Max Time: 2 ½ hrs

Max Marks: 75

Q I Attempt any **three** (15)

A) Explain the different brackets and their usages in Python.

B) Explain the various arithmetic and logical operators in Python with the help of examples.

C) Explain the ways of terminating the loops and skipping specific sections in Python.

D) Write a program in Python that reads a number and displays the square, cube, and fourth power. Use the ** operator only for the fourth power.

E) Write a program in Python that reads an integer and prints how many digits the number has, by checking whether the number is ≥ 10, ≥ 100, and so on. (Assume that all integers are less than ten billion.) If the number is negative, first multiply it by -1.

F) Write a program that reads a five-digit positive integer and breaks it into a sequence of individual digits. For example, the input 16384 is displayed as 1 6 3 8 4.

Q II Attempt any **three** (15)

A) Explain what are parameters and arguments in functions.

B) Explain recursive functions with help of an example.

C) Explain what are boolean functions, void functions, fruitful functions.

D) Write a recursive function which returns the factorial of a number.

E) Write a function repeat(st, n, delim) that returns the string st repeated n times, separated by the string delim. For example, repeat("ab", 3, ", ") returns "ab, ab, ab".

F) Write a program that reads an integer and displays all its smallest factors, also known as prime factors.

Q III Attempt any **three** (15)

A) Explain exception handling mechanism in Python with examples.

B) Explain various file modes in Python.

C) Explain list in Python and the various functions and operations associated with it with examples for each.

D) Write a function sumWithoutSmallest in Python that computes the sum of a list of values, except for the smallest one, in a single loop.

E) Explain the various operations and functions associated with the dictionary with examples for each.

F) Given a dictionary gradeCounts = {"A": 8, "D": 3, "B": 15, "F": 2, "C": 6}, write the Python statement(s) to print: (i) all the keys. (ii) all the values. (iii) all the key and value pairs. (iv) the average value.

Q IV Attempt any **three** (15)

A) Explain how synchronization of threads is done in Python.

B) Explain at least two functions from each of these modules: math, random.

C) Explain how to define a class and create objects.

D) Explain how to create and use module in Python.

E) Create a 'Point' class in Python that represents a point in the Cartesian coordinate system. Define function to find the distance between the calling point object and another point object passed as an argument to the function.

F) What are the different Meta characters? Explain their usage.

Q V Attempt any **three** (15)

A) Write a Python code to display error, yes-no message box.

B) Explain the 'Entry' widget.

C) Explain how to create menu in Python.

D) Write a short note on Place Geometry.

E) Write a python code to create a GUI application to covert 'meter' to 'kilometer'.

F) Explain 'Button' widget.

Max Time: 2½ hrs   SYIT Semester III   Max Marks: 75

COMPUTER NETWORK   20.10.2023

Instructions:
1) **All** questions are **compulsory**.
2) Mixing of sub questions is not allowed.
3) Write in clear, legible, writing.

Q1) Attempt any three: (15)
   A) Draw and explain TCP/IP protocol stack.
   B) Explain the services of data link layer.
   C) Explain frame format of HDLC.
   D) Explain in detail about protocol layering.
   E) Explain L1 and L2 switch.
   F) Explain evolution of computer network.

Q2) Attempt any three: (15)
   A) Explain IEEE 802.11 project
   B) Draw and explain architecture of bluetooth.
   C) Write short note on satellite network.
   D) Explain in detail about data link layer design issues.
   E) Draw and explain the block diagram of parity generator and checker for error detection.
   F) Explain periodic analog signals and digital signal.

Q3) Attempt any three: (15)
   A) Explain ICMP messages.
   B) Explain path vector routing algorithm with diagram.
   C) Explain IPV 4 packet format with diagram
   D) An organization is granted a block 130.56.0.0/16. The administrator want to create 1024 subnets.
      a) find the number of addresses in each subnet.
      b) find the subnet prefix.
      c) find the first and last address in first subnet
   E) Write short note on OSPF
   F) Explain transition techniques from IPV4 to IPV6.

Q4) Attempt any three: (15)
   A) Explain TCP features.
   B) Draw and explain TCP segment in detail.
   C) Explain stop and wait and GO Back N ARQ protocol in detail.
   D) Explain flow control mechanism provided by TCP in detail.
   E) Explain applications of UDP in detail.
   F) Explain three way handshaking mechanism for connection establishment and termination in TCP with diagram.

Q5) Attempt any three: (15)
   A) EXplain four scenarios of electronic mail with diagram.
   B) Explain DHCP operation with diagram.

C) Explain POP3 and IMAP in detail.
D) Explain SSH in detail.
E) Explain FTP protocol in detail with diagram.
F) Explain in detail DNS resolution process with diagram.

SY - IT sem-III
Data Structures
(2½ hours)

Total Marks: 75

N. B.:(1) All questions are compulsory.
(2) Make suitable assumptions wherever necessary and state the assumptions made.
(3) Answers to the same question must be written together.
(4) Numbers to the right indicate marks.
(5) Draw neat labeled diagrams wherever necessary.
(6) Use of Non-programmable calculators is allowed.

1. **Attempt any three of the following:** 15

a. Perform Bubble sort on the following:

   31   12 10 87 5 26 18   19

b. Explain how linear and binary search will be used to find 12 in the following list:

   1 3   5   7   11   12   17   19 21 22   24

c. What is sparse matrix . Explain with example.

d. Find the address of the indicated elements assuming base address to be 1000

Array	Storage	Element		
Int[10][20]	Row major	A[2][10]		
float[20][40]	Col major	A[10][10]		

e. Compare the running time T1 of the linear search algorithm, with the running time T2 of the binary search algorithm when n=1000 and n=10000.

f. Suppose A is a sorted array with 200 elements and suppose a given element,x appears with the same probability in any place in A. Find the worst case running time f(n) and the average case running time g(n) to find x in A using the binary search algorithm.

2. **Attempt any three of the following:** 15

a) Explain the structure advantages /disadvantages and types of linked list.

b) Write the algorithm for insertion of a node at the given position and deletion at the end in linked list.

c) Write and explain an algorithm to insert a new element into sorted linked   list.

d) Explain how memory is allocated and deallocated for linked list.

e) Give an algorithm to copy one link list into another link list.

f) Write and explain an algorithm to split a linked list into two linked lists.

3. **Attempt any three of the following:** 15

a. What is stack? How it is different from other data structures?

b. What are basic operations performed on stack? Explain the underflow and overflow condition of the stack.

c. Convert the following infix expressions into other prefix and postfix expressions.:
   1. a*b + (c+d) – (e+f) + g*h/k^2
   2. b + c*d-e + (e^2*f)
   3. (a*b*c^2+d) + (c/d +c)

d. What is a deque? List its different types

e. What is the difference between stack and queue?

f. What is priority queue? Explain its applications.

4. **Attempt any three of the following:** 15

a. Sort the following elements using merge sort.
   23 56 13 34 78 62 98 53 49 82

b. Explain with example the following terms:
   i. Degree of a node
   ii. Path
   iii. Internal node
   iv. Similar binary trees
   v. Complete binary tree

c. Draw the binary tree whose inorder and preorder traversals are:
   In-order : g d b h e i a f c
   Pre-order : a b d g e h i c f

d. Make a binary search tree by inserting the following numbers in sequence
   52 36 98 29 123 39 15 56 31 365 278 45 72

e. Draw max and min heap with the following elements
   80 9 25 30 100 45 62 89 51 23 11 27 323

f. What is AVL tree? How balancing is done in AVL tree? Explain with example

5. **Attempt any three of the following:** 15

a. What is hash table and hashing. Explain mid-square method

b. What is open-addressing? Explain

c. Explain linear probing with example

d. What is hashing? Explain different ways to perform hashing.

e.. Explain any two collision-resolution techniques

f. Explain Depth-first search. What are its uses?

Applied Math.

Note: (1) All questions are compulsory. **SY- IT- Sem -III**

(2) Make suitable assumptions wherever necessary and state the assumptions made.

(3) Numbers to the right indicate marks.

(4) Use of Non-programmable calculator is allowed.

Q1). Answer any three of the following: [15 M]

a) Find the eigen value of.

$$A=\begin{bmatrix} 2 & 3 & 4 \\ -1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$$

b) Find the inverse of matrix by adjoint method.

$$A.=\begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$$

c) Evaluate using De-Moivre's theorm $(1 + \sqrt{3})^{-12} + (1 - \sqrt{3})^{12}$

d) Use solvable for y to solve $p^3 + p - e^y = 0$

e) Find cube root of unity

f) By using Laplace transform prove that $L[t^3 + 5t - 2]$

Q2) Answer any three of the following.   [15 M]

a) Evaluate using Gamma function $\int_0^\infty \frac{x^4}{4^x} dx$

b) Evaluate using DUIS $\int_0^1 \left(\frac{1-x^\alpha}{\log x}\right) dx, \alpha \geq 0$

c) Find $L^{-1}[\frac{1}{s^2 - 8s + 2}]$

d) Find two complex numbers such that their sum is 8 and their product is 20.

e) Simplify $\dfrac{(cos2\theta - isin2\theta)^5 (cos3\theta + isin3\theta)^8}{(cos4\theta + isin4\theta)^7 (cos\theta - isin\theta)^8}$

f) Solve by using method of substitution $\dfrac{dy}{dx} + x \tan(y-x) = 1$

Q.3) Answer any three of the following.   [15 M]

a) Find tanh x, if $6sinh x + 2cosh x + 7 = 0$

b) Find the Laplace transform of $f(t) = [cos(3t)]^2$

c) Evaluate using Gamma function $\int_0^\infty \sqrt{x} - e^{\sqrt[5]{x}} dx$

d) Solve differential equation using I.F. $y^2\,dx+(x^2-xy)dy=0$

e) Solve using Inverse Laplace Transform

$$\frac{d^2y}{dt^2}+y=t;\ y(0)=1,\ y^{l}(0)=-2$$

f) Express $c = \begin{bmatrix} 3 & 4 & -3 \\ 6 & -3 & 0 \\ 0 & 8 & -4 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrices.

Q.4) A nswer any three of the following.   [15 M]

a) separate into real and imaginary part $tan^{-1}(e)^{i\theta}$

b) If f(t)=4 for t ≥ 0 then find its Laplace transform.

c) Evaluate $\int_0^1 \sqrt{\log\left(\frac{1}{x}\right)}\,dx$

d) use solvable for y method to solve following equation

$$y=2px+p^4x^2$$

e) Find Laplace transform of

$$F(t)=4 \qquad 0\le t<3$$

$$=t\text{-}3 \qquad 3\le t$$

f) Find the non –trivial solutions of the following system of equations

$x+2y+z=0$

$4x+y+2z=0$

$3x+y+3z=0$

$x+2y\ \ =0$

Q.5) Answer any three of the following   [15 M]

a) compute L [cos h^2 (2t)].

b) using inverse hyperbolic function prove that $tan^{-1} x = \frac{1}{2}\log\left(\frac{1+x}{1-x}\right)$

c) solve $\int_0^1 \frac{x^{\frac{1}{2}}}{(1-x^2)^{\frac{-1}{3}}}\,dx$

d) solve $(x+1)\frac{dy}{dx}+1=2\,e^{-y}$

e) Find Laplace Transform of $f(t)=6t^3\text{-}3\cos(2t)+7e^{-2t}$

f) Evaluate $\Gamma 4.5$

Operating Systems

Q1) Attempt any three: (15)

A) Write a short note on Simple Batch Systems

B) What are the different transitions in a five state process model?

C) What are the steps followed by an operating system when a process is created?

D) Write a short note on distributed operating system and operating systems with object-oriented design

E) Explain the five state process model

F) Write a short note on symmetric multiprocessing

Q2) Attempt any three: (15)

A) Explain the different states of a thread

B) What are the requirements for mutual exclusion to be fulfilled by the operating system?

C) Define the following terms **any five**:- Semaphore, Binary Semaphore, Mutex, Monitor, User level threads, Kernel Level threads

D) Write a note on Semaphore and how it is used to ensure mutual exclusion. Explain through an example

E) Write a note on Readers/Writers problem

F) Explain Message Passing between processes

Q3) Attempt any three: (15)

A) Explain Dynamic Partitioning with a neat diagram. What are its advantages and disadvantages? How do you overcome its disadvantage

B) Write a note on segmentation

C) What is thrashing in virtual memory? How do you avoid thrashing?

D) What is the use of resource allocation graph? Explain with a diagram

E) How can deadlocks be prevented?

F) Explain the Dining Philosopher's problem

Q4) Attempt any three: (15)

A) What are the different types of schedulers? Explain each

B) What are the criteria for scheduling?

C) Explain the Shortest Job First/Next (SJF/SJN) scheduling algorithms

D) What are the different types of multiprocessor systems? Explain each

E) What is the granularity (level of detail) at which tasks can be divided amongst multiple processors?

F) Write a short note on the Design Issues while scheduling tasks on a multiprocessor system

Q5) Attempt any three: (15)

A) What are different types of buffering techniques used for I/O operations? Explain each

B) Explain the following Disk Scheduling policies with the help of a neat diagram:- SSTF, LOOK, CLOOK

C) Explain the following file organization techniques with a neat diagram:- Sequential file, Indexed Sequential file

D) What are the common file access rights that can be given to another user? Explain

E) Explain the following File Allocation Methods:- Linked List

F) Explain the various techniques of free space management

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