Jalpaiguri Govt. Engg. College
(A Govt. Autonomous College)
COE/B.Tech/CSE/PCC-CS602/2021-22
2022
COMPUTER NETWORK

FM: 70		Time Allotted: 3 hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group – A
[Objective Type Questions]

Answer all the questions 5 X 2 = 10

1		Which topology is most reliable and why?
2		Is flow and error control needed in a noiseless channel? Why or why not?
3		What is bandwidth delay product?
4		What is piggybacking?
5		A packet has arrived with M an M bit value of 0 in IPv4 datagram. Is this is the first fragment, the last fragment, or a middle fragment? Do we know if the packet was fragmented?

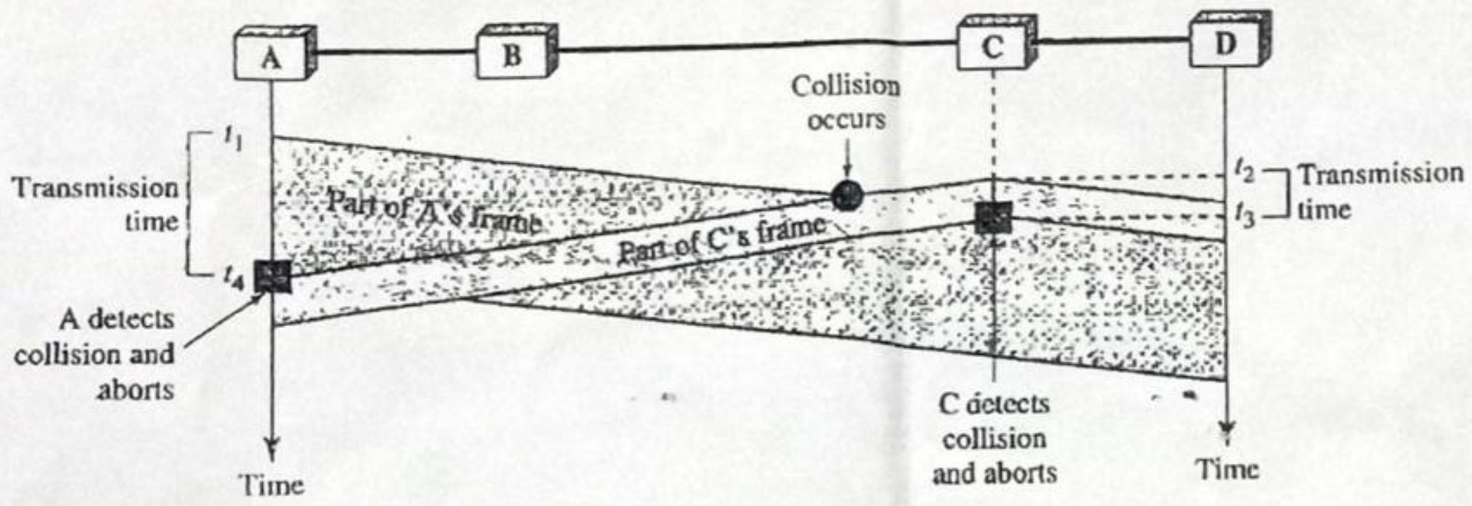
Group – B
[Long Answer Type Questions]

Answer any four of the following 4 X 15 = 60

6	a.	In which two layers of OSI model Flow control and Error control is done? Why is it done in two layers?	
	b.	What are the differences between packet switching and circuit switching?	
	c.	A network using CSMA/CD has a bandwidth of 10 Mbps. If including all the delays, the maximum propagation time is 25.6 μs, what is the minimum size of the frame? What is the difference between FDMA and FDM?	
			4+5+(3+3)
7	a.	Why is acknowledgement numbered in stop & wait protocol? Discuss the situation when unnumbered acknowledgements can create confusion in the sender and receiver end.	
	b.	Discuss CSMA/CD with the help of a flow chart.	
	c.	A network with one primary and four secondary stations uses polling. The size of a data frame is 100 bytes. The size of poll; ACK and NAK frames are 32 bytes each. Each station has 5 frames to send. How many total bytes are exchanged if there are no limitations on the number of frames a station can send in response to a poll?	
			4+5+6
8	a.	What is vulnerable time? Show that the vulnerable time in case of slotted ALOHA is T_{fr} (The frame transmission time).	
	b.	We have a pure aloha network with 100 stations. Channel capacity is 10 Mbps and frame size is 100 bits. What is the number of frames/s each station can send to achieve a maximum efficiency?	
	c.	Draw the IPv4 datagram format. Explain the function of "Flags" field in the datagram format. Which field of the IPv4 header change from router to router?	
	d.	The value of HLEN in an IPv4 datagram is 7. How many option bytes are present?	
			(1+3) +4+5+2

P.T.O

9	a.	Draw and explain ARP packet format. insertion of non information data in data.	
	b.	A host with IP address 120.65.25.20 and physical address B2:34:55:10:25:10 has a packet to send to another host with IP address 120.65.25.30 and physical address A5:34:6E:10:25:10. The two host are on the same Ethernet network. Show the ARP request and reply packets encapsulated in Ethernet frames.	
	c.	What is the advantage of BOOTP over RARP?	
			7+5+3
10.	a.	What is bit stuffing? Why is it used?	
	b.	In the below figure, the data rate is 10Mbps, the distance between station A and C is 2500m, and the propagation speed is 2 X 10^8 m/s. Station A starts sending a long frame at time t_1 =0, station C starts sending a long frame at time t_2 =3μs. The size of the frame is long enough to guarantee collision detection. Findthe number of bits station A and station C has sent before detecting collision.	
	c.	Explain why the vulnerable time in ALOHA depends on T_{fr}, but in CSMA depends on T_p?	
			4+7+4
11.	a.	Calculate the throughput of stop-and-wait flow control mechanism if the frame size is 4.8K bits, bit rate is 9.6Kbps and distance between device is 200km. Speed of propagation is 200000 km/s.	
	b.	Define and describe 'relay agent'	
	c.	Draw and explain HDLC frame format	
			5+4+6
		.....END.....	



③ measurement of how many bits can fill up a network link - gives max amt of data that can be transmitted by the sender at a given time before waiting for ack

④ 2 way communication. when frame is received, receiver waits and does not send the control frame back to sender immediately

Flag Header Data Trailor Flag

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]

COE/B.TECH./CSE/PEC-IT-601C/2021-2022

2022

Software Engineering

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are requested to write their answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer *all* questions 5x2=10

1. Define Data Dictionary. 2
2. What do you mean by size of a software product? How project size can be estimated? 2
3. Write down the roles of SRS document in software development. 2
4. Define software metrics with example. 2
5. "System testing can be considered a pure black-box testing". Justify the answer. 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions 4x15=60

6. i) Draw a schematic diagram to represent the iterative waterfall model of software development. Write down the advantages and limitations of iterative waterfall model. 3+3
   ii) What is a prototype? Under what circumstances it is beneficial to construct a prototype? 2+1
   iii) According to Boehm's, explain different categories of software product with examples? Draw the characteristics curve of development effort with respect to project size for different categories of software product and explain. 3+3

7. i) Assume that the size of an utility software has been estimated to be 42,000 lines of source code. Assume that the average salary of software developers is Rs. 30,000 per month. Determine the effort required to develop the software, nominal development time, the no. of engineers required and the cost to develop the product. 2+2+2+2
   ii) Using Putnam's method, show how effort required to develop a project depends on project schedule. 3
   iii) Write down the differences between two types of organization structures: Project Format and Function Format. 4

8. i) Consider a software project with 5 tasks T1-T5. Duration of the tasks (in days) are 15, 10, 12, 25 and 20, respectively. T2 and T4 can start when T1 is complete. T3 can start when T2 is complete. T5 can start when both T3 and T4 are complete. 3*2
   a) Draw the PERT chart.
   b) When is the latest start date of the task T3?
   c) When is slack time of the task T4?
   ii) What do you mean by software Risk? Explain the principles of software risk management. 2+4
   iii) Differentiate between PERT chart and GANTT chart. 3

9. i) Define software reliability and software quality. 2+2
   ii) Explain using one simple sentence each what you understand by the following reliability measures: 4
   a) A POFOD of 0.001
   b) A ROCOF of 0.002
   c) MTBF of 200 units
   d) Availability of 0.998
   iii) Explain the different levels of SEI Capability Maturity Model . 4+3
   iv) Write down the different steps of Quality Management.

10. i) Distinguish between software verification and software validation. Differentiate between structural complexity and computational complexity of a program. Define a metric for measuring the structural complexity of a program. 3+3+3

ii) Explain the different methods for white box texting with examples. 6

11. i) What do you mean by the terms cohesion and coupling in the context of software design? How are these concepts useful in arriving at a good design of a system? 3+1

ii) What is model? Explain the different types of diagrams and views supported in UML. 2+6

iii) What do you mean by Software Maintenance? 3

12. Write Short Notes on any ***three*** 3*5

i) Spiral Model
ii) Integration Testing
iii) Decision Tree and Decision Table
iv) Halstead's software science
v) Project Scheduling

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH./CSE/PCC-CS601/2021-22
2022
DATABASE MANAGEMENT SYSTEM

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are requested to write their answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. Define 'meta data'. 2
2. What is prime attribute? 2
3. List two reasons why 'null' values might be introduced into the database? 2
4. What is Foreign key? 2
5. What do you mean by Explicit Cursor? 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***four*** questions 4x15=60

6. i) Discuss the external view, internal view and conceptual view in three-tier database architecture. How are these different schema layers related to concepts of logical and physical data independence? 6+3
   ii) Write down the difference between procedural and non-procedural DML. 3
   iii) What are the disadvantages of DBMS? 3

7. i) Draw the $E - R$ diagram of the following : 8
   An exhibition organization keeps information about paintings and sculptures. Each painting has a PAINTING-NAME and PAINTING-DESCRIPTION. Each sculpture has a SCULPTOR-NAME, SCULPTURE-NAME and SCULPTURE-DES. Paintings and sculptures may appear in the same gallery. For the purpose of keeping track of the location of items, each painting and sculpture is given a unique identifier ART-NO. Each gallery has an identifier GALLERY-NO, and a size. Each gallery can store any number of art objects. Each art object appears in one gallery only. The DATEPLACED-IN-GALLERY is kept for both paintings and sculptures.
   Note that PAINTING-NAME is unique within PAINTER-NAME, and SCULPTURE-NAME is unique within SCULPTOR-NAME.

   ii) Describe how the entity animal (in a ZOO) can be developed into a specialization hierarchy. 3
   iii) Compare between 3NF and BCNF with example. 4

8. i) Let the following relation schemas be given:
   Sailors(sid:integer, sname: string, rating: integer, age: real)
   Boats(bid: integer, bname: string, color: string)
   Reserves(sid: integer, bid: integer, day: date)
   Perform the following queries on the tables in relational algebra, tuple relational calculus and domain relational calculus:
   a) Find the color of the boats reserves by Sourav. 2.5
   b) Find the sid's of sailors with age over 20 who have not reserved any green boat. 2.5
   c) Find the name of the sailors who have reserves boat 209(bid). 2.5

   ii) Consider the following schemas, primary keys are underlined.
   Employee (employee-name , street, city)
   Works (employee-name, company-name, salary)
   Company (company-name, city)
   Manages (employee-name, manager-name)

Write SQL's for the queries given below

1) Find all employees in the database who live in the same cities as the companies for which hey work. 2.5
2) Find all employees in the database who live in the same cities and on the same streets as do their managers. 2.5
3) Find the company that has the smallest payroll. 2.5

9. i) Write short note on integrity constraints. Why is normalization required? 2+2
   ii) Given a relational schema Supply {sno, city, status, pno, qty} with FD set 6
   F= { sno -> city, city -> status, {sno, pno} -> qty}
   Find the key of the schema.
   Also reduce it into 3NF.
   iii) Discuss with suitable example the lossless and lossy decomposition. 5

10. i) What is transaction? Explain the transaction states. 1+4
    ii) Discuss the ACID properties of transaction. 5
    iii) Explain with example serializable schedule. Define MVD with suitable example? 2+3

11. Write short notes (***any three***) 3X5=15

    i) Functional Dependency 5
    ii) Database Model 5
    iii) B+ Tree 5
    iv) Triggers. 5
    v) Data independence 5

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

COE/B.TECH./CSE/PEC-IT601B/2021 22

2022

DATA WAREHOUSING & DATA MINING

Full Marks: 70 Times: 3 Hours

The figures in the margin indicate full marks.
Candidates are requested to write their answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer all questions 5x2=10

1. Define data warehouse.
2. "FP-Tree approach is faster than Apriori algorithm for large frequent item-sets detection"- Justify?
3. Construct a lattice of cuboids for a four dimensional data warehouse?
4. What is concept hierarchy?
5. What is virtual warehouse?

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any *four* questions 4x15=60

6. i) Provide the pseudo code of the k-means clustering algorithm. State the advantage and drawback of k-means algorithm. 5+2
   ii) Compare the centroid update process of k-means with the medoid update process of k-medoids. 2
   iii) Find two clusters from the given data (A(1,3), B(7,3), C(2,9), D(5,5), E(9,7), F(3,7), G(6,7), H(5,9), I(1,9)) when initial centroids are C and G. Show all the steps for 3 iterations. 6

7. i) State the apriori property, joining rule and pruning process for Apriori Algorithm. How does pruning step help to reduce the execution time of Apriori Algorithm? 3+2
   ii) Enumerate all frequent itemsets from the database given in Table 1 using Apriori algorithm with minimum support count S=3. List all the candidate set and large frequent itemsets for each database scan. Show the association rules along with their confidence for all the frequent itemsets in L3. 5+3
   iii) Given frequent itemset l and subset s of l, prove that the confidence of the rule "s' ⇒ (l – s')" cannot be more than the confidence of "s ⇒ (l – s)," where s' is a subset of s. 2

TID	Item_Codes
T1	M, O, N, K, E, Y
T2	D, O, N, K, E, Y
T3	M, A, K, E
T4	M, U, C, K, Y
T5	C, O, O, K, I, E

Table 1

8. i) Draw the decision tree of the training data given in Table 2 using information gain. {***cheat*** is the class label attribute}. 10
   ii) List the classification rules obtained from the decision tree. 3
   iii) What are the differences between supervised and unsupervised machine learning? 2

TID	Refund	Marital Status	Taxable Income	Cheat
1	Yes	Single	10 to 15	No
2	No	Married	10 to 15	No
3	No	Single	up to 8	No
4	Yes	Married	10 to15	No
5	No	Divorced	8 to 10	Yes
6	No	Married	up to 8	No
7	Yes	Divorced	10 to 15	No
8	No	Single	8 to 10	Yes
9	No	Married	up to 8	No
10	No	Single	10 to 15	Yes

Table 2

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9. i) Draw the FP-Tree for the database given in Table 3 with minimum support count S=2. 6

ii) Derive all the conditional FP-Tree and state the frequent itemsets. 7

iii) Write the advantage of FP-Tree Algorithm over Apriori Algorithm. 2

TranID	List of Item_IDs
T100	Butter, Milk, Rice
T200	Bread, Butter, Jam
T300	Butter, Sugar
T400	Bread, Butter, Milk
T500	Bread, Sugar, Pepsi
T600	Butter, Sugar, Curd
T700	Bread, Sugar
T800	Bread, Butter, Sugar, Jam
T900	Bread, Butter, Sugar

Table 3

10. i) Briefly compare the following concepts. You may use an example to explain your point(s).

(a) Star schema and snowflake schema 3

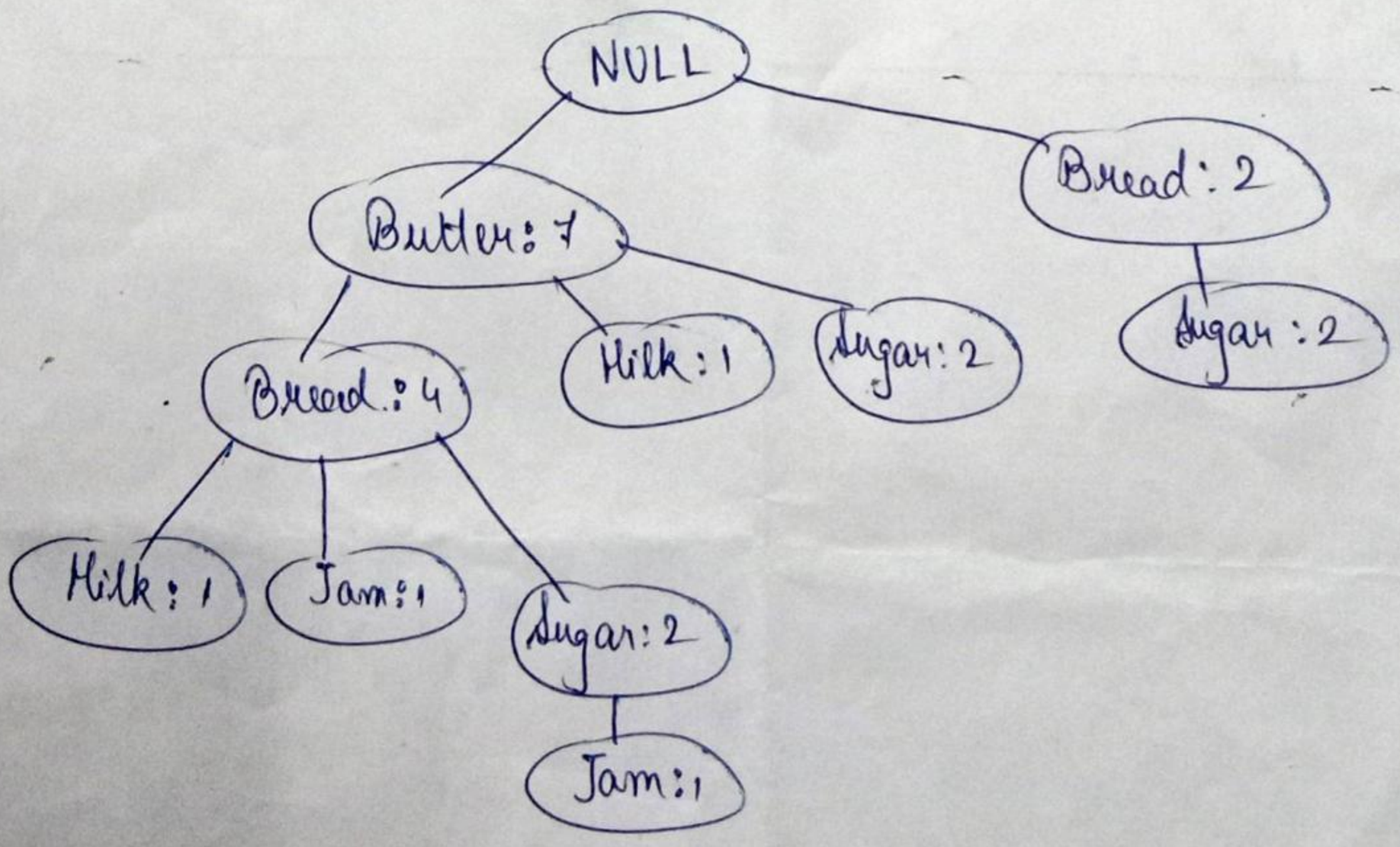
(b) Independent and dependent data marts 3

(c) OLAP and OLTP 6

ii) Write a short note on Metadata repository. 3

11. i) Draw the 3-Tier Data Warehouse architecture and explain each tier. 8

ii) Discuss the OLAP operations which are performed in the middle tier of the data warehouse architecture on Multidimensional Data Model. 7



JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CSE/OEC-IT601A/2021-22
2022
NUMERICAL METHODS

Full Marks: 70 Times: 3 Hours

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GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer ***all*** questions 5x2=10

1. Prove that $\nabla = \Delta E^{-1}$ 2
2. Define round off error and truncation error. 2
3. State any two properties of dividend difference. 2
4. Solve by Gauss elimination method: x+y=2,2x+3y=5 2
5. Find an iterative formula to find $\sqrt[4]{N}$ where N is a positive number. 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any ***five/ four*** questions 4x15 = 60

6. i)Taking h=0.5 evaluate $\int_1^2 \frac{dx}{\sqrt{1-x^2}}$ using Trapezoidal rule. 5

   ii) Solve the following equations by matrix-inversion method.
   3x+y+2z =3 , 2x-3y-z = -3 , x+2y+z = 4 5

   iii) Use Lagrange's method to find log_{10} 656 , given that and log_{10} 654= 2.8156, log_{10} 658 =2.8182, log_{10} 659 =2.8189 , log_{10}661 =2.8202 5

7. i)Find a root of the following equation using bisection method correct to three decimal places. 8

   $x^3 - x - 1 = 0$

   ii)Given dy/dx=(y-x)/(y+x) with initial condition y=1 at x=0;find for x=1 by Euler's method. 7

8. i)Find a real root of the equation $3x + \sin x - e^x = 0$ by the method of false position correct to four decimal places. 8

   ii) Given the following table, find the number of students whose weight is between 60 and 70 lbs: 7

Weight (in lbs) x:	0 – 40	40 – 60	60 – 80	80 – 100	100 – 120
No. of students:	250	120	100	70	50

9. i) Determine f(x) as a polynomial in x for the following data: (Newton's divided difference formula) 7

x:	-4	-1	0	2	5
f(x):	1245	33	5	9	1335

   ii) Solve the following equations by Factorization Method: 8

   10x+y+z=12; 2x+10y+z=13; 2x+2y+10z=14

10. i) Is Simpson's Method faster than the Trapezoidal method? Which one is more reliable? 3

ii) Solve the following equations by matrix-inversion method. 5

$10x+y+z=12;\ 2x+10y+z=13;\ 2x+2y+10z=14$

iii) Find a positive value of $\sqrt[3]{17}$ correct to four decimal places, by the Newton-Raphson method. 7

$x = \sqrt[3]{17}$

$f(x) = x^3 - 17 = 0$

11. i) Use Runge Kutta 4th order method to evaluate $y(0.2)$ with $h = 0.1$, given $\frac{dy}{dx} = y - x$ and, $y(0) = 2$. 7

ii) The population of a town is as follows:
Estimate the population increase during the period 1945 to 1976. 8

x Year	1941	1951	1961	1971	1981	1991
y Population in thousands:	20	24	29	36	46	51

12. i) Find by Newton Raphson method, a root of the following equation correct to 3 decimal places. 8

$x^3 - 5x - 3 = 0$

ii) Find an approximate value of $\log_e 5$ by calculating to 4 decimal places, by Simpson's $1/3^{rd}$ rule.

$\int_0^2 dx/(4x+5)$ dividing range into 10 equal parts.

$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$

0, 1, 2, 3

$x_0 = 2.5$

$x_1 = 0$

$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)}$