SY-IT-Sem-III
DM. System
Oct - 2018

Q. P. Code: 53634

(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 is the role of DBMS? What are its advantages over file system?
b. Explain storage system and query processor components of database structure.
c. What is a business rule? What is its purpose in data modeling?
d. Write comparison between hierarchical, network & relational model.
e. List and explain Codd's rules in detail.
f. Explain ER diagram and its components. Give the distinction between disjoint, overlapping, total and partial constraints. Draw E-R diagram for the following situations that correctly models this domain and its constraints.
A small racing league want a database to keep track of teams, drivers, races and scores in the league. The league is run for teams, which are identified by their names. Each team has one or more drivers signed up, and each driver is registered with the league and has a unique league licence number. First and last names of the drivers should also be included. A driver may only participate for a single team throughout the season. Races are identified simply by the dates when they are run. For each race, the league also wants to store the venue where it took place. Drivers participate in races, and for each participating driver the database should store the total race time for that driver, and the league score they got from that race.

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

a. Why are entity integrity and referential integrity important in a database? Explain in detail.
b. Explain why normalization is necessary in database system & also explain database anomalies in detail.
You are given the following set of functional dependencies for a relation R(A,B,C,D,E,F),
F ={AB→C, DC →AE, E →F }
a. What are the keys of this relation?
b. Is this relation in BCNF? If not, explain why by showing one violation.
c. Is the decomposition (A, B, C, D) (B, C, D, E, F) a dependency preserving decomposition? If not, explain briefly.
c. Write short note on Cartesian product with its syntax and example.
d. Explain SET operators in relational algebra with example.
e. Explain formal definitions with safety of expressions of tuples relational calculus.
f. State the difference between relational algebra and calculus.

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

a. What are constraints? What are the different types of constraints? Explain.
b. When can a view be updated? Explain the syntax of updating a view. Also state the difference between views and table.

[TURN OVER]

c Consider the relations :
Worker
(WORKER_ID,FIRST_NAME,LAST_NAME,SALARY,JOINING_DATE,DEPARTMENT)
Write the SQL queries for the following:

a. Write An SQL Query To Print The FIRST_NAME And LAST_NAME From Worker Table Into A Single Column COMPLETE_NAME. A Space Char Should Separate Them.
b. Write An SQL Query That Fetches The Unique Values Of DEPARTMENT From Worker Table And Prints Its Length.
c. Write An SQL Query To Print First Three Characters Of FIRST_NAME From Worker Table.
d. Write An SQL Query To Fetch Worker Names With Salaries >= 50000 And <= 100000.
e. Write An SQL Query To Fetch The No. Of Workers for Each Department in the Descending Order.

d Write in brief about SQL with its advantages and also explain NULL value concept. How NULL values are different from EMPTY values?

e Define Join and List its type and explain any two in details. Consider the following relation and solve the below query:
Sample table: departments
(DEPARTMENT_ID,DEPARTMENT_NAME ,MANAGER_ID , LOCATION_ID)
Sample table: employees
(EMPLOYEE_ID , FIRST_NAME , LAST_NAME , EMAIL , PHONE_NUMBER ,HIRE_DATE , JOB_ID , SALARY , COMMISSION_PCT , MANAGER_ID , DEPARTMENT_ID)

i) Write a query in SQL to display the first name, last name, department number, and department name for each employee.

f Differentiate between ANY and ALL operators with example & also explain hierarchical query.

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

a. List the ACID properties. Explain the usefulness of each.
b. Explain the concept of serializability and explain in detail view serializability.
c. What are concurrent transaction? Explain in detail the main features of concurrent execution.
d. What are the disadvantages of time stamping methods for concurrency control? Eplain timestamp ordering protocol.
e. What benefit does rigorous two-phase locking provide? How does it compare with other forms of two-phase locking?
f. If deadlock is avoided by deadlock-avoidance schemes, is starvation still possible? Explain your answer.

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

a. What is the use of % TYPE attributes and how it is beneficial while declaring the variable?

b. Illustrate the attributes of implicit cursor with examples.

c. Explain the function Raise_Application_Error () with example.

d. List & explain the various features of PL/SQL & also differentiate between anonymous blocks and subprograms.

e. What are packages in PL/SQL? List and explain the various advantages of packages. Create a package to display the employee name and salary.

f. What are triggers? Explain the syntax for creating a trigger in PL/SQL. List the benefits of creating trigger in PL/SQL.

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Extra.

SYBSCIT - SEM III OCT 2018

25/10/18

Q. P. Code: 53624

(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. Explain the features of Python programming.
b. What is variable? What are the rules and conventions for declaring a variable?
c. Explain if—else statement with an example.
d. Write a Python program to print factorial of a number. Take input from user.
e. Explain continue statement with an example.
f. Write a Python program to calculate area of triangle and circle and print the result. Take input from user.

2. **Attempt *any three* of the following:** 15
a. Define function. Write syntax to define function. Give example of function definition.
b. What is actual and formal parameter? Explain the difference along with an example.
c. Write a Python program to calculate factorial of given number using recursive function.
d. Discuss the difference between local and global variable.
e. Explain any five basic operations performed on string.
f Write a Python program to check whether a string is palindrome.

3. **Attempt *any three* of the following:** 15
a. What are lists? How to define and access the elements of list?
b. Write a program to input any two tuples and interchange the tuple values.
c. Explain directory methods in Python.
d. How to create dictionary in Python? Give example.
e. Explain different modes of opening a file.
f. Write a Python program to accept an integer number and use try/except to catch the exception if a floating point number is entered.

4. **Attempt *any three* of the following:** 15
a. What is regular expression? What are different types of regular expression?
b. Explain math module with its any five functions.
c. List and explain built in class attributes with example.
d. How to import a module? Explain time module.
e. What is multithreading? How to create a thread?
f. Design a class that store the information of student and display the same.

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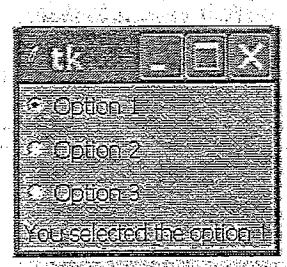
5. **Attempt *any three* of the following:** 15

a. Write a Python code to create the following GUI:



b. Explain the layout manager in detail.

c. What is the use of listbox widget? Give an example to add elements to listbox.

d. Write a source code in Python to create login screen.

e. Write a source code in Python to read single and multiple results of query execution.

f. Write a source code in Python to show database connectivity and insert the following information in table named 'Item':

Itemno	Item name	Price	Quantity
101	Geometry Box	50	100
102	Soap	100	50
103	Perfume	150	25
104	Pen	50	200
105	Pencil	20	100

Write queries based upon Item table given

i. Display item name and price value.

ii. Display the item information whose name starts with letter 'p'.

iii. Display item name, whose price is in between 50 to 100.

iv. Display soap information.

v. Remove pen information.

SY-IT-Sem III
Comp. Networks
Oct -2018

Q. P. Code: 53631

(Time: 2½ hours)

Total Marks: 75

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

a. Explain the types of transmission modes for data flow.

b. Discuss the advantages and disadvantages of different network topologies.

c. What is Shannon capacity of noisy channel?
The signal-to-noise ratio is given as 36dB and the channel bandwidth is 2 MHz. Calculate theoretical channel capacity.

What are the different types of transmission impairments?

e. Distinguish between data rate and signal rate.
A signal is carrying data in which one data element is encoded as one signal element (r=1). If the bit rate is 100kbps, what is the average value of the baud rate if c is between 0 and 1?

f. Define constellation diagram. Explain its role in analog transmission.

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

a. Describe the goals of multiplexing. Which are the 3 multiplexing techniques?

b. Define FHSS (Frequency Hopping Spread Spectrum). Explain how it achieves bandwidth sharing.

c. Discuss the advantages and disadvantages of optical fiber.

d. Explain the two technologies of circuit switching.

e. List and explain the services provided by data link layer.

f. How does a single-bit error differ from a burst error?

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

a. Compare and contrast flow control and error control.

b. Explain the working of stop-and-wait protocol.

c. Discuss the concept of pure ALOHA.

d. Write note on TDMA (Time Division Multiple Access).

e. Discuss *any five* characteristics of standard Ethernet.

f. Write short note on routers.

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

a. List and explain the services provided by network Layer.

b. Write short note on NAT (Network Address Resolution)

[TURN OVER]

c. What is fragmentation? Discuss the three fields in an IP datagram related to fragmentation.
d. How to overcome instability in distance vector routing algorithm.
e. Discuss different timers in RIP (Routing Information Protocol).
f. Differentiate between IPv4 and IPv6.

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

a. Explain the concept CSMA/CA.
b. Explain the services provided by User Datagram Protocol (UDP).
c. Discuss the three-way handshaking in TCP (Transmission Control Protocol) for connection establishment.
d. Explain the process of transferring a mail.
e. Explain the architecture of World Wide Web (WWW).
f. Briefly explain the different timers in TCP (Transmission Control Protocol).

SYIT - Sem III
Data Structure
Oct - 2018

Q. P. Code: 53626

(2½ hours)

[Total Marks: 75]

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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. List and explain the different asymptotic notations used in data structures.
b. What are the different ways in which data structures are classified? Explain in detail.
c. What do you mean by complexity of an algorithm? Explain its types.
d. Write an algorithm for binary search in an array.
e. What is sparse matrix? Explain different types of sparse matrix.
f. Explain with the help of an example how to merge two sorted arrays.

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

a. Explain the structure 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 an algorithm to copy one linked list into another linked list.
d. Write an algorithm to insert an element at the beginning and end of circular linked list.
e. Write and explain an algorithm for inserting at the beginning in two way linked list.
f. Explain the different categories of header linked list.

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

a. Write the algorithm for push and pop operation of the stack.
b. Write the algorithm for converting infix to postfix and convert the following expression to postfix notation using stack.
I=(6+2)*5-8/4
c. Write the algorithm for evaluating a postfix expression using stack and give an example.
d. How insertion and deletion operations take place in a queue?
e. Explain how queue can be represented using linked list and give the algorithm for insertion in it.
f. How priority queues are represented in memory.

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

a. Write an algorithm to find the minimum and maximum element in binary search tree.
b. Create a heap for the given elements 15 7 10 2 20 15 18.
c. Construct a binary tree from its inorder and postorder traversals.
In-order: 5 10 12 15 18 20 25 30 35 40 50
Post-order: 5 12 18 15 10 25 35 50 40 30 20
d. Sort the following elements using selection sort.
22 35 17 8 13 44 5 28

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e. Write and explain the algorithm for finding a position of a given element and its parent in a binary search tree.

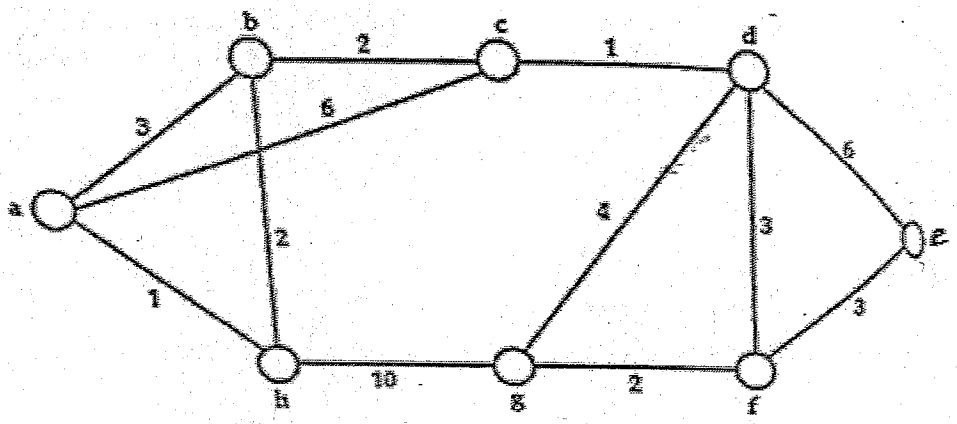
f. Write the algorithm for inserting in a node in Red-Black tree.

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

a. What are the different ways to represent graphs in memory? Explain.

b. Write and explain the algorithm for best first search in a graph.

c. Using Prim's algorithm find the minimum spanning tree.



d. Define the following terms.

1. Graph.
2. Weighted graph.
3. Multi graph.
4. Directed graph.
5. Hamiltonian path.

e. Explain any two collision resolution techniques.

f. What are hash table and hash functions? Explain folding method and mid square method for constructing hash functions.

SY-IT-Sem-III
Applied Maths.
Oct-2018

Q. P. Code: 53635

(Time: 2½ hours)

Total Marks: 75

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(6) Use of **Non-programmable** calculators is **allowed**.

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

a. Reduce the matrix to normal form and find its rank where

$$A=\begin{bmatrix}1 & -1 & 3 & 6\\ 1 & 3 & -3 & -4\\ 5 & 3 & 3 & 11\end{bmatrix}$$

b. Examine for consistency the system of equations
$x-y-z=2;\quad x+2y+z=2;\quad 4x-7y-5z=2$ and solve them if found consistence.

c. Verify Cayley – Hamilton Theorem for the matrix A.

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

d. Express in Polar from $-1+\sqrt{3}\,i$

e. Simplify $\dfrac{(\cos\theta-\sin\theta)^6(\cos 5\theta-i\sin 5\theta)^{-2}}{(\cos 8\theta+i\sin 8\theta)^{1/2}}$ using De-Moivre's theorem.

f. Prove that : $\therefore \sinh^{-1}x=\log\left(x+\sqrt{x^2+1}\right)$

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

a. Solve $y^2-x^2\dfrac{dy}{dx}=xy\dfrac{dy}{dx}$

b. Solve $\dfrac{dy}{dx}+2y\tan x=\sin x$

c. Solve $(p-2x)(p-y)=0$

d. Solve : $y=xp+\dfrac{1}{p}$

e. Solve : $(D^2+6D+9)y=5^x-\log 2$

f. Solve : $x^2\dfrac{d^2y}{dx^2}-x\dfrac{dy}{dx}-3y=0$

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

a. Find the Laplace transform of $f(t)=\begin{cases}\cos t & 0<t<\pi \\ \sin t & t>\pi\end{cases}$

b. Evaluate by using Laplace transform $\int_0^\infty t^2 e^{-t}\sin t\, dt$

c. Find the Laplace transform of the following.

$\frac{dy}{dt}+3y(t)+2\int_0^t y(t)dt=t; \quad given\ y(0)=0$

d. Find the inverse Laplace transform of $\frac{s}{(s-2)^4}$

e. Find inverse Laplace transform of $\cot^{-1}(s)$

f. Find the Laplace transform of : $f(t)=\begin{cases}1 & 0<t<a \\ -1 & a<t<2a\end{cases}$ and $f(t)=f(t+2a)$

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

a. Evaluate : $\int_0^1\int_0^y xy\, e^{-x^2}\, dx\, dy$

b. Take Expression as a single integral and evaluate

$\int_0^{a/\sqrt{2}}\int_0^x x\, dx\, dy+\int_{a/\sqrt{2}}^a\int_0^{\sqrt{a^2-x^2}} x\, dx\, dy$

c. Evaluate $\int_0^a\int_0^{\sqrt{a^2-y^2}}\left(\sqrt{a^2-x^2-y^2}\right)dx\, dy$

d. Evaluate : $\iiint_V \frac{dx\, dy\, dz}{(x+y+z+1)^3}$ where V is the volume bounded by the planes,

$x=0,\ y=0,\ z=0, and\ x+y+z=1.$

e. Evaluate $\iint xy(x+y)dx\,dy$ over the area between curve $y=x^2$ and the line $y=x$

f. Prove that the volume of the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{e^2}=1$ is $\frac{4\pi}{3}abc$

[TURN OVER]

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

a. Evaluate $\int_0^\infty x^2 . e^{-h^2x^2} . dx$

b. Evaluate $\int_0^\pi x \sin^6 x \, dx$

c. Show that : $\int_0^{\pi/2} \frac{\log(1 + a \sin^2 x)}{\sin^2 x} . dx = \pi\left[\sqrt{1+a} - 1\right]$

d. Show that : $\int_0^\infty \frac{\sin x}{x} . dx = \frac{\pi}{2}$

e. Find : $\frac{d}{dx}\left[erf(x) + erf_c(ax)\right]$

f. If $\phi(\alpha) = \int_{f(\alpha)}^{g(\alpha)} F(x, \alpha)\, dx$, write the rule to find $\frac{d\phi}{d\alpha}$ and hence prove that,

$$\frac{d}{dx}\left[erf\sqrt{x}\right] = \frac{e^{-x}}{\sqrt{\pi x}}$$

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