Date 07/10/2024

S.Y.B.Sc.(I.T.) – Semester III
PYTHON PROGRAMMING

(Time: 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. What are the different types of errors in programming?

b. What is a variable? How are variables created in Python? What are the rules for variable names?

c. Explain the following Python type conversion functions with suitable examples.
i) ord() **ii)** str() **iii)** hex() **iv)** list() **v)** complex()

d. Explain comparison operators in Python with suitable examples.

e. Explain the Python for loop with syntax, flow diagram and example for displaying first 10 numbers in ascending and descending order.

f. Write a Python program to accept a number from the user and display sum of its digits.

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

a. Explain the following math functions and constants with suitable examples:
i) ceil() **ii)** fabs() **iii)** fmod() **iv)** isnan() **v)** pi

b. What is a module? How are modules imported in Python? Give suitable examples.

c. Explain the concept of "Checking Types". Write a Python program to demonstrate the concept of "Checking Types".

d. Write a program in Python that accepts a number from the user and checks whether it is an Armstrong number or not, using a function.

e. What is a string? How are strings created in Python? What are the different string operators in Python?

f. What will be the output of the following program? Explain every statement in detail.

```
print("Div={}, Roll No={}".format('A', 1))
print('{:>20}-SY'.format('BScIT'))
print('{:*<20}-SY'.format('BScIT'))
print('{:.10}-SY'.format('Python Programming'))
print('{:.10}-SY'.format('Python Programming'))
n = 10/3
print('{:5d}'. format(int(n)))
print('{:05.1f}'. format(n))
n = 5 -10
print('{:d}'.format(n))
```

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

a. Explain list traversal. Write a Python program to demonstrate list traversal.

b. What is a variable-length argument tuple? Write a Python program to demonstrate variable-length argument tuple.

c. What are the different operations that can be performed on dictionaries? Write a Python program to illustrate dictionary operations.

d. Explain are the different file access modes in Python.

e. Explain the following built-in Python Exceptions with examples:
i) StopIteration ii) ImportError iii) IndexError
iv) SyntaxError v) TypeError

f. Write a short note on Exception Handling. Explain the syntax of Exception Handling in Python.

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

a. What is a Regular Expression? What are the types of regular expressions? Explain the character class of regular expression.

b. What will be the output of the following Python program? Explain each statement in detail.

```
import re
s = "This is a demonstration of \"Python\" Regular Expression"
print("\nSearch [^d-n] = ", re.search("[^d-n]", s))
print("\nFindall \\b[a-z] = ", re.findall(r"\b[a-z]", s))
s1 = "Hellooo World!!! Hello World!!!"
print("\nFindall lo* = ", re.findall("lo*", s1))
print("\nFindall on(?=\w) =", re.findall("on(?=\w)",s))
print(s.split())
```

c. Explain the concepts of object-oriented programming.

d. Write a Python program to implement multilevel inheritance.

e. Write a short note on Multi-threaded Programming in Python.

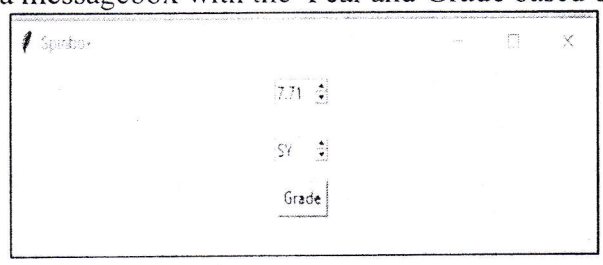
f. Write a Python program to create a module named geometry to calculate area of circle and square. Import the module in a new file. Write a function pointShapeVolume(x, y, squareBase) that calculates the volume of a square pyramid if squareBase is True and of a right circular cone if squareBase is False. x is the length of an edge on a square if squareBase is True and the radius of a circle when squareBase is False. y is the height of the object. Use circleArea and squareArea functions from the geometry module to calculate the base areas.

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

a. How is a window created in Python GUI? Explain the attributes of a window.

b. How is a rectangle created in Python GUI? Explain the properties of rectangle.

c. Write a Python program illustrate the different methods of Checkbutton Widget Write a Python program to create 2 Spinbox Widgets. For the first Spinbox, change the starting value to 4, stop value to 10, increment value to 0.01. Display values FY, SY and TY in second Spinbox. Display a messagebox with the Year and Grade based on values selected in the Spinboxes.



Value	Grade
10	O
9.00 – 9.99	A+
8.00 – 8.99	A
7.00 – 7.99	B+
6.00 – 6.99	B
5.00 – 5.99	C
4.00 – 4.99	D

d. Write a Python Program to create a Listbox with 10 items – PP, DS, CN, OS, AM/MP, JP, IES, COST, SE and CGA. Add a vertical Scrollbar to the Listbox.

e. How are SQL queries executed in Python? Explain the syntax to add, update and delete rows from a table.

f. Write a Python GUI program to display a messagebox with total no. of rows in the employee table (eno, ename, age, dept). Display the rows of the table in a tabular format in the window.

S.Y.B.Sc.(I.T.) – Semester III
SUBJECT: COMPUTER NETWORKS

Date 8/10/2024

(Time: 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. Explain the importance of the Data-link and presentation layer of the ISO/OSI layer.
b. Write a short note on the Router device.
c. What is the meaning of Information? Explain the data flow type.
d. Explain the protocol concept with its key elements.
e. Explain the importance of the following protocols used in the TCP/IP protocol
i) ARP **ii)** RARP **iii)** ICMP **iv)** IGMP **v)** SCTP
f. Discuss the concept of WAN.

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

a. Write a short note on parallel transmission.
b. Explain the architecture of Bluetooth technology.
c. Discuss the concept of FEC with a suitable example.
d. Explain the error with its types.
e. Write a short note on properties of Wireless Lan.
f. Discuss the Analog signal with a suitable diagram.

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

a. Explain the workings of RIP with a suitable diagram.
b. Discuss the ICMP concept with its error reporting message.
c. Explain the Internet protocol concept with an IPv4 protocol datagram with a diagram.
d. Discuss the IPv6 packet format with a suitable diagram.
e. Explain how the IPv4 protocol is different from the IPv6 protocol.
f. Write a short note with a diagram on how the BGP protocol works in a computer network.

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

a. Write a short note on selective repeat ARQ.
b. Discuss UDP protocol and enumerate user Datagram format with a suitable diagram.
c. Explain how the TCP protocol is different from the UDP protocol.
d. Write a short note on UDP operation.
e. Discuss TCP protocol and explain TCP services.
f. Discuss the operation of stop & wait ARQ during data frame damage and lost.

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

a. Elaborate concept of an Email with its advanced features.
b. Write a short note on WWW.
c. What is HTTP? Explain the principle of HTTP operation with a suitable diagram.
d. What is the meaning of DNS and explain Domain name space.
e. Discuss the role of HTML in the computer network with a suitable example.
f. Explain the role of FTP in the computer networks.

S.Y.B.Sc.(I.T.) – Semester III
SUBJECT: APPLIED MATHEMATICS

Date 9/10/2024

(Time: 2½ hours)

Total Marks: 75

N. B.: (1) **All** questions are **compulsory**.
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(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **non-programmable** calculators is **allowed**.

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

a. Examine the consistency of the given system of linear equations & hence, find its solution if it is consistent:
$x + 4y + 3z + w = 0, 2x + 3y - z + 2w = 0, 3x + 7y + 5z + w = 0$

b. Verify Cayley Hamilton Theorem for the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

c. Find the eigen values & eigen vectors of $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$

d. Define: Orthogonal Matrix
Determine whether $A = \frac{1}{7}\begin{bmatrix} 3 & 2 & 6 \\ -6 & 3 & 2 \\ 2 & 6 & -3 \end{bmatrix}$ is orthogonal or non-orthogonal matrix.
If it is orthogonal, find its inverse.

e. Solve the given system of linear equations by method of inversion
$2x + 3y - 4z = 4, 3x - 2y + z = 0, x + y + 5z = 8$

f. State De-Moivre's Theorem & hence apply it to prove :
$\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^{90} + \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^{90} = -2$

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

a. Solve the differential equation: $\frac{d^3y}{dx^3} - 8y = cos2x$

b. Solve the differential equation: $\frac{dy}{dx} - \frac{2xy}{1+x^2} = (1 + x^2)^2$

c. Solve the differential equation: $sec^2xtanydx + sec^2ytanxdy = 0$

d. Solve the differential equation: $\frac{d^3y}{dx^3} - 8\frac{d^2y}{dx^2} + 17\frac{dy}{dx} - 10y = e^{2x}$

e. Solve the differential equation: $\left(\frac{dy}{dx}\right)^2 - 7\frac{dy}{dx} + 12 = 0$

f. Solve the differential equation: $\frac{d^2y}{dx^2} + 9y = e^{4x}$

S.Y.B.Sc.(I.T.) – Semester III
SUBJECT: APPLIED MATHEMATICS

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

a. Find $L(e^{3t}sin5tsin3t)$

b. Find $L^{-1}[\frac{s^2+s+2}{(s-1)(s+2)(s-3)}]$

c. Find $L^{-1}[\frac{2s-5}{(s-2)(s^2+4)}]$

d. Find $L[\frac{cos2t-cos3t}{t}]$

e. State the formula to find $L(sinhat)$ & $L(coshat)$. Hence, find $L(\ tsinh5t\ )$

f. Find $L^{-1}(\frac{3-2s}{s^2+4s-12})$

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

a. Evaluate: $\int_{-1}^{1}\int_{-2}^{2}\int_{-3}^{3}(x^2+y^2+z^2)dzdxdy$

b. Evaluate: $\int_0^2\int_x^{x+2}(x-y+2)dydx$

c. Evaluate: $\int\int xy(x+y)dxdy$ over the area between curve $x=y^2$ & the line $x=y$

d. Evaluate: $\int_1^2\int_2^3(x^2+y^2-2)dydx$

e. Evaluate: $\int_0^2\int_0^x\int_0^{y-x}3x^2yzdzdydx$

f. Evaluate: $\int_0^3\int_y^{\sqrt{y}}(x+xy)dxdy$

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

a. Evaluate: $\int_0^{\infty}\frac{x^2(x^2-x^3)}{(1+x)^9}dx$

b. Evaluate: $\int_0^1(1-\sqrt[3]{x}\ )\ x^{1/2}dx$

c. Evaluate: $\int_0^{\infty}x^9\ e^{-x^5}\ dx$

d. Evaluate: $\int_0^{\pi/2}sin^4\theta cos^4\theta d\theta$

e. Define: Error Function. Prove that $\text{erf}(\infty)=1$

f. Define: Complementary Error Function. State & prove the relation between error function & complementary error function.

S.Y.B.Sc.(I.T.) – Semester III
DATA STRUCTURES

Date 11/10/2024

(Time: 2½ hours) **Total Marks: 75**

N. B.: (1) **All** questions are **compulsory**.
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(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. How the data structures are classified? Explain in details.
b. List and explain asymptotic notations used in data structure.
c. Write an algorithm of insertion of an element at the end of an array.
d. Explain how sequential search will be used to search for value 41 from the following list of values 70 40 30 11 57 41 25 14 52.
e. Illustrate the concept of sparse matrix.
f. What is array? Explain with suitable example. Also write advantages and disadvantages of array.

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

a. What is linked list? Write an algorithm for traversal in singly linked list.
b. Write an algorithm for insertion of node at given position and deletion at the end in linked list.
c. What is Double Linked List? Write a program to add new node at the end of DLL.
d. What is header linked list? What are the different types of headers linked list.
e. Write a short note on circular linked list.
f. How a linked list can be used to represent a polynomial expression? Explain with suitable example.

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

a. Write an algorithm for push and pop operation of the stack using array representation.
b. Write a short note on Deque.
c. Convert the following expression:
(i) infix to prefix: ((a / b) + c) - (d + (e * f))
(ii) infix to postfix: K + L - M*N + (O^P) * W/U/V * T + Q
d. What is circular queue? Explain with an example, how it is implemented?
e. What is priority queue? Explain application of priority queue.
f. Write an algorithm to insert and delete an element in queue using suitable example.

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

a. Write an algorithm to traverse Binary tree recursively in-
i) Preorder manner **ii)** Inorder manner
b. Explain the following terms regarding trees:
i) Root **ii)** Path **iii)** Parent Node **iv)** Degree of Node **v)** Level of Tree
c. What is heap? Draw and explain the Max Heap with the following elements
44, 33, 77, 11, 55, 88, 66
d. What is selection sort? Sort the following elements using selection sort
12 29 25 8 32 17 40
e. Binary tree T has nodes. Generate Binary tree according to Inorder and Postorder of the tree
i) Inorder :9,5,1,7,2,12,8,4,3,11 **ii)** Postorder:9,1,2,12,7,5,3,11,4,8
f. Write a short notes on
i) Insertion sort **ii)** Merge sort

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

a. What is hashing? Explain hashing function with example.

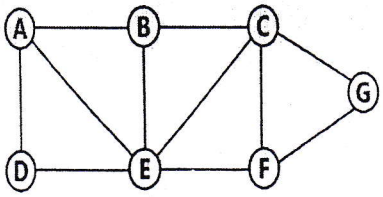
b. Explain the following terms

i) Linear probing **ii)** Quadratic probing

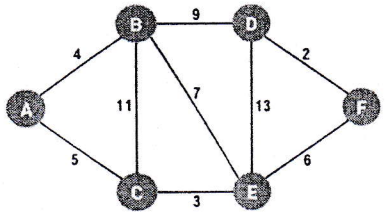
c. The key 50, 700, 76, 85, 92, 73, 101 are inserted into an initially empty hash table of length 7 using open addressing with hash function h(k)=k mod 7 and linear probing. What is the resultant hash table?

d. What is graph? What are the different ways to representation the graph?

e. What is Breadth first search? What are the different steps to implement following graph using BFS



f. Using Dijkstra's Algorithm find out the shortest distance of all the nodes from source node using following graph



S.Y.B.Sc.(I.T.) – Semester III
OPERATING SYSTEMS

(Time: 2½ hours)

Total Marks: 75

N. B.: (1) **All** questions are **compulsory**.
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(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. Define Operating System and outline its primary functions.
b. Explain the concept of serial processing and highlight two major problems it faces?
c. Describe the role of redundancy in achieving fault tolerance within a system. How does it work?
d. List and explain few reasons for process creation.
e. In the context of operating systems, what does it mean when a process is suspended? List and explain four attributes of a suspended process.
f. List and explain the different types of interrupts that can occur in a system.

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

a. What is the difference between a process and a thread?
b. Explain the various multi-threading models used in operating systems.
c. Define terms:
i. Atomic Operations ii. Critical Section iii. Deadlock iv. Livelock v. Mutual Exclusion
d. What are some key design issues that arise when dealing with concurrency in systems?
e. What is the Readers-Writers Problem, and how can it be solved using semaphores?
f. How do direct and indirect addressing differ in the context of message passing?

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

a. Describe Resource Allocation Graph? i. With deadlock ii. With a cycle but no deadlock.
b. Explain Dining Philosophers Problem using Semaphores.
c. Explain the concept of Simple Paging in operating systems?
d. List three degrees of awareness between processes and briefly define each.
e. Given the page reference string **7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2.** Calculate the number of page faults using the LRU algorithm with 3 frames. Show your step-by-step process.
f. What is thrashing in the context of virtual memory management?

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

a. Explain any one primitive and non-preemptive scheduling algorithm.
b. Draw Gantt chart, calculate the average waiting time & average turn-around time if the processes are scheduled using: FCFS algorithm.

Process	Burst Time	Arrival Time
P1	6	2
P2	2	5
P3	8	1
P4	3	0
P5	4	4

c. Show the working of round-robin scheduling with help of example.
d. List and briefly define five general areas of requirements for a real-time operating system.
e. What is the concept of priority inversion in real-time operating systems?
f. Discuss three interrelated issues involved in Scheduling on a multiprocessor.

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

a. What is Direct Memory Access (DMA) and how does it work?

b. What is total **head** movement for C-LOOK scheduling for given I/O blocks **82,170,43,140,24,16,190** where head is initially at cylinder **50**.

c. List five file organization. Explain any one with advantages and disadvantages.

d. Explain File System Architecture with the help of diagram.

e. What are the three main classes of intruders?

f. Explain the access matrix model of implementing protection in operating system.