13001

I Semester M.C.A. Degree Examination, May/June 2023
(CBCS Scheme) (F+R)
COMPUTER APPLICATIONS
The Art of Programming

Time : 3 Hours | Max. Marks : 70

Instructions : *1) Answer **all** the Sections.*
*2) Answer **any five** from Section – **A**.*
*3) Answer **any four** from Section – **B**.*

SECTION – A

I. Answer **any five** of the following. **Each** question carries **6** marks : **(5×6=30)**

1) Explain the concept of algorithm with an example.
2) Explain the analysis of algorithm using time and space complexity.
3) Draw the flowchart to check whether the given number is prime or not.
4) Explain the different looping structure.
5) Explain generation of pseudo random number.
6) Explain the different types of function.
7) Define pointer variables. How is it different from normal variables ?
8) Explain text processing technique.

SECTION – B

II. Answer **any four** of the following. **Each** question carries **10** marks : **(4×10=40)**

9) Explain asymptotic notation. **10**
10) Discuss the design of algorithm for keyword searching in text. **10**
11) Explain in detail binary search with an example. **10**
12) a) Write an algorithm to find linear pattern searching. **5**
    b) Compare between malloc() and calloc(). **5**
13) a) Write a C program to sort 5 names using array of pointer. **5**
    b) Write an algorithm for array counting. **5**
14) Write a C program to add two matrix N × N. **10**

13005

I Semester M.C.A. Degree Examination, May/June 2023
(CBCS) (F + R)
COMPUTER APPLICATIONS
Object Oriented Programming

Time : 3 Hours Max. Marks : 70

Instruction : *Answer* ***all*** *the Sections.*

SECTION – A

I. Answer **any five** questions. **Each** question carries **6** marks. **(5×6=30)**

1) What is JAVA ? Explain JAVA programming structure.
2) Write a note on autoboxing and unboxing.
3) Write a short note on final class.
4) What is containment in JAVA ? Explain with an example.
5) What is Exception Handling ? Explain with an example.
6) What is package ? Write the steps to create and access package.
7) Discuss JAVA thread life cycle with an example.
8) How parameters are passed in applet ? Give an example.

SECTION – B

II. Answer **any four** questions. **Each** question carries **10** marks. **(4×10=40)**

9) a) Explain the features of JAVA. **(5+5)**
   b) Why JAVA is called platform-independent language ? Justify.
10) Explain different types of constructor with example. **10**
11) Write short notes on :
   a) Dynamic method dispatch
   b) Object typecasting. **10**
12) a) How does string class differ from the string buffer class ? **(5+5)**
   b) Differentiate between throw and throws statements.
13) Write a JAVA program to demonstrate method overloading. **10**
14) Explain any five methods of Data input stream and Data output stream. **10**

13004

I Semester M.C.A. Degree Examination, May/June 2023
(CBCS) (F+R)
COMPUTER APPLICATIONS
Theory of Computation

Time : 3 Hours Max. Marks : 70

Instruction : *Answer **all** Sections.*

SECTION – A

I. Answer **any five** of the following. **Each** question carries **6** marks. **(5×6=30)**

1) What is positive closure (+) and Kleene closure (*) ? Explain with example.
2) Construct the DFA to accept the strings 0's and 1's representing 0 modulo 5.
3) Explain Turing machine and instantaneous description of Turing machine.
4) Construct the PDA for given CFG

   S->0BB

   B->0S

   B->1S

   B->0.

5) Prove that S->aSbS/bSaS over the Σ ={ a, b} is ambiguous.
6) Write the difference between Moore and Mealy Machine.
7) Eliminate Unit production from the following Grammar

   S->AB

   A->a

   B->C

   B->b

   C->D

   D->E

   E->a.

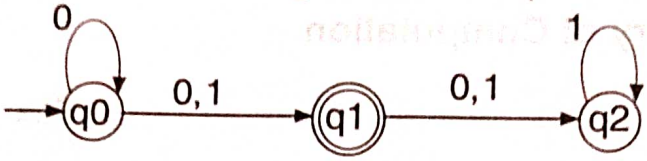
8) Explain Halting problem of Turing machine.

P.T.O.

SECTION – B

II. Answer **any four** of the following. **Each** question carries **10** marks. **(4×10=40)**

9) a) Convert the following NFA to its equivalent DFA. **8**



b) Write application of Regular Expression. **2**

10) Minimize following DFA using table filling method (Myhill algorithm). **10**

δ	0	1
→A	B	F
B	G	C
*C	A	C
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

11) a) Construct the PDA to accept the language $L=\{a^n b^{2n} | n \geq 1\}$ by final state acceptance. **6**

b) Check whether the above PDA is deterministic. **4**

12) a) Convert the CFG into GNF. **8**

S->AB
A->BS|1
B->SA|0

b) Define derivation Tree. **2**

13) a) Explain Chomsky's hierarchy of language with example. **5**

b) Prove that complement of recursively enumerable language is recursive. **5**

14) a) Obtain a Turing machine to accept language $L=\{ 0^n 1^n | n \geq 1\}$ **6**

b) Explain Post Correspondence Problem (PCP). **4**

13002

I Semester M.C.A. Degree Examination, May/June 2023
(CBCS Scheme) (F+R)
COMPUTER APPLICATIONS
Discrete Mathematics

Time : 3 Hours Max. Marks : 70

Instruction : Answer all the Sections.

SECTION – A

I. Answer **any five** questions. **Each** question carries **six** marks. (5×6=30)

1) a) Define Tautology. Show that for any propositions p, q, r the compound proposition : $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology. 3

b) If A, B, C are any three non-empty sets then prove that $A \times (B \cup C) = (A \times B) \cup (A \times C)$. 3

2) a) Use Mathematical Induction to show that $1 + 2 + 2^2 + 2^3 + \ldots\ldots\ldots + 2^n = 2^{n+1} - 1$. 4

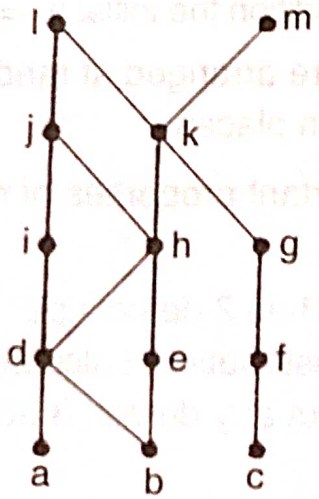
b) Find the inverse of the function $f(x) = \frac{x+1}{x}$. 2

3) ABC is an equilateral triangle whose sides are of length 1 cm each. If we select 5 points inside the triangle. Prove that at least two of these points are such that the distance between them is less than ½ cm. 6

4) Define POSET. Determine LUB and GLB of following subsets for Hasse diagram given below : 6

i) {a, b, c}

ii) {f, g, h}



P.T.O.

5) Explain geometric distribution and poisson distribution with example. 6

6) A bag 'A' contains 2 white and 3 red balls and a bag 'B' contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag 'B'. 6

7) What do you mean by Spanning tree ? Write a note on tree traversal. 6

8) Explain in degree and out degree of graph. Also explain about the adjacency matrix representation of graphs. Illustrate with an example. 6

SECTION – B

II. Answer **any four** questions. **Each** question carries **10** marks. (4×10=40)

9) a) Using Venn diagram prove that $P\Delta(Q\Delta R) = (P\Delta Q)\Delta R$. (5+5)

b) Among 100 students, 32 study mathematics, 20 study physics, 45 study biology, study mathematics and biology, 7 study mathematics and physics, 10 study physics and biology and 30 do not study any of the three subjects.

i) Find the number of students studying all three subjects.

ii) Find the number of students studying exactly one of the three subjects.

10) a) Write the following conditional statement in symbolic form. Also give the converse, inverse and contra-positive of the statement. 7

"If the flood destroys Mohan's house or the fire destroy Mohan's house, then Mohan's insurance company will pay him".

b) Prove the following equivalence : $\sim (\exists_x \sim P(x)) \equiv \forall_x P(x)$. 3

11) a) Solve $a_n = a_{n-1} + 2a_{n-2}$, $n > 2$ with condition the initial $a_0 = 0$, $a_1 = 1$. 5

b) The letters of the word COMPUTER are arranged at random. Find the probability that vowels occupy even places. 5

12) a) Define normal distribution. State important properties of normal distribution. 4

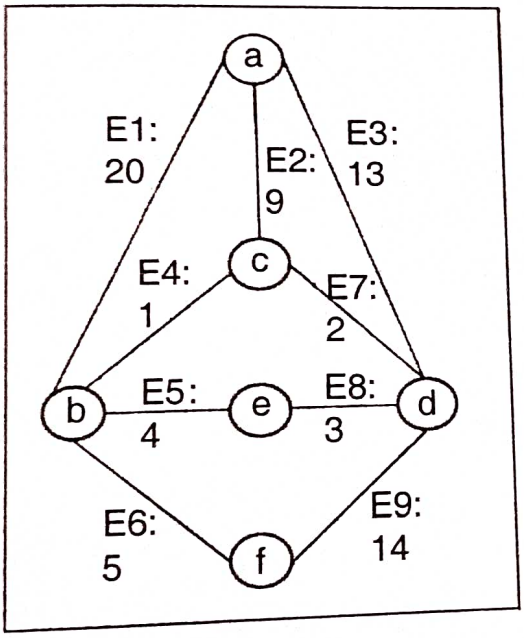
b) Suppose that a manufactured product has 2 defects per unit of product inspected. Using poisson distribution, calculate the probabilities of finding a product without any defect, 3 defects and 4 defects. 6

13) a) Two graphs with the following adjacency list are given, find whether G and H are isomorphic or not.

Graph G		Graph H	
Vertices	**Adjacent Vertices**	**Vertices**	**Adjacent Vertices**
P	q, s	A	b, c, d
Q	p, q, r	B	b, d
R	q, t	C	a, d
S	p, q, t	D	a, b, c
T	s	E	d

b) State and prove Baye's theorem. (5+5)

14) a) Find a minimal spanning tree for the following graph, using Kruskal's algorithm.



b) Give an example of a graph which is Hamiltonian but not Eulerian and vice versa. (5+5)

13003

I Semester M.C.A. Degree Examination, May/June 2023
(CBCS Scheme) (F + R)
COMPUTER APPLICATIONS
Computer Organization and Architecture

Time : 3 Hours Max. Marks : 70

Instruction : *Answer* ***all*** *the Sections.*

SECTION – A

I. Answer **any five** of the following. **Each** question carries **6** marks. **(5×6=30)**

1) Convert $(FADE)_{16}$ into Decimal, Octal, Binary Number System.
2) Explain half adder.
3) Explain the different instruction formats.
4) Define addressing mode. Explain the types of addressing mode.
5) Explain ILP and write it's limitations.
6) Difference between Memory-Mapped I/O and Programmed I/O.
7) Explain the virtual memory concepts.
8) Explain the characteristics of multiprocessor.

SECTION – B

II. Answer **any four** of the following. **Each** question carries **10** marks. **(4×10=40)**

9) a) Explain Von Neumann Architecture in detail. 5
   b) Explain JK Flip Flop with neat diagram. 5
10) a) Define counter. Explain Binary Counter in detail. 5
   b) Define Universal gate. Prove NOR as an Universal gate. 5
11) Explain RISC and CISC architecture in detail. 10
12) a) Explain interrupt cycle with neat diagram. 5
   b) Explain arithmetic micro-operation. 5
13) a) Explain arithmetic instructions with an example. 5
   b) Explain the Block diagram of DMA Controller. 5
14) Explain RAID in detail. 10

13006

I Semester M.C.A. Degree Examination, May/June 2023
(CBCS Scheme) (F + R)
COMPUTER APPLICATIONS
Data Structures

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer **all** Sections.*
*2) Answer **any five** from Section – **A** and answer **any four** from Section – **B**.*

SECTION – A

I. Answer **any five** of the following. **Each** question carries **6** marks. **(5×6=30)**

1) Define Data Structure. Explain classification of data structures.

2) Explain Asymptotic notation for complexity of algorithm.

3) Write the application of the following data structure :

   a) Graph

   b) Linked List.

4) Define Queue data structure. Explain its classification.

5) Define the following terms with reference to trees along with a diagram to illustrate them.

   a) Child

   b) Parent

   c) Ancestor

   d) Descendent

   e) Leaf node

   f) Internal node.

P.T.O.

6) Define Stack. Explain Push and Pop operations on stacks.

7) Write an algorithm for Binary Search.

8) Using Selection sort Technique sort the following list :

18, 9, 27, 54, 36, 45, 72, 8, 63

SECTION – B

II. Answer **any four** of the following. **Each** question carries **10** marks. **(4×10=40)**

9) Discuss the various operations on strings and give algorithm for them without using built in function. **10**

10) Discuss the insertion and deletion operation on Singly Linked List with algorithm and Illustration. **10**

11) Along with the algorithm, explain Tower of Hanoi concept. Show it for 3 discs. **10**

12) What is AVL Tree ? Construct AVL tree using following list. **10**

16, 27, 9, 11, 36, 54, 81, 63, 72

13) Define B-Tree and explain its operation with example. **10**

14) Along with algorithm, explain the working of Quick sort technique. **10**
