7

7. Solve any two 2×
 - a. Find the solution of $u_x + u_y = u$ given that $u(x,0)=2$
 - b. Derive the partial differential equation governing the conservation laws.
 - c. Show that the value under integral sign $\int_{(4,0,3)}^{(-1,1,2)} [(yz + 1)dx + (xz + 1)dy + (xy + 1)dz]$ is exact and evaluate the integral.

Best of luck

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/I

Time: 3 hrs

Subject: - MICROPROCESSOR

Attempt all Question

1. a) Describe the block diagram of Von Neumann Architecture. (7)
b) Describe Addressing mode of 8086 with an Example. (8)

2. a) Explain the functional block diagram of 8085. (8)
b) Explain about flag register of 8086 with an example. (7)

3. a) Draw the timing diagram of MVI B, 20H. (8)
b) Draw and explain the flag register of 8085. (7)
c) Calculate the total execution time of an instruction LDA , 2005H , where frequency is 3.14 MHZ. (5)

4. a) Write an Assembly program in 8086 to find the multiple of two 16 bit Numbers. (10)
b) WAP in 8085 to add two numbers located at 3030H and 4040H. Display sum on Port 1. If carry is generated, display it on Port 2. Store sum on 5050H. (10)

5. a) Design memory interface circuit having two 4KB RAM and one 2KB ROM with Microprocessor which starting address is 8000H. (8)
b) How the interrupt processing occurs in microprocessor. Explain the vector chain and polled Interrupt. (7)

6. Short Note (7.5X2=15)
 - a) 8237 DMA Controller.
 - b) Interrupt vector table.

THE END

Madan Bhandari College of Engineering
Urlabari-3, Morang
Final Internal Examination (Fall 2024)

Level: Bachelor

Full Marks: 100

Programme: B.E Computer

Pass Marks: 45

Year/Part:II/I

Time: 3 hrs

Subject: - Data Communication

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

1A) Why data communication is important ? Draw and explain a generic data communication model. [7]

B) Explain the concept of bit rate, baud rate . Explain the data frame format of synchronous and asynchronous communication . [8]

2 A) Determine if the system described by $y(t) = \cos [x(t+5)]$ is causal, linear, time variant and stable. [7]

B) Explain OSI reference model as a layered architecture with function of each layer. [8]

3A) What are different modes of propagation in wireless communication? Explain merits and demerits of optical fiber. [8]

B) A bit stream is 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1 . Derive the actual bit string transmitted. Show that the error is detected if any one bit in the received bit stream is inverted. [7]

4A) What is modulation? Explain QPSK modulation in details. [7]

B) Explain the multiplexing technique applied in digital telephony with their significant, application and multiplexing techniques. [8]

5A) What is Transmission impairment? Explain its types. [7]

B) Explain with suitable example Sliding window ARQ. [8]

6A) Explain Digital modulation in details. [7]

B) Draw the line coding for unipolar, polar (NRZ-I, NRZ-L), Manchester and Differential Manchester for 11001010011. [8]

7 Write Short notes on any two (2*5=10)

I) Satelite Communication

II) Stop and wait ARQ

III) Data Transmission technique

Madan Bhandari College of Engineering
Urlabari-3, Morang
Final Assessment- 2024, Fall

Level: Bachelor Full Marks: 100
Programme: Computer Engineering Pass Marks: 45
Year/Part: II/I Time: 3 hrs
Subject: - Database Management System

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

1. a). Define Data Independence? How is Schema different from Instance? Justify with suitable examples [2+5]

b). What is weak and strong entity set? Draw ER diagram for Pokhara University database system including primary key, weak entity, composite attribute, multivalued attribute and derived attributes in your ER diagram [2+6]

2. a). Suppose we have the following relations/schemas:[8]

- Employee (person_name, street, city)
- Works (person_name, company_name, salary)
- Company (company_name, city)

- I. Find the names of all employee who live in 'Biratnagar' and whose salary is less than Rs. 45000
- II. Find the names of all employee who work for 'Nepal Bank Ltd'
- III. Find the names and cities of residence of all employees who work for 'Sidarth Bank'
- IV. Increase the salaries of all employees by 10%

b). Write SQL statements for the following: [7]

- i. Create a table named 'Doctor' with DID as a primary key and following attributes: D_License, D_Fname, D_Lname, D_Gender, and D_Salary.
- ii. Enter full detailed informations of a Doctor
- iii. Change D_Salary by 90,000
- iv. Remove all doctors records whose name contains character 's' in second position in his/her first name
- v. Display the total salary of all the doctors
- vi. Create a view from the above table/relation
- vii. Display all the records of your table

3. a). Define database constraint? Explain different kinds of database constraints with suitable examples [2+5]
- b). What are the benefits of stored procedure? Explain assertion and triggers with examples [2+6]
4. a). Explain the importance of database normalization? Describe normalization up-to 3NF with examples [8]
- b). Why database security is important? Explain about the integrity, access control, authorization and authentication in database [7]
5. a) What is transaction model? Explain the states of database transaction with examples [2+5]
- b). Explain in detail about query processing and optimization process with a block diagram? Also create a parse tree by taking a relational algebra query [8]
6. a). What is serial schedule and serializable schedule? Check whether the given schedule S is conflict serializable or not. If yes, then determine the execution sequences of all the transactions [8]

T1	T2	T3	T4
	R(A) W(B)	R(A) W(A) W(B)	R(A) R(B)

OR

- a). Mention failure classes. Explain high availability remote backup system with diagram [7]
- b) Explain about the organization of records in file with it's different types [7]
7. Write short notes on: [Any Two] [5+5]
 - a. NoSQL Database
 - b. Cryptocurrency
 - c. Functional dependencies and Armstrong's Axioms

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

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

Subject: - Computer Graphics

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

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

1. a) Define Computer Graphics? Explain the applications of CG in Computer Simulation, Scientific Visualization and CAD.

7

b) Define CRT? Explain with neat diagram about the working principle of shadow mask method?

8

OR

Define resolution and persistence. Explain the digital to analog converter in frame buffer organization?

2. a) What is the difference between DDA and BLA? How decision parameter is calculated in Mid point circle method. Show all necessary derivation

7

b) Explain the boundary fill algorithm in detail. How this approach differs from flood fill?

8

3. a) Differentiate between Window and Viewport. Discuss the 2-Dimensional Viewing pipe line with different steps involved, and further derivation needed for window to viewport coordinate Transformation.

7

b) A mirror is placed vertically such that it passes through the points (5, 0) and (0, 5). Find the reflected view of triangle ABC with coordinates A (5, 30), B (30, 50) and C (20, 60).

8

OR

What is the significance of Clipping in Computer Graphics?
Let ABCD be the rectangular window A(20,20), B(90,20), C(90,70) & D(20,70). Find the region code for the end points and use Cohen-Sutherland Line Clipping Algorithm to Clip the Line P1P2 with P1(10,30) and P2(80,90).

4. a) Derive the equation for cubic Bezier curve and find the coordinate at t=0.2 with respect to the control points (1, 1), (4, 6) (8,-3) and (12, 2).

7

b) Why depth sorting method is called Painter's Algorithm? Explain scan line method for visible surface detection with an example. What is the difference between specular reflections versus diffuse reflection?

8

5. a) Explain why is RGB called as additive and CMYK called as subtractive model?

7

b) How phong shading is different from Gouraud shading? Explain it.

8

6. a) Discuss the need for machine-independent graphical languages. Explain two different graphical software standards

7

b) What is the significance of Open GL in computer Graphics? Discuss open Graphics Library in details with different features associated with it.

8

7. Write short notes(Any Two):

10

a) Raster vs Random scan system

b) Graphics File Format

c) Parallel Projection vs Perspective Projection

- a) What is internal and external fragmentation? Define logical and physical address.
- b) Explain DMA with its types. What is a DMA controller. draw its block diagram?
- c) Explain the different attributes of a file. Explain the file allocation techniques.
- d) What is Virtual Memory? Explain its types.
- e) Explain about linked list data structure and its implementation.
- f) Explain in detail about threads.

Write short notes on any two:

- a) Swapping.
- b) Context switching.
- c) Memory management with bit-maps.

POKHARA ENGINEERING COLLEGE
Internal Assessment Examination

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) Describe the historical evolution of Intel's series microprocessor. What are the essential differences between microprocessor and microcontroller? 5+3

b) Draw and explain the block diagram for internal architecture of Intel 8085 microprocessor. 7

2. a) Write an ALP in 8085 to find the sum of even numbers located from address C050H-C059H and store the result in D060H. 7

b) Define machine cycle. Draw the labelled timing diagram for the instruction STAC020H. 1+7

3. a) What are the flags of 8086 microprocessor? Show the flag position and explain each flag with example. 2+6

OR

- What is addressing mode? Explain different type of addressing modes of 8086 microprocessor. 2+6

b) What are assembler directives? Explain any five different assembler directives of 8086 microprocessor. 2+5

4. a) Write an 8086 program to read a string from the keyboard and display the string in reverse order. 8

b) Design an address decoding circuit to interface one ROM chip of 2KB and one RAM chip of 4KB at address 0000H and E000H respectively. 7

- a) Define parallel interface. Explain the different operating modes of 8255 PPI. 2+5
- b) What is asynchronous serial data communication? With the help of block diagram explain the working of 8251 USART. 2+6
5. a) What is interrupt? Draw well labelled architecture of Programmable Interrupt Controller (PIC) Intel 8259 and explain its working. 1+6
- b) What is Interrupt Vector Table (IVT)? Draw the IVT for 8086 microprocessor and explain different types of 8086 interrupts with respect to interrupt vector table. 2+6
7. Write short notes on any two: 2×5
- a) Difference between I/O mapped I/O and memory mapped I/O.
 - b) Types of interrupts.
 - c) Procedures and macros.

POKHARA ENGINEERING COLLEGE
Internal Assessment Examination

Level: Bachelor Semester - Fall

Year : 2024

Programme: BE Computer

Course: Database Management System

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) Explain any two important components of a typical DBMS. 7
b) How will you model a Natural join using relational algebra. Write down the steps involved along with example. 8
2. a) Consider the following relations R and S 8

R:

S:

Sid	SName	Marks
S001	Hari	85
S002	Sita	78
S003	Bidur	85
S006	Vinod	68

Sid	SName	Marks
S004	Sarita	76
S003	Bidur	85
S006	Shyam	75
S005	Vinod	68

- i. Show the id and name of those students whose marks are less than 80 from relation schema R. (write only relational algebra)

- ii. Write the results (intermediate results also)
RUS
RUS

$\Pi_{SName} (\sigma_{Marks < 80} S)$

- b) Consider the table tbl_emp as follow. (Here, * denotes primary key)

EmpId*	EmpName	Salary	Date_of_join	Phone	Department
E001	Ram	20000	2060-02-01	#1234	Packing
E002	Hari	18000	2065-04-01	#5647	Cleaning
E004 c)	Sita	15000	2068-04-01	#2564	Polishing

Write the SQL statement for following

- i. Insert a new record
- ii. Delete the record of Sita
- iii. Change the department of Hari to Marketing
- iv. Add a new column Address to the above table
- v. Increase the salary of all employee by 5000
- vi. Select the row having salary greater than 16000
- vii. Delete the entire table.

3. a) What do you mean by Integrity Constraint? Explain its types. 2+6

b) Define Normalization. Explain about 1NF, 2NF and 3NF. 2+5

4. a) Explain Access Control List (ACL) with an example. 8
- b) What is query processing? Explain in detail each step involved in query processing with suitable example. 7
5. a) What is transaction? Describe two phase locking protocol.
 b) What is serializability? Test the serializability for following schedule. 2+6
- R1(A)R2(B)R3(C)W2(B)W3(C)W1(A)R3(B)R2(A)R1(C)W2(A)W1(C)
 W3(B) 2+5
6. a) Construct a B+ tree (whose pointer number is 4) for the following set of keys:
 2, 3, 5, 7, 11, 17 19, 23, 29, 31 8
- b) Explain log-based recovery with suitable example. 7
7. Write short notes on any two:
 a) Timestamp based protocol
 b) DDL, DML and DCL
 c) Strong entity vs weak entity 2×5

POKHARA ENGINEERING COLLEGE
FINAL ASSESSMENT

Level: Bachelor	Semester – Fall	Year : 2025
Programme: B.E.	Full Marks: 100	
Course: Computer Graphics (III Sem)	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. Define Computer Graphics? Explain the application of computer graphics in simulation, Entertainment and research. 8
- b. Suppose an RGB raster system to be designed using 8-inch x 10-inch screen with a resolution of 100 pixels per inch in each direction. If we want to store 6 bits per pixel in the frame buffer, how much storage in bytes do we need for the frame buffer? Also find out the aspect ratio of the raster system? 7
- 2a. Differentiate between Beam penetration method and shadow mask method. 7
- b. Consider a line from (5,5) to (13,9). Use Bresenham's algorithm to rasterize a line. 8
- 3a. Explain symmetry of circle. Digitize a circle for the equation:

$$(x-6)^2 + (y-7)^2 = 36$$
 8
- b. What is uniform scaling? Reflect an object(2,3), (4,3), (4,5) about line i, $y=0$ and ii $y=x$. 8
- 4a. Prove that:
 - i. Two successive Translations are Additive
 - ii. Two successive Scaling are Multiplicative
- b. Use Cohen Sutherland line clipping algorithm to find the visible portion of the line P (40,80), Q (120,30) inside the window. The window is defined as ABCD with A (20,20), B (60,20), C (60,40) and D (20,40).

$$(x_1, y_1) = (20, 20) \\ (x_2, y_2) = (60, 40)$$

5a. Explain about Polygon edges and polygon tables for 3D 8

b/ Define projection with example. 7

6a/ Explain about Z-buffer method for detecting visible surface with its draw back and remedy. 8

b/ What is illumination model? Differentiate between Phong

Shading and Gouraud Shading.

a/ Write Short notes on: (Any Two) 10

b. Bezier Curve

c/ Sutherland Hodgeman Clipping

Composite Transformations

compiling it with

$$(x - w)^2 + (y - v)^2 = r^2$$

$$\therefore \sqrt{=} 6$$

$$P_0 = 1 - r = 1 - 6 = -5 \quad \text{initial point} = (0, 0)$$

if $P_k < 0$

$$P_k \geq 0$$

$$x_{k+1} = x_{k+1}$$

$$y_{k+1} = y_k$$

$$P_{k+1} = P_k + 2(x_{k+1} - 2y_{k+1})$$

$$P_{k+1} = P_k + 2(x_{k+1} - 2y_{k+1})$$

$x \neq 0$

$y \neq 0$

POKHARA ENGINEERING COLLEGE

Level: Bachelor
Programme: BE

Semester - III SEM Year : 2024

Full Marks: 100

Course: Data Communication (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.

Assessment Examination.

1. a) Write a brief about evolution of Data Communication. Why is analog transmission backed off as digital transmission coming into the influence. Explain. 8
b) Compare synchronous and asynchronous transmission. Explain with appropriate example the condition Bit rate is not always equal to Baud rate. 7
2. a) How do u define unit impulse function? Find whether Acoswt is an energy or power signal. 7
b) A discrete time system is described as $y(n)=y^2(n-1)+x(n)$. Now a bounded input of $x(n)=2\delta(n)$ is applied to this system. Assume that the system is initially relaxed. Check whether the system is stable or not. 8
3. a) Explain the basic system properties. Find whether $x(t)=t^2$ is a time invariant or not? 7
b) Why is TCP/IP called an implementation model? Explain the functions of each protocol of all the layers of OSI reference model. 8
4. a) Fiber optics and copper wires are two means of cables used in today's wired communications. Which one among two is the best connection and why? 7
b) Define error with its types. Generate CRC code for given data sequence x^7+x^5+1 and divisor 1011 . 8

- a) What is ARQ? Explain about GO Back-N and Selective Repeat ARQ? 7
- b) Draw the following data formats for the bit stream 1101010001 using Polar NRZ, AMI, HDB3 and Manchester. 9
- a) Define multiplexing. Explain the working of QPSK with transmitting and receiving side. 8
- b) The equation of amplitude wave is given by $s(t) = 20[1 + 0.8 \cos(2\pi \cdot 10^3 t)] \cos(4\pi \cdot 10^5 t)$. Find the carrier power, total sideband power and the bandwidth of AM wave. 7
- Write short notes on (Any Two): 2
- a) Analog Modulation techniques
 - b) Standard Organizations
 - c) Hamming Code

***** Rest of Luck *****

POKHARA ENGINEERING COLLEGE

Level: Bachelor
 Programme: BE (Computer/Civil/IT)
 Semester : Fall
 Course: Calculus II

Year :2024
 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) ✓ Evaluate $\int_0^2 \int_0^{\sqrt{4-y^2}} \cos(x^2 + y^2) dx dy$ by changing into polar coordinates. -5

b) ✓ Evaluate $\int_0^1 \int_0^{1-x} \int_0^{x+y} e^z dz dy dx$ -5

c) ✓ Find the volume of the solid whose base is the region in the XY-plane that is bounded by the parabolay = $4 - x^2$ and the liney = $3x$ while the top of the solid is bounded by the planez = $x + 4$ -5
 2.

a) ✓ Solve by power series method: $y'' + 9y = 0$ -7

b) ✓ If $J_n(x)$ represents the Bessel's function of ordern then show that

 - i. $\frac{d}{dx} [x^n J_n(x)] = x^n J_{n-1}(x)$. -8
 - ii. $x^n J_n'(x) = -n J_n(x) + x J_{n-1}(x)$
- OR**
- Express $x^3 + 2x^2 - x - 3$ in terms of legendre's polynomials -2
3. a) i) ✓ Find the Laplace transformation of $t^2 \cos \omega t$ -7
 - ii) ✓ Find the inverse Laplace transform of $\frac{1}{(s+3)^2+1}$
 - b) ✓ Solve the initial value problem

$$y'' + 2y' + 2y = 0, \quad y(0) = 0, \quad y'(0) = 1 \quad -8$$
 4. a) If $\phi = \log(x^2 + y^2 + z^2)$ then find $\operatorname{div}(\operatorname{grad}\phi)$ -5
 - b) Find the directional derivative of $f = xy^2 + yz^3$ at $P(2, -1, 1)$ along the direction of the normal to the surface $x \log z - y^2 + 4 = 0$ at $(-1, 2, 1)$. -5

c) Calculate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = [(x-y)^2, (y-x)^2]$ where $C: xy = -5$
 $1, 1 \leq x \leq 4$

a) Define Green's theorem in a plane. Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ counter-clockwise around the boundary C of the region R when $\vec{F} = (x^2 e^y, y^2 e^x)$ where C : the rectangle with vertices $(0,0), (2,0), (2,3), (0,3)$

b) Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ using stoke's theorem where $\vec{F} = (y^2, z^2, x^2)$ where C is the boundary of surface $S: x + y + z = 1$ in the first octant.

OR

Evaluate $\iint_S \vec{F} \cdot \hat{n} dA$ by using Gauss divergence theorem, where $\vec{F} = (x^2, 0, z^2)$, S is the box $|x| \leq 1, |y| \leq 1, |z| \leq 1$

i.a) Find the fourier series of

$$f(x) = \begin{cases} 1 & \text{if } -\pi < x < 0 \\ -1 & \text{if } 0 < x < \pi \end{cases}$$

b) Expand $f(x) = x^2$ for $0 \leq x \leq \pi$ in a Fourier Cosine series and deduce

$$\text{i. } \sum_{n=1}^{\infty} \left(\frac{1}{n^2} \right) = \frac{\pi^2}{6}$$

$$\text{ii. } \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} = \frac{\pi^2}{12}$$

1. Attempt any two question $2 \times 5 = 10$

a) Find the general solution of $2u_x + 2u_y - u = 0$ using solution of quasilinear partial differential equation.

b) Find the breaking time for $u_t + 2u, u_x = 0, u(x, 0) = e^{-x^2}$

c) Show that the value under integral sign

$$\int_{(0,0,0)}^{(4,1,2)} (3ydx + 3xdy + 2zdz)$$

is exact and evaluate the integral.