

PGIS-N 1039 B-15
M.Sc. Ist Semester Degree Examination
Computer Science
(Digital logic and Computer Design)
Paper - HCT 1.1
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates.

- 1) Section A is Compulsory.
- 2) Answer any five questions from Section B

Section - A

1. Answer the following questions. (10×2=20)

- a) Draw the symbols for basic logic gates.
- b) Which Combination of gates are used for AND-OR-INVERT implementation?
- c) What is a combinational Circuit?
- d) Why multiplexer is required?
- e) What is magnitude Comparator?
- f) How do you define State equation?
- g) What is interregister transfer?
- h) Represent $(-9)_{10}$ in a 6-bit register using sign 1's and 2's complement.
- i) Define an accumulator.
- j) Compare vectored interrupt and non-vectored interrupt.

Section - B

2 a) What is number system? Convert $25.15_{(10)}$ to equivalent Binary, octal and Hexadecimal number system. (6)

- b) Perform the subtraction of decimal numbers 03880-58619 by using 10's and 9's complement method. Check the answer by straight subtraction. (6)
- 3 a) State and prove Demorgan's theorems. (6)
- b) Simplify the following Boolean function F with don't care conditions by using k-map method $F = \overline{A}\overline{B}D + \overline{A}CD + \overline{A}BC$ (6)
- $$d = \overline{A}B\overline{C}D + ACD + A\overline{B}\overline{D}$$
- 4 a) Implement Full subtractor with two Half Subtractors and an OR gate. (6)
- b) Explain the operations of Clocked 'D' flip flop. (6)
- 5 a) Design a 4-bit synchronous Binary counter. (6)
- b) Explain logic micro operations with an example. (6)
- 6 a) Design the 4-bit Combinational logic shifter. (6)
- b) Explain microprogram sequencer. (6)
- 7 a) What is Fetch and Execute cycle? Explain. (6)
- b) Define I/O interface? Explain Direct Memory Access (DMA) interface. (6)
- 8 Write notes on any two of the following. (2×6=12)
- a) Integrated circuits.
- b) Decoders
- c) Status Register
- d) 8086 micro processor.
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PGIS-N 1041 B-15
M.Sc Ist Semester (CBCS) Degree Examination
Computer Science
(Mathematical Foundation of computer science)
Paper - HCT 1.2
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. Section - A is **compulsory**
2. Answer **any 5** questions from section B

Section - A

1. Answer the following questions (10×2=20)
- a) Define a subset of a set. Give an example.
 - b) Let $R = \{(a, a), (a, b), (a, c), (b, b), (b, c)\}$ be a relation on the set $\{a, b, c, d\}$. State the minimum number of elements which need to be added to R in order so that the relation is
 - i) Reflexive
 - ii) Symmetric
 - c) Show that $p \vee \bar{q}$ is a tautology
 - d) Define partition of a set. Give an example
 - e) construct a logic diagram for Boolean polynomial: $x \wedge (y \vee z)$.
 - f) Define degree of a vertex in a graph.
 - g) What is lattice? Give an example.
 - h) Define group. Give an example.
 - i) State the phrase structure grammar and give an example.
 - j) What is semantics

Section - B

2. a) Prove the following equivalence: $P \rightarrow (q \vee r) \equiv (p \rightarrow q) \vee (q \rightarrow r)$ (6)
- b) Prove by using mathematical induction: $1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n}{3}(2n-1)(2n+1)$ (6)
- Where n is a positive integer.

3. a) Define an equivalence relation. If $A = \{a, b, c, d\}$ and $R = \{(a,a), (b,a), (b,b), (c,c), (d,d), (d,c)\}$, then determine, whether R is equivalence relation. (6)
- b) Consider $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 3x - 7$. Show that f is both injective and surjective on the set of real numbers \mathbb{R} . (6)
4. a) Solve the recurrence relation $a_n = a_{n-1} + 2, n \geq 2$ Subject to the initial condition $a_1 = 3$. (6)
- b) State and prove De-Morgan's theorem for Boolean Algebra. (6)
5. a) For any graph G with six vertices. Show that G and \bar{G} contain a triangle. (6)
- b) Prove that for any positive integer n , if G is a connected graph with n vertices and $(n-1)$ edges then G is a tree. (6)
6. a) State and prove pigeonhole principle. (6)
- b) Let $G = \{(a,b) : a, b \in \mathbb{R}, a \neq 0\}$. Define a binary operation $*$ on G by $(a,b) * (c,d) = (ac, bc + d)$ for all $(a,b), (c,d) \in G$. Show that $(G, *)$ is a group. (6)
7. a) Give a grammar that satisfies the language: $L = \{a^{2i} b^{2j} : i \geq 1, j \geq 1\}$. (6)
- b) Design the finite state machine that adds two binary integers x and y . (6)
8. a) Define the parity check code. For an encoding function $E: Z_2^4 \rightarrow Z_2^6$, the parity check matrix is given by $H = \begin{bmatrix} 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 \end{bmatrix}$. (6)
- i) Find the associated generator matrix
- ii) Decode the received words: 010101, 111010, 111110.
- b) Write notes on any two of the following. (6)
- i) Hamiltonian graph
- ii) Error correction
- iii) Inference Rules

PGIS-N 1043 B-15
M.Sc. Ist Semester Degree Examination
Computer Science
(Data Structures using C++)
Paper - HCT - 1.3
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates.

- 1) Section 'A' is Compulsory.
- 2) Answer any five questions from section B

Section - A

Answer the following questions

(10×2=20)

1. a) Mention any two advantages of OOP.
- b) What is STL? What is its significance?
- c) How is the efficiency of an algorithm measured?
- d) State any one difference between sequential search and binary search.
- e) Give any two advantages of stacks.
- f) What are the differences between arrays and linked lists?
- g) What is recursion?
- h) Define height and degree of a node in a tree.
- i) What is the significance of Huffman code?
- j) Differentiate between internal sort and external sort.

Section - B

2. a) What is a friend function? Explain with a supporting example. (6)
b) What are constructors and destructors? Discuss them with a supporting code snippets (6)
 3. a) Explain the need for virtual base class and illustrate its usage. (6)
b) How do you convert from one derived type to another derived type? Illustrate with an example. (6)
 4. a) Design an algorithm to search key element in the list by using binary search. (6)
b) Develop an algorithm to find the sum and average of integer values stored in a linked list. (6)
 5. a) Explain an array implementation of a stack in C++. (6)
b) Explain how stack data structure is useful in converting an infix expression to a postfix expression. (6)
 6. a) Develop both iterative and recursive algorithms for generating the nth member of Fibonacci series. (6)
b) Write the binary tree traversal algorithms. Trace the algorithm for your own binary tree. (6)
 7. a) Design an algorithm to construct an AVL tree. (6)
b) Explain insertion sort algorithm and investigate its efficiency. (6)
 8. Write notes on any two of the following. (2×6=12)
 - a) Generic programming.
 - b) Queue operations.
 - c) Operations on Graph.
 - d) B-Tree ADT.
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PGIS-N 1046 B-15
M.Sc. Ist Semester Degree Examination
Computer Science
(Operating system principles)
Paper : SCT 1.1
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

- 1) Section A B compulsory
- 2) Answer any five Questions from section B.

PART - A**Answer the following Questions****(10×2=20)**

1.
 - a) What is system call? Give an example.
 - b) Why CPU scheduling is required
 - c) What is Swapping? What are different Swapping techniques?
 - d) Write the free Space Management techniques?
 - e) What are the various states of a process?
 - f) Differentiate between page and a segment
 - g) What is meant by Thrashing? Give an example
 - h) What is Swap-Space Management?
 - i) Differentiate between long term and short term schedulers
 - j) What is the importance of shells in linux?

PART - B

2.
 - a) Define operating system . Explain various components of an operating system. 6
 - b) Discuss how preemptive scheduling is different from non. Preemptive scheduling. 6

3. a) Define virtual machine with a neat diagram explain the working procedure of virtual machine. 6
- b) What is interprocess communication? Explain the different methods used for logical implementation of a message passing system. 6
4. a) What is deadlock? What are the necessary conditions for a deadlock to occur? Explain 6
- b) What is paging? Discuss the structure of page tables with an appropriate examples. 6
5. a) What are the major methods used for allocating a disk space? Explain any one in detail. 6
- b) Explain Swap-Space Management. 6
6. a) Why file protection is necessary? Explain the techniques used for the file protection. 6
- b) Describe the Interprocess communication in clientserver systems. 6
7. a) Explain how do you use cryptography as a security tool. 6
- b) Discuss the file system in linux operating system. 6
8. Write notes on any two of the following (2×6=12)
1. Shell programming
 2. Distributed OS.
 3. RAID
 4. Directory structure
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