

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Computer Graphics (New)

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) 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

Programme: BE

Course: Microprocessor and ALP

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

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 Θ such that $\vec{F} = \nabla\Theta$. 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
Programme: BE
Course: Data Communication (New)

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) 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.
 - 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. 8
- b) Represent the given bit stream 10011100001101 using
 - i. Polar NRZ
 - ii. Differential Manchester
 - iii. HDB3
 7. Write short notes on: (Any two) 2×5
 - a) Standards organizations
 - b) Noise and its types
 - c) HDLC protocol vs Point-to-Point protocol

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Operating Systems (New)

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) 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. How would a Round Robin Scheduling algorithm behave when its time quantum is increased significantly? Explain with an example. 7

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.

- b) What are classical IPC problems? Explain reader writer problem. 7

3. 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. 8

i. FIFO

ii. LRU

iii. 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:

- i. What is the content of the matrix needed?
 ii. Is the system in a safe state? Also find the safe sequence. 8
- 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
- a) The Shell and Virtual Machine
 b) Window vs Linux
 c) Monolithic kernel and micro kernel

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2024

Programme: BE

Course: Database Management System (New)

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) Differentiate between schema and instances. Explain data independence with its importance.

- 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.

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:

Actors(Actor_Age)

Acts(Actor Title)

Directors (Director, DirAge)

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 Dhabani 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).

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

OR

As a database administrator, purpose 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