Total No. of Questions : 8]

P9115

[6179]-24

S.E. (Computer Engineering/ Computer Science & Design Engineering/ Artificial Intelligence & Data Science Engineering)

DISCRETE MATHEMATICS

(2019 Pattern) (Semester-III) (210241)

Time : 2¹/₂ Hours] Instructions to the candidates.

- 1) Answer Question No. Q1 or Q2, and Q3 or Q4, and Q5 or Q6 and Q7 or Q8.
- Neat diagram must be drawn whenever necessary. 2)
- Figures to the right indicate full marks. 3)
- Assume suitable data, if necessary. **4**)

How many bit strings of length 8 bits can be constructed which will either *Q1*) a) Start with '1' or end with '00'? [6]

- In how many ways can 6 Boys and 2 Girls be seating in a row such that b)
 - 2 Girls are seating together i)

2 Girls are not seating together ii)

- How many bit strings can be formed of length 10 bits which contains?[6] c)
 - at least four 1's i)
 - at most four 1's ii)

OR

- How many bit strings of length 10 can be formed which will contain *Q2*) a) either 5 consecutive 0s or 5 consecutive 1s? [6]
 - A zip code contains 6 digits. How many different zip codes can be made b) with the digits 0-9 if.
 - i) No digit is used more than once.
 - The first digit is not '0' ii) **[6]**
 - Use the Binomial theorem to expand $(3a-2b)^6$ [6] c)

[6]

SEAT No. :

[Total No. of Pages : 5

[Max. Marks : 70

Find shortest path from vertex '0' to vertex '4' using Dijkstra's algorithm. *Q3*) a)



[6179]-240

- What is planar Graph? A simple planar graph G contains 20 vertices and c) degree of each vertex is 3. Determine the number of regions in planar graph G? [5]
- For the following graph find different cut set and identify the max flow in *Q5*) a) given network [6]



Find the optimal prefix code for the given characters with the frequency b) of occurrences as below. [6]

15

equency

Character

A

E

Ι

- Ο U
- S 13 Т 1
- Find minimum Spanning tree using prims algorithm c)



[6179]-240

- **Q6**) a) Construct Binary search Tree: 21, 28, 14,18,11, 32, 25, 23, 37, 27, 5, 15, 19, 30, 12, 26
 - b) For the following transport network find the maximum flow using max flow min cut theorem. [6]



[6]

[6]

[6]

- Q7) a) Let $Z_4 = \{0,1,2,3\}$ and 'R be the relation under operation '+' defined as a+b=a+b: if (a+b) < 4 a+b=a+b-4: if $(a+b) \le 4$ Where $a,b \in Z_4$ Determine Algebraic System $(Z_4,+)$ is abellian group or not? [6]
 - b) Explain:
 - i) Integral domain
 - ii) Field
 - c) Let A= $\{0,1,2,3\}$ and 'R' be the relation under operation ' \odot ' defined as a \odot b=a,b%4. Determine algebraic system (A, \odot) is monoid or not? [5]

[6179]-240

c)

1

OR

Let $Zn = \{0, 1, 2, 3, ..., n-1\}$ **Q8**) a)

Let Zn={0,1,2,3,...n-1} Consider 'R' relation under operation '+' defined as "addition Modulo 5" and operation '*' defined as " multiplication modulo 5". Does the Algebraic system. $(Z_5, +, *)$ forms Ring"? [8]

- Explain the following properties of Algebraic structure with example [4] b)
 - i) Identity
 - ii) Inverse
- en. Consider 'R' be the relation under binary operation '*' on a set Z. Does c) the algebraic system (Z,*) is Abelian Group? [5]

Total No. of Questions : 8]

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SEAT No. :

[Total No. of Pages : 2

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S.E. (Computer Engineering A.I & D.S.) FUNDAMENTALS OF DATA STRUCTURES (2019 Pattern) (Semester - III) (210242)

[Max. Marks : 70

Instructions to the candidates:

Time : 2¹/₂ Hours]

- 1) Answer to the questions (Q.No.1 or Q.No.2, Q.No.3 or Q.No.4 Q.No.5 or Q.No.6, Q.No.7 or Q.No.8).
- 2) Assume suitable data, if necessary.
- 3) Draw neat labelled diagram wherever necessary.
- 4) Figures to the right indicate full marks.
- Q1) a) Sort the following numbers step by step using insertion sort : [9]
 55, 85, 45, 11, 34, 5, 89, 99, 67
 Comment on time complexity of Insertion sort
 - b) Explain in brief any three searching techniques. What is the time complexity of these techniques? [9]
- Q2) a) Explain Fibonacci Search algorithm with suitable example. What is it's time complexity?

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b) Given numbers 29, 57, 47, 39, 36, 20, 55, 28, 31, 39. Sort stepwise using radix sort. When it is appropriate to use radix sort? Write time Complexity. [9]

- Q3) a) Write pseudo code for following function using Singly Linked List of students (roll_number and name stored in every node) [9]
 - i) Search given roll no and delete that record. Draw diagram of operation.
 - ii) Add given number after specified number in the list. Draw diagram of operation.
 - b) Write and explain use of Generalized linked list for representation of multivariable polynomial with suitable example. Explain node structure. [9]

- Q4) a) Write pseudocode to perform addition of two polynomials using doubly linked lists into third list. Write time complexity of it. [9]
 - b) Write and explain node structure of Circular Singly Linked List and Doubly Linked list. Write pseudocode for concatenation of two doubly linked lists. [9]
- Q5) a) Write rules to convert given infix expression to postflx expression using stack. Convert expression (P * Q (L + M * N) ^ (X * Y / Z) stepwise using above rules.

Where his - exponential operator. [8]

- b) Explain with example three different types of recursion. [9] OR
- *Q6*) a) Explain procedure to convert infix expression to prefix expression and postfix evaluation with suitable example. [8]
 - b) Write pseudo-C/C++ code to implement stack using Singly linked list with overflow and underflow conditions. [9]
- *Q7*) a) Draw and explain Circular queue using array. Write pseudocode for Add, Remove operations. [8]
 - b) What is Doubly Ended Queue? Draw Dragram with labelling four basic operations at appropriate places. Which two data structures are combined in it and how? [9]
 - OR
- *Q8*) a) Write short note on :

- [8]
- i) Comparison of Circular Queue with Linear queue
- ii) Priority Queue
- b) Draw and explain implementation of Linear Queue using Singly Linked List. Explain Add, Remove, Queue Full and Queue Empty operations.[9]

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Total No. of Questions : 8]

P1528

[6002]-157

S.E. (Computer Engineering) (Artificial Intelligence & Data Science) (Computer Science & Design Engineering) **OBJECT ORIENTED PROGRAMMING (OOP)** (2019 Pattern) (Semester - III) (Theory) (210243)

Time : 2¹/₂ Hours] [*Max. Marks* : 70 Endsem exam based on 3, 4, 5, 6. 1) Draw Neat and clean Diagram. 2) 3) Assume suitable data if necessary. What is runtime polymorphism? How it is achieved in C++. Explain it *Q1*) a) along with example. [5] b) Explain virtual base class and virtual function with example. [6] c) Explain need of operator overloading. Write C++ program to demonstrate use of unary operator overloading. [6] Explain polymorphism and types of polymorphism in C++. *Q2*) a) [5] Explain what is type casting, Explain Implicit and explicit type of b) conversion with example. [6] Write a program to overload insertion (<<) and extraction (>>) operator c) in C++. 6 What are various functions which are used to manipulate file pointers? *03*) a) Explain using example. [7] Explain command line arguments in C++? Write program to explain the b) same. [7] What are different file opening mode? [4] c) OR Explain formatted and unformatted input and output functions used in **Q4**) a) C++ with example. [7] What are stream classes and their use? Provide the hierarchy of stream b) classes in C++. [7] Explain the use of command line arguments. If we want to pass c) command line arguments what will be prototype of main function and explain its arguments along with example. [4] *P.T.O.*

Instructions to the candidates:

SEAT No. :

[Total No. of Pages : 2

Q5) a)	What is the power of templates in $C \rightarrow 2$? Explain along with one example. [5]					
b)	Explain exception handling mechanism in C++? Write a program in C++					
	to handle "divide by zero" exception. [6]					
c)	Write a short note on typename and export keyword in C++. [6] OR					
06) a)	What is mean by user defined exception? Give one example. [5]					
2 b)	Explain class template using multiple parameters. Write a program in C++.					
,	[6]					
c)	How multiple catching is implemented in exception handling? [6]					
07) a)	Explain the concept of the Standard Template Library (STL) in C++					
Q7) a)	What are its key components? [7]					
b)	Differentiate between sequence containers and associative containers in					
,	the STL. Provide examples of each. [7]					
c)	Discuss the advantages of using container adapters in the STL. Provide					
	examples of container adapters [4]					
	OR					
Q8) a)	How can vectors and lists be used as sequence containers in the STL?					
	Explain with a appropriate example. [7]					
b)	Explain the concept of iterators in the STL. Differentiate between iterator					
	and pointers. [7]					
c)	Describe the process of using the STL algorithms for Quick sort. [4]					
	P. Ho. + + + + O					
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[6002]	-15/ 2 >					

### **P-9117**

# [6179] 243

S.E. (Computer Engineering) (AI & DS) (Computer Science & Design Engineering)

### **COMPUTER GRAPHICS**

## (2019 Pattern) (Semester - III) (210244)

Time : 2¹/₂ Hours

Instructions to the candidates:

- 1) Attempt Q.P or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8
- 2) Figures to the right side indicates full mark.
- 3) Draw neat diagram wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) Find transformation of a triangle A(1, 0) B(0, 1) C(1, 1) by performing translation by one unit in x and y directions and then rotating 45° about the origin.

- b) What are the types of Projection and write in brief about any one type of projection. [6]
- c) Write transformation matrix for (i) 2-D Rotation clockwise direction
   (ii) 2-D Scaling (iii) 2-D translation (iv) 2-D reflection about X-axis. [6]

#### OR

- Q2) a) Explain Perspective projections with example.
  - b) Given a circle C with radius 5 and center coordinates (1, 4). Apply the translation with distance 5 towards X axis and 1 towards Y axis. Obtain the new coordinates of C without changing its radius. [6]
  - c) Given a line segment with starting point as (0, 0) and ending point as (4, 4). Apply 30 degree rotation anticlockwise direction on the line segment and find out the new coordinates of the line. [6]
- Q3) a)Write a short note on :[6]i)CMY color modelii)b)Explain Back-face Removal algorithm.[6]
  - c) Explain ambient light and diffuse reflection with examples. [6]

[Total No. of Pages : 2

[Max. Marks : 70]

**SEAT No. :** 

*P.T.O.* 

[6]

		OR oo						
<b>Q4</b> )	a)	Explain the CIE chromaticity diagram.	[6]					
	b)	Explain Painter's algorithm.	[6]					
	c)	Explain Gouraud Shading method.	[6]					
Q5)	a)	What are various applications of Fractals?	[5]					
	b)	Explain Hilbert's curve with an example.	[6]					
	c)	Write a short note on Interpolation.	[6]					
		G. V						
<b>Q6</b> )	a)	Explain B-spline curve.	[5]					
	b)	Explain the Bezier curve. List its properties.	[6]					
	c) 🕅	What are fractals? Explain Triadic Koch in detail.	[6]					
Q7)	a)	Compare Conventional and Computer based Animation.	[5]					
	b)	Discuss NVIDIA as a gaming platform in detail.	[6]					
	c)	Explain the structure of a segment table with example.	[6]					
		OR	lp,					
<b>Q</b> 8)	a)	Write short note on Motion Specifications.	[5]					
	b)	Explain architecture of i860.	[6]					
	c)	Explain creation and renaming of segment.	[6]					
		10.×						
	B							
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SEAT No. :

[Total No. of Pages : 3

[*Max. Marks* : 70

# [6002]-222

## S.E. (Artificial Intelligence and Data Science) OPERATING SYSTEMS

## (2019 Pattern) (Semester - III) (217521)

Time : 2¹/₂ Hours] Instructions to the candidates

- 1) Solve questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary

*Q1*) a) What is synchronization? Operating system support and programming language support for synchronization. [6]

- b) What is inter process communication? Explain pipes and shared memory. [6]
- c) What are classical synchronization problems? Explain any one in detail.[6] OR
- Q2) a) What is deadlock? Explain its characteristics with example.
  - b) What are different methods of handling deadlock? Explain deadlock detection with example.
  - c) Consider a system that contains five processes P1, P2, P3, P4, P5 and the three resource types A, B and C. Following are the resources types: A has 10, B has 5 and the resource type C has 7 instances. Determine if the system is safe or not. [6]

Process	Allocation			Max			Available
	Α	В	C	A	В	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	2
P4	2	1	1	2	2	2	33
P5	0	0	2	4	3	3	0.
						- <del>() /</del>	

*P.T.O.* 

[6]

What is swapping? Does swapping increase the Operating system's c) overheads? [6] **DR Q4**) a) Explain the differences between: [6] Logical and physical address space i) Paging and segmentation ii) b) What is internal fragmentation and external fragmentation? How are they reduced? [6] What are advantages of partitioning the memory? What are different ways c) memory partitioning? [6] List and explain file types and file access methods. **Q5**) a) [6] What are different disk scheduling policies? Explain SCAN and CSCAN b) with example. [6] Explain how free space management is done by Operating Sytem? [5] c) OR What are different disk scheduling policies? Explain LIFO and SCAN **Q6**) a) with example. Given memory partition of 100K, 500K, 200K, 300K and 600K(in order). b) How would each of First fit, best fit and worst fit algorithm blace processes of size 212K, 417K, 112K, 426K (in order)? Which also makes the most efficient use of memory. [6] What is Directory? Explain directory implementation and allocation c) methods. [5] What are goals of Linux? Also interfaces to linu **Q7**) a) [6] What is kernel? Explain structure of kernel. b) [6] Explain various process management system calls in Linux with example. c) [5] OR [6002]-222 2

Explain the virtual memory system with suitable diagram.

of logical and physical memory.

Explain the basic method for implementing paging. Draw the paging model

**[6]** 

[6]

**Q3**) a)

b)

- Q8) a) Define the components of LINUX system with diagram. What is the responsibility of kernel in LINUX operating system? [6]
  - b) What are different Process management system calls in Linux. Explain exec() and brk() in detail. [6]
  - c) Explain implementation of process and threads in Linux. [5]

[6002]-222