

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

(Affiliated to Pokhara University)

Dhangadhi, Kailali

First Terminal Examination

Level: Bachelor

Semester : VI/III_Fall

Year : 2024

Program: B.E. Computer

F.M. : 100

Course: Data Communication

P. M. : 45

Time : 3 Hrs.

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) What is data communication system? Explain the block diagram of data communication. [8]
b) What is the role of standard organizations in data communication?
Explain any four Standard Organizations. [7]
- 2.a) Explain different types of data transmission techniques. ? [8]
b) A TV channel has a signal with bandwidth of 12MHz and it is transmitted with the 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. [7]
- 3.a) What are guided and unguided transmission media? Compare and contrast between twisted-pair, co-axial cable and optical Fibre. [8]
b) Check whether the signal $x(t) = A \cos \omega_0 t$ is a power or energy signal? [7]
- 4.a) What does topology refers to? Explain about star, bus, and mesh topology with an application of each. [8]
b) Define Signal. Explain Different types of Elementary signals with its discrete and continuous time representation [7]
- 5.a) What is a system? Explain different properties of System with examples. [8]
b) How collision can be detected and corrected in data transmission?
Explain in Brief with its flow chart about CSMA/CD. [7]
- 6.a) What is meant by "open system interconnection"? Explain briefly the services provided by each layer in OSI model [7]
b) Define electromagnetic spectrum for telecommunication. Briefly explain ground wave, sky wave and line of sight (LOS) propagation [8]

OR

Why Networking is important in communication system. Explain different types of network.

7. Write short notes (Any two)

[5x2=10]

a) Shannon's Theorem

b) X.25

c) Modes of Data Transmission

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First Term 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 as a resource manager and extended machine. Also explain some of the function of operating system in brief. 7
b) Explain the different structure of Operating System with diagram. 8
2. a) Define process and PCB. Explain in detail the process states and its transition diagram. 8
b) What is important multi-threading? Explain in brief about types of multi-threaded model. 7
3. a) Define IPC. Differentiate between Process and Threads in details. 8
b) Define Race Condition. Also explain the different techniques to avoid race condition. 7
4. a) Define the concept of Dining philosopher problem. How do you solve the dead lock in it explain with algorithm? 7
b) What is a semaphore? Explain the producer consumer problem. Write the algorithm for producer consumer problem using binary semaphores. 8
151
5. a) Define Kernel. Explain different types of Kernels used in operating system with diagram. 8
b) Find the Safe sequence for the following Process snapshot. 7

Process	Allocation	Max	Available
	A B C	A B C	A B C
P0	0 1 0	7 5 3	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	
P4	0 0 2	4 3 3	

6. a) Find the Average Waiting time and Turn Around Time for the following Processes using SJF Non-Pre-emptive Process Scheduling Algorithm.

7

Process	Arrival Time	Burst Time
P1	0	6
P2	1	8
P3	2	7
P4	4	6
P5	2	9

- b) Find the Average TAT and WT using HRRN Non-Pre-emptive Process Scheduling Algorithm.

8

Process	Arrival Time	Burst Time
P1	1	5
P2	4	2
P3	2	6
P4	5	7
P5	2	8

7. Write Short Note on (Any Two)

5x2

- a) Open-Source OS
- b) Dekker's Algorithm
- c) Message Passing

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First Term Examination

Level: Bachelor

Semester: III_Fall

Year : 2024

Program : B.E. Computer

F.M : 100

Course : Microprocessor and ALP

P.M. : 45

Time : 3hrs.

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

Attempt all the questions.

1.
 - a) Differentiate between microprocessor and microcontroller. 7
 - b) Differentiate between Harvard Architecture and Von-Neumann Architecture. 8
2.
 - a) Draw the functional architecture of 8085 microprocessor and explain in brief. 8
 - b) Write a program to copy 10 bytes data from memory location starting from 5000H to memory location starting from 6000H. 7
3.
 - a) Draw and explain timing diagram of ADD M. 8
 - b) Interface two 4 KB RAM with 8085 microprocessor. 7
4.
 - a) Explain the instruction set of 8085. 8
 - b) Write an ALP for 8085 to count the integers available in an array starting from memory location 3500H to 3510H for exactly divisible by two and save the result in the register B. 7
5.
 - a) Explain the addressing modes in 8085. 7
 - b) Explain the following instructions: LDA, SHLD, CMP, RAR 8
6.
 - a) Explain the flag implementation in 8085. 8
 - b) Interface 8KB and 4KB RAM without foldback address with 8085. 7
7. Write short notes on **any two:** 2×5
 - a) Flags in 8085
 - b) Evolution of microprocessor
 - c) Timing diagram for I/O Read

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First Term Examination

Level: Bachelor

Semester: III_Fall

Year : 2024

Programme: B.E. (Computer/Civil)

F.M. : 100

Course: Calculus-II

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. Evaluate the following integrals

[5×3=15]

a) $\int_0^{\pi} \int_x^{\pi} \left(\frac{\sin y}{y} \right) dy dx$.

b) $\int_{-1}^1 \int_0^{\sqrt{1-x^2}} e^{-(x^2+y^2)} dy dx$.

c) $\int_0^3 \int_1^3 \int_1^2 xy^2 z dx dy dz$

2. a) Find the volume of the solid cut from the first octant by the surface

$z = 4 - x^2 - y^2$. (3 dimensional)

[7]

b) State Dirichlet's theorem. Using it evaluate the integral

$\iiint_V x dx dy dz$ over the region V in the first octant bounded by
 $x^{2/3} + y^{2/3} + z^{2/3} = 1$.

[8]

3. a) Using power series method, solve $y'' - 2xy' + y = 0$.

[7]

b) Express the polynomial $x^3 - 5x^2 + x + 2$ in terms of Legendre polynomials.

[4]

c) If $J_n(x)$ is a Bessel's function, prove that

[4]

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

4. a) Solve the Bessel's equation $x^2 y'' + xy' + (x^2 - n^2)y = 0$.

[8]

b) State first shifting theorem. Find the Laplace transform of the following functions (Any Two): [2+6=8]

i) $t^2 \sin wt$ ii) $e^{-2t} \cos^2 t$ iii) $\frac{1-\cos t}{t}$

5. a) Find the inverse Laplace transform of the following functions: [7]

O i) $\frac{s}{s^2 + 6s + 13}$ ii) $\frac{1}{s(s^2 + w^2)}$

b) Solve the initial value problem using Laplace Transform: [8]

O $y'' + 4y' + 3y = e^{-t}$, $y(0) = y'(0) = 1$.

6. a) Find the Fourier series of [7]

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

b) Find the Fourier series of [8]

O $f(x) = x^2$, for $-\pi < x < \pi$

and show that $\frac{\pi^2}{12} = 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$

7. Attempt all [4×2.5 = 10]

i) Find the smallest period of the function $\sin k\pi x$.

ii) Evaluate: $\int_0^2 \int_0^4 (4 - x^2) dx dy$.

iii) Draw the graph of the Legendre polynomials $P_2(x)$ and $P_3(x)$.

iv) Find the Laplace transform of unit step function.

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Dhangadhi, Kailali

First Term 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 the questions.

1. a) Define database system. What are the advantages of DBMS over file management system? 7

b) Draw a database using ER diagram for a commercial bank. This commercial bank maintains information about entities: Depositor, Account, Loan and Branch. State any assumptions made in design of the ER diagram. 8

2. a) Explain the types of database application architecture with suitable diagram. 7

b) Consider the following relational database.

Publisher(pid, name, location)

Book (bid, title, author, page, price)

Publish (bid, pid, publish_date)

Write the relational algebra statements for the following queries.

1. Find the title of book published by Addison Wisely.
2. Update the author name to "MNP" of book "Database".
3. Delete book record whose price is less than 350.
4. Find the total number of books of each publisher.

3. a) What is relational Database Design? Describe the feature of good relational design. 7

b) What is SQL? Explain DDL, DML and DCL. 8

4(a)

Define update, insert and delete anomalies. Normalize the following relation to 3NF.

7

E_ID	Name	Post	Sex	Salary	Address
1	Rahul	Sr. Engineer	M	100000	Kathmandu
2	Sushila	Web Developer	F	40000	Birgunj
3	Rahul	Web Developer	M	40000	Dhangadhi
4	Harish	Jr.Engineer	M	70000	Balaju
5	Jhon	Jr.Engineer	M	70000	New York

b) What is a key in database? Explain the types of keys with example.

8

5. a) What is data abstraction? Explain its three levels with diagram.

7

b) What is functional dependency? Explain the partial and transitive functional dependency with examples.

8

6. a) What are integrity constraints in database? Explain its types.

8

b) Why do we need to join tables? Explain the inner joins with examples.

7

7. Write short notes on:(Any Two)

2 x 5

a) Schema and Instances

b) Armstrong's Axioms

c) Aggregate Functions

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First Term 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 application of computer graphics in the field of information technology. 7
b) Explain different types of touch panels with its working mechanism. 8

2. a) What is scan conversion? Derive Bresenham's line drawing algorithm for $|m| > 1$. 8
b) Digitize one octant of circle by using mid point circle generation algorithm center at (10,20) and radius is 10. 7

3. a) Derive Ellipse Drawing algorithm. 8
b) Explain Flood fill algorithm. 7

4. a) Differentiate between raster and random scan system. 8
b) Write the DDA algorithm to find points between (x,y) to (x_k, y_k) . 7

5. a) Using Bresenham's line drawing algorithm predict the pixels on the line from (2,2) to (12,10). 8
b) Explain Flood Fill area filling algorithm. 7

6. a) Explain 2D-Basic transformations. 8
b) How are the colors displayed in the Monitor? Explain all methods.. 7

7. Write short notes on the following (Any Two) 5x2
 - a) Homogenous coordinate
 - b) Reflection about line $y=mx+c$
 - c) 2-successive translation

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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

2. 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

3. a) What are impairments in data communication. Explain in brief. 7

- b) Differentiate between OSI layers and TCP/IP layers. 8

4. 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 8 check (CRC) method. The generator polynomial is $x^4 + x + 1$. Determine the transmitted codeword.

5. 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 8 waveforms of message signal, carrier signal and modulated wave.

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)

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Pre-University Examination

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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
8

b) Design an ER diagram for a 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.

Assume relevant assumption for the given system.

2. a) Consider the relational database 7

Employee(Empname, street, city)

Works(Empname, post, cmpname, Salary)

Company(cmpname, location)

8

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)

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
ORM

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

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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

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Pre-University Examination

Level: Bachelor

Semester: III_Fall

Year : 2024

Programme: B.E. Computer

F.M. : 100

Course: Microprocessors and ALP

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) 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
2. a) Explain the addressing modes in 8085 microprocessor. 8
- b) Define T-state. Draw the labeled timing diagram of the instruction ORI 50H. 7
3. a) How will you interface 4KB RAM and 2KB ROM with 8085? 8
- b) How multiple interrupts can be handled using 8259 PIC? Explain with necessary block diagram. 7
4. a) Write a program to add two 32-bit numbers. 8
- b) Explain the control word format of 8255 PPI. 7
5. a) Explain about IVT of 8086. 7
- b) Define assembler directives. Explain the following assembler directives along with their format: The memory model definition, The PROC directive, The DB directive, OFFSET. 8
6. a) Write an ALP for 8086 to implement Pythagoras theorem. 8
- b) What is macro assembler? Differentiate between macros and procedures. 7
7. Write short notes on any two: 2×5
 - a) Memory mapped I/O vs I/O mapped I/O
 - b) Fetch, decode and execute
 - c) Pipelining in 8086

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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. 8

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 ration Using FIFO, Optimal, LRU and MRU Page Replacement Algorithms. 8
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/Civil)

F.M. : 100

Course: Calculus II

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) 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]

2. 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 ,

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

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

3. a) Evaluate:

[8]

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

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]

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]

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

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

$$f(x) = \pi - x, 0 < x < \pi.$$

[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 $u_x + u_y = u$, $u(x, 0) = 2$.

POKHARA UNIVERSITY

Level: Bachelor ,

Semester: Fall

Year : 2024

Programme: BE

Full Marks : 100

Course: Data Communication (New)

Pass Marks : 45

Time : 3 hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain the five essential components of a data communication system. How does each component contribute to successful communication? Explain with suitable diagram. 7
- b) What is serial and parallel data transmission? Differentiate between synchronous and asynchronous data transmission. 8
2. a) Check whether the given system is linear, time invariant and causal or not. 7
 - i. $y(t) = \log x(t)$
 - ii. $y(t) = t^2 x(t)$
- b) Differentiate between energy and power signal. Calculate whether ramp signal is power signal or energy. 8
3. a) Why Frame Relay is faster than X.25? Explain TCP/IP layers and compare it with OSI reference model. 8
- b) What is the purpose of cladding in an optical fibre? Explain the modes of propagation used in the optical fibre. 7
4. a) Define transmission impairments. And explain the causes of transmission impairments in details. 7
- b) If the 7 bit Hamming codeword received by a receiver is 1011011. Assuming the even parity, state whether the received codeword is correct or wrong. If wrong, decode the correct data word and locate the bit in error. 8

OR

Compress "Engineering" using Huffman codes and find its efficiency and redundancy.

5. a) What is ARQ? What are the two types of sliding window ARQ error control? Explain. 8

- b) What do you mean by multiplexing? How is TDM different from FDM? 7
6. a) Why do we need modulation need in data communication? Explain. 7
OR
- Calculate the rate of a 500 baud 8-QAM signal with a constellation diagram.
- b) Represent the given bit stream 10011100001101 using 8
- Polar NRZ
 - Differential Manchester
 - HDB3
7. Write short notes on: (Any two) 2×5
- Standards organizations
 - Noise and its types
 - HDLC protocol vs Point-to-Point protocol

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Calculus II

Semester: Fall

Year : 2024
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: $\int_0^{\pi} \int_x^{\pi} \frac{\sin y}{y} dy dx$ by changing the order of integration. 5
- b) Evaluate the integrals: $\iiint_V (x^2 + y^2 + z^2) dx dy dz$ taken over the volume of the sphere $x^2 + y^2 + z^2 = 1$. 5
- c) Find the volume of the solid whose base is the region in the xy -plane that is bounded by the parabola $y = 4 - x^2$ and the line $y = 3x$, while the top of the solid is bounded by the plane $z = x + 4$. 5
2. a) Solve the differential equation: $y'' + 9y = 0$ by using power series method. 7
- b) Define Legendre differential equation. Also, derive the solution of Legendre differential equation. 8

OR

If $J_n(x)$ represents the Bessel's function of order n , then show that:

- i. $\frac{d}{dx} [x^n J_n(x)] = x^n J_{n-1}(x)$ 4
- ii. $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$ 4
3. a) Solve the following differential equation by using Laplace transform $y'' + 2y' - 3y = 6e^{-2t}$, $y(0) = 2$, $y'(0) = -14$. 7
- b) i) State second shifting property for Laplace transform and using this, find the Laplace transform of $e^{-3t} u(t-3)$. 4
- ii) Find the inverse Laplace transform of $\frac{\pi}{(s-3)^2 + \pi^2}$. 4
4. a) Find the directional derivative of $f = x^2yz + 4xz^2$ at $(1, -2, 1)$ in the direction $2\vec{i} - \vec{j} - 2\vec{k}$. 5

- b) Show that the vector $\vec{F} = (x^2 - yz, y^2 - xz, z^2 - xy)$ is conservative vector field and find the scalar potential function Φ such that $\vec{F} = \nabla\Phi$. 5
 c) Find the work done by the force $\vec{F} = (3x^2, 2xz - y, z)$ along the curve $x = t, y = \frac{t^2}{4}, z = \frac{3t^2}{8}$ from $(0, 0, 0)$ to $(2, 1, 3)$. 5
 5. a) Evaluate the integral by using Green's theorem 7

$$\oint_C [(3x^2 + y) dx + 4y^2 dy]$$
 where C: the boundary of the triangle with vertices $(0, 0), (1, 0), (0, 2)$; oriented in counterclockwise direction.
 b) State Stoke's Theorem. Evaluate $\oint_C (\vec{F} \cdot d\vec{r})$ by using Stoke's theorem, where $\vec{F} = (y, xz^3, -zy^3)$ and $C: x^2 + y^2 = 4, z = 3$. 8
OR
 Evaluate: $\iint_S \vec{F} \cdot \vec{n} dA$, where $\vec{F} = (18z, -12, 3y)$ and S is the surface of plane $2x + 3y + 6z = 12$ in the first octant.
 6. a) Find the Fourier series of $f(x) = x + |x|, -\pi < x < \pi$ and show that $\frac{\pi^2}{8} = 1 + \frac{1}{9} + \frac{1}{25} + \dots$. 7
 b) Find the Fourier sine and cosine series for the function $f(x) = x^2$ in the interval $0 < x < L$. 8
 7. Write short notes on: (Any two) 2×5
 a) Find the general solution of the partial differential equation $u_x + u_y = u$.
 b) Derive the one-dimensional traffic flow model using conservation law.
 c) A particle moves along the curve $x = t^3 + 1, y = t^2, z = 2t + 5$. Find the velocity and acceleration at $t = 1$.

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2024

Programme: BE

Full Marks : 100

Course: Computer Graphics (New)

Pass Marks : 45

Time : 3 hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What do you mean by Computer Graphics? Explain the working principle of refresh CRT with figure. 7
- b) What are the benefits of using a GPU for graphical rendering? What makes a GPU more ideal for graphical rendering than using a CPU? 8
2. a) Mention the limitations of DDA algorithm. Derive the necessary expression of decision parameters to rasterize a line with $m < 1$. 8
- b) Digitize one octant of a circle by using midpoint circle generation algorithm center at origin and radius is 12. 7
3. a) A graphics designer needs to animate the swing of pendulum in center of display window with string attached at pivot point (350,300). If pendulum is displaced by 45 degrees from its resting position. Calculate the extreme points of bob's trajectory if string length is of 10 units. 8

OR

- Reflect the triangle A(4,3), B(5,5) and C(4,6) about an axis defined by equation of line $y=2-2x$.
- b) Why is it required to map an object description from a window to a viewport? A triangle with vertices A(30,30) B(50,30) C(40,35) is required to be mapped from a window with its lower left corner at (20,20) and upper right corner at (60,40) to a viewport with its lower left corner at (50,50) and upper right corner at (80,70). 7
 4. a) Derive composite matrix for rotation about an arbitrary axis in 3D. 8

OR

- What are non-planar surface? How can a Bezier surface be generated from Bezier curve?
- b) Rotate the triangle with vertices A(3,3), B(5,3), C(4,5) by 45° in anti clockwise direction While keeping B (3,3) fixed. 7

5. a) What role does Visible Surface detection play in displaying realistic scenes? Explain Depth Sorting approach for removing hidden surfaces. 8
- b) What is Gouraud shading? Explain it with an example. What are its drawbacks? How such drawbacks are removed? 7
6. a) What is OpenGL? Write any five GLUT call back functions with their necessary syntax. 7
- b) Why is it required to visualize data sets? Explain how data sets can be visualized? 8
7. Write short notes on: (Any two) 2×5
- a) 2D Viewing pipeline
- b) Perspective Projection
- c) Window to viewport transformation

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2024

Programme: BE

Full Marks : 100

Course: Operating Systems (New)

Pass Marks : 45

Time : 3 hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain operating systems as a resource manager. Describe batch, time-sharing and distributed operating systems in brief. 8
 b) Define Starvation in context to priority CPU scheduling algorithm. 7
How would a Round Robin Scheduling algorithm behave when its time quantum is increased significantly? Explain with an example.

OR

What is the race condition and critical section problem? Define semaphore and use it to solve producer consumer problems.

2. a) Suppose that the following processes with their burst time arrive for execution at the times indicated. Solve the following 8

Process Arrival Time Burst Time

P1	0	8
P2	1	4
P3	2	1

- i. Draw Gant chart for FCFS, SJF(non-preemptive) and SRTN
 ii. Find AWT and ATAT.
 iii. Determine which one among them would be the worst algorithm.

3. b) What are classical IPC problems? Explain reader writer problem. 7
a) Differentiate between internal fragmentation and external fragmentation? Why do we need virtual memory? Explain the translation of logical address to physical address using paging with necessary diagrams. 8

b) What is page table? Explain hierarchical and based page table.

7

OR

Explain thrashing. What is the purpose of a translation lookaside buffer(TLB)? In a fixed partitioning scheme, what are the advantages of using unequal-size partitions?

4. a) Consider the following page reference strings: 2, 3, 4, 5, 3, 2, 6, 1, 3, 2. 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.

- FIFO
- LRU
- Second chance

b) Differentiate between interrupt I/O and Programmed I/O. Describe a DMA controller with necessary diagrams.

7

5. a) Consider following snapshot of a system

7

Processes	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	1	1	2	1	1	2	1	5	2
P1	1	0	0	1	7	5			
P2	1	3	5	2	3	5			
P3	0	6	5	0	6	7			
P4	0	0	2	0	6	6			

Answer the following questions using Banker's algorithm:

- What is the content of the matrix needed?
- Is the system in a safe state? Also find the safe sequence.

b) Describe the file descriptor. Explain the linked list file allocation method.

8

6. a) Differentiate between process and threads. What are different multithreading models? Explain.

7

b) What is cloud operating system? Discuss its characteristics and advantages.

8

7. Write short notes on: (Any two)

2×5

- The Shell and Virtual Machine
- Window vs Linux
- Monolithic kernel and micro kernel

POKHARA UNIVERSITY

Level: Bachelor'

Semester: Fall

Year : 2024

Programme: BE

Full Marks : 100

Course: Microprocessor and ALP

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) Differentiate between Von Neumann and Harvard architecture. 7
Explain fetch, decode and execute cycle in microprocessor with suitable diagram.
- b) What are the different rotate instructions used in 8085 instruction sets? 8
Explain with the help of simple example for each of them.
2. a) Draw and explain a well labelled timing diagram of the instruction LXI H, 2435H. 8

OR

- Draw the timing diagram for the 8085 instruction LDAX D.
- b) Write an 8085 ALP to add the odd numbers in a set of data array. The length of an array is in memory location C050H and starting address of the array is from C051H. Store the sum and Carry in memory location D050 and D051. 7
3. a) Write an assembly language program to display a string 'POKHARA UNIVERSITY' characterwise using macro to insert space between characters. 7

OR

- Write an assembly language program to display 'MICROPROCESSOR' in reverse order.
- b) Draw the internal architecture of 8086 microprocessor and compare the functions of its two basic units. 8
4. a) Explain detail about the memory segmentation of 8086 microprocessor with its diagram. 7
- b) What is the significance of 8255 PPI? Draw and explain the control word for 8255 PPI in I/O mode. 8

5. a) Differentiate between partial and absolute address decoding. Design memory interfacing circuit with 8085 for 2KB RAM, 4KB ROM and 8KB EPROM with initial address 1000 H. 8
- b) What is DMA? Explain DMA operation with the block diagram of DMA Controller 7
6. a) What are the hardware and software interrupts of 8085 and 8086? Briefly describe the conditions which cause the 8086 to perform each of the following types of interrupts: Type 0, Type 1, Type2, Type 3 and Type 4. 8
- b) Explain the block diagram of Programmable Interrupt Controller with its major features. 7
7. Write short notes on: (Any two) 2×5
- a) Stack and Subroutine
 - b) Maskable and non-maskable interrupts of 8085
 - c) Polled vs. Chained interrupt

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2024

Programme: BE

Full Marks : 100

Course: Database Management System (New)

Pass Marks : 45

Time : 3 hrs.

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

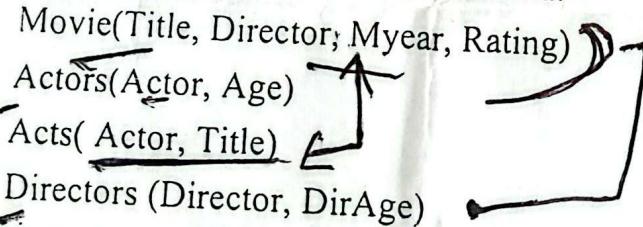
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Differentiate between schema and instances. Explain data independence with its importance. 8
- b) Design an ER diagram for an Online Food Delivery System to manage customers, restaurants, orders, and delivery. Draw the ER diagram with cardinalities and constraints. 7

2. a) What is relational algebra? Explain Selection, Projection, Union, Cartesian-product, Join and Set-Difference operations with suitable examples. 7

- b) Consider the given relational schema: 8



Write the SQL statement for the following task:

- i. Find the movies made by Gopal Varma after 1997.
- ii. Find all actors and directors.
- iii. Find number of movie which are directed by Devid Dhaban having actor "Bishnu".
- iv. Find (Director, Actor) pairs where the directors is younger than the actor.
- v. Find the number of movie actor wise.

3. a) Explain functional dependency with its types? For $R = \{A, B, C, D\}$ and $F = \{A \rightarrow BC, B \rightarrow C, AB \rightarrow C, AC \rightarrow D\}$, List the closure of functional dependency F. 7

OR

What are database constraints? Explain its types with suitable examples. When do we need Denormalization? Explain.

b) Define normalization. Create a relation in Unnormalized Form (UNF) and normalize it up to the Second Normal Form (2NF). 8

4. a) Why security is needed in database? Explain access control mechanisms. 7

OR

As a database administrator, propose the measures to protect the database against physical and cyber threats.

b) Define ACID properties. Explain view serializability with suitable examples. 8

5. a) What do you mean by query processing? Explain the steps of query processing with necessary diagram. 7

b) Construct a B+ tree for the following set of key values: {2, 5, 7, 9, 11, 17, 21, 23, 29, 31}. Assume that the tree is initially empty and values are added in ascending order where the pointer number is FOUR. 8

6. a) Consider following two transactions T1 and T2 given in figure where T1 executes before T2. Also consider initial value of A, B and C are 1000, 2000 and 3000 respectively. 7

T1	T2
Read (A)	Read (C)
A = A - 500	C = C - 200
Write (A)	Write (C)
Read (B)	
B = B + 500	
Write (B)	

Use the concept of deferred and immediate database modification log based recovery method in given problem.

b) Define data warehousing and explain how it supports decision-making processes in large organizations. 8

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

a) Query cost estimation

b) Set operations in SQL

c) NoSQL Databases and its characteristics