

Department of Information Technology, SGSITS, Indore
Mid Sem Test-I
IT 38501 (Distributed Computing)

Time: 1 Hr

Max. Marks: 20

Note: All questions are mandatory

Mark CO BL

- | | | | | |
|----|---|---|-----|-----|
| Q1 | Heterogeneity in distributed system is masked by <u>middleware framework</u> | 2 | Co1 | BL1 |
| | The abbreviation 'RFC' stands for <u>Request for comments.</u> | | | |
| Q2 | Access transparency and Location Transparency are together referred to as <u>Network transparency</u>

<u>Failure</u> transparency enables the concealment of faults, allowing users and application programs to complete their task despite failure of hardware and software components. | 2 | Co1 | BL1 |
| Q3 | Draw (Illustrate) the architectural models (any three). | 3 | Co2 | BL2 |
| Q4 | Discuss 'IP multicast': <u>a method used to distribute a signal to multiple recipients usually over the Internet.</u> | 3 | Co3 | BL2 |
| Q5 | Describe any one problem associated with concurrently executing transactions and its solution. → <u>lost updates, unclear reads, non-repeatable reads, phantom reads, deadlocks, hunger.</u> | 5 | Co6 | BL2 |
| Q6 | Discuss 'Dirty read' problem and its solution.

occurs when a transaction reads data that has been modified by another transaction, but not yet committed. | 5 | Co6 | BL2 |

Department of Information Technology, SGSITS, Indore
Mid Sem Test-II
IT 38501 (Distributed Computing)

Time: 1 Hr

Max. Marks: 20

Mark	CO	BL
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2	Co4	BL1
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2	Co5	BL1
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Q1 Draw 'file service architecture'. Note: All questions are mandatory

Q2 The instantaneous difference between the readings of any two clocks is called _____.

Different clocks count time at different rates, hence diverge, called as _____.

Q3 State the validation rules in 'Optimistic concurrency control'.

Q4 State the disadvantage of using locks for concurrent transactions.

3	Co6	BL2
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3	Co6	BL2
---	-----	-----

Q5 Describe the working of ring-based election algorithm.

Q6 Draw well labeled NFS architecture. Brief about the operations of Virtual file system.

5	Co5	BL2
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5	Co4	BL2
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**APRIL 2024 EXAMINATION
III B.Tech. (4YDC) EXAM
IT 38501: DISTRIBUTED COMPUTING**

Time: 3 Hrs.

**Max. Marks: 70
Min Marks: 22**

TOTAL NO. OF QUESTIONS IN THIS PAPER: 5

Note: Attempt all questions. Each question carries equal marks. Each question has five parts (a), (b), (c), (d) and (e). Attempt (a), (b) and (c). Attempt any one from (d) and (e).

		Marks	CO	BL	PI
Q1	(a) Define synchronous and asynchronous Distributed System.	2	1	1	1.4.1
	(b) Draw diagrams (any two) depicting the architectural models of Distributed system.	2	2	1	1.4.1
	(c) Comment on the usability of mobile code.	3	1	3	3.2.2
	(d) Describe techniques for dealing with failures in distributed system.	7	1	2	1.4.1
	OR				
	(e) Explain about the types of transparency, in distributed system.	7	1	2	1.4.1
Q2	(a) Define 'idempotent' and 'non-idempotent' operations.	2	3	1	1.4.1
	(b) State the role of 'Communication module' in RMI.	2	3	1	1.4.1
	(c) Write the server side code for implementing "Remote Calculator" application.	3	3	3	3.2.2
	(d) Describe 'RMI invocation semantics'.	7	3	2	1.4.1
	OR				
	(e) Explain the objects and modules involved in achieving RMI.	7	3	2	1.4.1
Q3	(a) State the directory service operations in 'File Service Architecture'.	2	4	1	1.4.1
	(b) Compare the Unix interface with Flat file service.	2	4	1	1.4.1
	(c) Brief about the implementation of group communication.	3	3	3	3.2.2
	(d) Explain the Distributed file system requirements.	7	4	2	1.4.1
	OR				
	(e) Describe the 'Sun Network File System'.	7	4	2	1.4.1
Q4	(a) Define the terms 'clock resolution' and 'clock drift'.	2	5	1	1.4.1
	(b) Give example of an 'event' in distributed system.	2	5	1	1.4.1
	(c) Express the concept of Inconsistent cut and Consistent cut with the help of a diagram.	3	5	3	3.2.2
	(d) Describe operation of any two algorithms used for 'Distributed mutual exclusion'.	7	5	2	1.4.1

OR

**APRIL 2023 EXAMINATION
III B.Tech. (4YDC) EXAM
IT 38501: DISTRIBUTED COMPUTING**

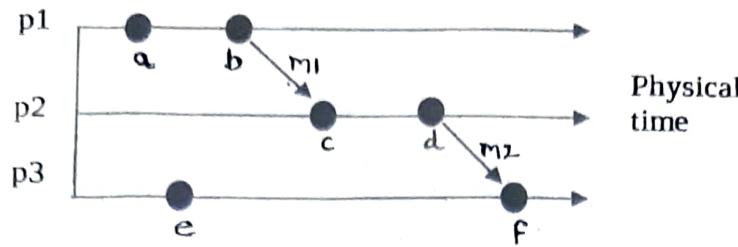
Time: 3 Hrs.

**Max. Marks: 70
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TOTAL NO. OF QUESTIONS IN THIS PAPER:5

Note: Attempt all questions. Each question carries equal marks. Each question has five parts (a), (b), (c), (d) and (e). Attempt (a), (b) and (c). Attempt any one from (d) and (e).

		Marks	CO	BL	PI
Q1	(a) Define Distributed System.	2	1	1	1.4.1
	(b) State two advantages of using proxy server in the architectural models of Distributed system.	2	2	1	1.4.1
	(c) Comment on the usability of mobile code.	3	1	3	3.2.2
	(d) Describe the topics 'heterogeneity and its masking', 'Openness and how it can be achieved' and 'techniques for failure handling' in distributed system. OR	7	1	2	1.4.1
	(e) Explain 'Access transparency', 'Location transparency', 'Performance transparency' and 'Failure transparency' of distributed system.	7	1	2	1.4.1
Q2	(a) Define 'External Data Representation' and 'Marshalling'.	2	3	1	1.4.1
	(b) Brief about 'IP Multi-cast'?	2	3	1	1.4.1
	(c) Write the server side code for implementing "Remote Calculator" application.	3	3	3	3.2.2
	(d) Describe 'RMI invocation semantics'. OR	7	3	2	1.4.1
	(e) Explain the role of 'Communication module', 'Remote reference module', proxy, skeleton and dispatcher in RMI.	7	3	2	1.4.1
Q3	(a) State the file system modules.	2	4	1	1.4.1
	(b) Define the term 'Navigation' and state its types.	2	4	1	1.4.1
	(c) Brief about the implementation of group communication.	3	3	3	3.2.2
	(d) Explain 'File Service Architecture'. OR	7	4	2	1.4.1
	(e) Elaborate the 'Sun Network File System'.	7	4	2	1.4.1
Q4	(a) Define the terms 'Clock skew' and 'UTC'.	2	5	1	1.4.1
	(b) What are the two modes of synchronizing physical clocks?	2	5	1	1.4.1
	(c) Given the events (a,b,c,d,e,f) occurring at three processes p1,p2,p3 as shown in the figure below and m1, m2 being two messages passed between p1 and p2, p2 and p3 respectively.	3	5	3	3.2.2



Justify the ordering of events a, b, c, d, e and f.

- (d) Describe 'central server algorithm' and 'ring based algorithm' used for 'Distributed mutual exclusion'. 7 5 2 1.4.1

OR

- | | | | | | |
|----------------------------------|---|---|---|-------|-------|
| (e) | Explain 'Bully' election algorithm. | 7 | 5 | 2 | 1.4.1 |
| Q5 (a) | Define Transaction. | 2 | 6 | 1 | 1.4.1 |
| | State two points about 'how nested transactions are better than flat transactions'. | 2 | 6 | 1 | 1.4.1 |
| | Quote an example of 'serially equivalent interleaving' among two concurrently executing transactions. | 3 | 6 | 3 | 3.2.2 |
| (d) Describe 'Hierarchic locks'. | 7 | 6 | 2 | 1.4.1 | |
| OR | | | | | |
| (e) | Explain the concept of 'Optimistic Concurrency Control'. | 7 | 6 | 2 | 1.4.1 |

MST-I EXAMINATION (Feb – May 2023)
III B.Tech. (4YDC) INFORMATION TECHNOLOGY
IT-38504: WEB ENGINEERING

Time : 3 Hrs.]

[Max. Marks : 20

All three questions are compulsory

		Marks	CO	BL	PI
Q1	1) Show HTTP request message for the Get request from internet explorer web browser for a page having image in it, language and encoding acceptable are French and gzip, respectively. The requested page is available on www.myServer123.com and cookie information as Hgfd67as7 to be sent to the server. 2) Show HTTP response message for successful execution of request by an apache server (Linux) for an HTML page. The date and length of content is also specified in the response message.	04 + 03	CO1	BL1	1.4.1
Q2	How a CGI request is handled? Explain the use of environment variables in CGI? Explain by taking suitable example.	02 + 04	CO2	BL3	1.4.1 2.2.2
Q3	(I) Write the HTML code for the following (a) Create an ordered list of elements (b) Create radio buttons to take one choice from among the various sports activities available in the college. (c) Create a text field to take mobile number as input from user. (d) Create a dropdown list of choosing electives from elective – I, Elective-II, Elective-III & Elective-IV. (e) Create a HTML form asking details from students including - Name, Enrollment number, branch, class & Year of registration. (II) Write a javascript code to put check on part (I. c) of this question that the mobile number field should not remain empty before form submission and maximum length of the number entered should not exceed 10.	01 + 01 + 01 + 01 + 01 + 02	CO1	BL1	1.4.1

Department of Information Technology

Mid-Sem Test-II (Session Jan - May'24)

Web Engineering (IT-38504)

Time 1Hrs.

Max. marks 20.

Q.1	A) State true/false for the following. Also give reason to support your answer: (I) MVC architecture can be realized by using only single servlet as controller. T (II) The session is by default false in JSP. F (III) in javax.servlet. <u>Servlet</u> the <u>Servlet</u> is a abstract class T	03	CO4
	B) Give one word for the following: (I) Name the method used to call a Servlet from Servlet <u>Service</u> () (II) Declaration tag in jsp <u><jsp: ... ></u> (III) Command used to set PATH environment variable in LINUX environment is	03	CO4
Q.2	What is CGI technology? Which language can be used for it? How will you test and debug a CGI Application?	04	CO2
Q.3	Write a Servlet program to welcome user on clients browser window after authenticating the user (User name and password are fixed). Mention only the name of form field being used.	06	CO4
Q.4	What is a Digital Signature, and How does a digital signature work?	04	CO5

Department of Information Technology

Mid-Sem Test-II (Session Jan - May'24)

Web Engineering (IT-38504)

Max. marks 20.

Time 1Hrs.

Q.1	A) State true/false for the following. Also give reason to support your answer: (I) MVC architecture can be realized by using only single servlet as controller. (II) The session is by default false in JSP. (III) in javax.servlet.Servlet the <u>Servlet</u> is a abstract class B) Give one word for the following: (I) Name the method used to call a Servlet from Servlet <i>java</i> <i>get()</i> (II) Declaration tag in jsp (III) Command used to set PATH environment variable in <u>LINUX</u> environment is	03	CO4
Q.2	What is CGI technology? Which language can be used for it? How will you test and debug a CGI Application?	04	CO2
Q.3	Write a Servlet program to welcome user on clients browser window after authenticating the user (User name and password are fixed). Mention only the name of form field being used.	06	CO4
Q.4	What is a Digital Signature, and How does a digital signature work?	04	CO5

APRIL - 2024 EXAMINATION
III B.Tech./B.E. (4YDC) INFORMATION TECHNOLOGY
IT38504 / IT3854: WEB ENGINEERING

Time : 3 Hrs.]**[Max. Marks : 70****TOTAL NO. OF QUESTIONS IN THIS PAPER : 05**

NOTE: Attempt all five questions. Attempt 14 marks sub-questions from each question.

	Marks	BL	CO
Q1 (a) How a web browser communicates with a web server?	2	2	1
(b) Write a short note on JavaScript DOM.	2	1	2
(c) What is an HTML form? Explain its various attributes.	3	2	2
(d) What is CGI technology? Which language can be used for it? How will you test and debug a CGI Application?	7	3	2
OR			
(e) An interactive recipe sharing website is to be develop where users can share recipes, rate them, and leave comments. The site will include features like user registration, recipe submission, a rating system, and search functionality.		3	2
1) Show the HTML code for user registration, recipe submission, and a catalog of recipes.	02		
2) Implement client-side logic for interactive features such as the validation of forms, rating system, comments section, and live search functionality using Java Script or suitable technology.	02		
3) To handle server-side processing, write the CGI code using Perl/Python for user authentication, recipe management, and dynamic content generation based on user interactions.	03		
Q2 (a) Write one word/sentence for the following:	7	1	1,3
1) JSP tag for printing value of a variable is			
2) HTTP Client side error is represented using error code in the range			
3) Each time a Servlet is executed, a new is started to serve the client request.			
4) An example of a Meta Search engine is			
5) The protocol is followed by the knowbots/crawler.			
6) is an example of a helper application?			
7) is an example of JavaScript framework?			
(b) Give syntax of the following	7	2	1,2
1) To set cookie of max age 1 day.			
2) Call a servlet from another servlet.			
3) Passing init-parameter from web.xml			
4) To retrieve options input in a JSP provided by the user through the Dropdown list in a HTML form.			
5) Java Script code to check the text field does not remain empty.			
6) robot.txt file entry to deny the MyNewsBot to visit the website.			
7) Execute query statement from servlet to update password value in UserDetail Table of MySql.			
OR			
C) Show HTTP request message for the GET request from Mozilla Firefox web browser for a page having an image file in it, language and encoding acceptable are English and gzip, respectively. The requested page is available on www.mySampleServer.com and cookie information as XYdebbjkfd3lu75 to be sent to the server. Also, show HTTP response message for successful execution of request by an IIS server (Windows) for an HTML page. The date and length of content is also specified in the response message.	7	3	1,2

- Q3 (a)** Differentiate between Servlet and CGI technology. Explain the life cycle methods of Servlet by drawing a suitable diagram. 7 1 2, 3

- (b)** Design a MVC model based web application for college students with following functionality/details- 7 4 3

Users should be able to access the web application using controller servlet or directly calls login.jsp. The login.jsp captures login and password and passes to the Controller servlet, which subsequently calls *Authenticate* servlet to authenticate user. The *Authenticate* servlet invalidate any preexisting session information, before checking for a valid user. If user is not a valid user, redirect the user to login.jsp and include phrase: invalid user on the page somewhere. If the user is a valid user, then store user id (obtained from database) and username in session object and redirect the user to home.jsp. For a new user, the registration.jsp to be called asking the user about - First, middle and last name, Date of birth, Address, Phone number, Department name (as drop down list), Roll number, Year and semester (Drop down list). When the user clicks on the logout button, displayed on the home page of the user, Logout.jsp is to be called. This terminates the user session and calls login.jsp.

You have to maintain a user session for performing all the activity. After logout the students should not be able to go back to the home page by pressing the back button.

OR

- (c)** Write a JSP that takes the user's name and age through an HTML form. 7 4 3
- Echo back the name and age along with a message stating the price of movie tickets.
 - The price is determined by the age passed to the JSP.
 - If the age is greater than 62, the movie ticket price is Rs.45.00.
 - If the user is less than 10 years old, the price is Rs. 30.00.
 - For everyone else, the price is Rs. 60.00.

- Q4 (a)** What is a Search Engine? Draw the architecture of Database based search engines and explain in detail. 7 2 5

- (b)** Write purpose of following java code: 7 3 3

- (i) session.setAttribute ("login_name", "test");
- (ii) String[] paramValues = request.getParameterValues("Hobbies");
- (iii) String str = connection.getInitParameter("rollno");
- (iv) Class.forName("com.mysql.jdbc.Driver");
- (v) RequestDispatcher rd = request.getRequestDispatcher("ProcessOrder.jsp");
- (vi) HttpSession sesn = request.getSession(false);
- (vii) session.invalidate();

OR

- (c)** Write a servlet program to accept init parameters to initialize one variable called "quote_of_the_day" and print the variable value on the client's browser window. Also show the contents of the web.xml file. 7 3 3

- Q5 (a)** Difference between Private key and Public key. 2 1 5

- (b)** What is a virtual private network ?, How does a virtual private network (VPN) work? 2 1,2 5

- (c)** What is XML? How is XML useful for designing Web Services? 3 1,2 4
In an RSA cryptosystem, a particular A uses two prime numbers $p = 13$ and $q = 17$ to generate her public and private keys. If the public key of A is 35. Then

- the private key of A is? 7 1,2 5

OR

- (e)** What is a Digital Signature, and How does a digital signature work? 7 1,2 5

**APRIL-MAY - 2023 EXAMINATION
III B.Tech. (4YDC) INFORMATION TECHNOLOGY
IT-38504/IT3854: WEB ENGINEERING**

Time : 3 Hrs.]

[Max. Marks : 70

TOTAL NO. OF QUESTIONS IN THIS PAPER : 05

NOTE: Attempt all five questions. Attempt both the parts of Q1. For the remaining questions, part (a) is compulsory, attempt any one part from (b) or (c).

	Marks	CO	BL	PI
Q1 (a) Write one word for the following:	07	CO1 CO2 CO3 CO4 CO5 CO6	BL1	1.4.1
1) HTTP response codes in the range represents server side error.				
2) CGI environment variable to know length of data received from client side				
3) Servlet life cycle method which may execute multiple times during servlet execution is				
4) JSP is converted to before execution.				
5) is an example of a meta search engine.				
6) When a message is transferred from sender to receiver, the intruder is not able to see the message is called message?				
7) is an xml based communication protocol used by web services.				
(b) Give one line syntax of the following	07	CO1 CO2 CO3 CO4 CO5 CO6	BL1	1.4.1
1) Define HTML hidden form field.				
2) Java Script code to check the password field named "passwd" should contain a special character from set '*' _ # \$ @' while registering a user for the first time.				
3) CGI code to get the value of the name variable received from the URL http://www.test12.com/hello.cgi?name="abc"				
4) Statement to call a JSP (process.jsp) from servlet.				
5) JSP code to retrieve session parameter value received from another JSP				
6) JSP code to initialize two variables to value 3 & 7 and printing their product.				
7) Execute query statement from servlet to insert UserName and Password value in Login Table of MySql.				
Q2 (a) Show the HTTP request and response message for the following :	05	CO1	BL3	1.4.1
(1) A person requests (using POST method) for a pdf document of size 4096 bytes available on https://www.123myweb.co.in . The above referred website is hosted on apache web server installed on Linux platform. Cookie information as G6T7YYpct7AuWVV is to be sent to the server.	+02			2.2.2
(2) In the example (1) above, if the requested resource is not available on the server, show & explain the response message generated by the server.				
(b) All 3 rd year students are to be registered for upcoming placement and asked to enter the details (Name, Aadhar number, Mobile number, current CGPA, Hobbies). The details should be entered through the HTML form. Design and HTML form for the above situation and show the CGI code to process above form data.	02 +02 +03	CO2	BL3	3.1.3

OR

(c)	Differentiate between CGI & servlet. Explain how CGI environment variables are useful for transferring information between web server & CGI programs, by taking a suitable example.	07	CO2	BL2	1.4.1 3.2.1
Q3 (a)	Write a CGI program to implement a website visit counter. Let the visit count value be stored in mysql database (use database name: Web1, Table name: Counter & column name : VisitCount).	07	CO2	BL3	5.1.2
(b)	Write a servlet program to authenticate a user. The authentication information is sent by submitting html form (login.html) using the post method. The user name and password information is stored in mysql (database: user, table : auth & column name : UName, Passwd)	07	CO3	BL3	5.1.2
OR					
(c)	What is a session? Why is session management required? Explain (1) Session variable (2) Cookies method of session management.	03 +04	CO3	BL2	1.4.1
Q4 (a)	How is web service different from web application? Why are they needed? Explain the architecture of web service by drawing a suitable diagram.	03 +04	CO4	BL1	1.4.1
(b)	Write a findFactorial.jsp to evaluate the factorial of a number and print the result on the browser window of the user. The number is to be taken as input from the user through the input.html file. Show code for input.html and findFactorial.jsp.	07	CO3	BL3	2.4.1
OR					
(c)	What is a deployment descriptor? Write a web.xml file describing (1) Entries for two servlets (2) Passing initial parameters to servlet.	07	CO3	BL2	4.1.1
Q5 (a)	Which property out of Integrity, confidentiality, authentication and non-repudiation is preserved for a message M sent from source to destination if (1) Private key encryption technique is applied on the message M resulting in message M' as an encrypted message? (2) Public key encryption technique is applied on the message M resulting in message M' as an encrypted message? Also give arguments to support your answer in both the above cases.	07	CO6	BL3	2.1.1 2.4.4
(b)	Write at least two advantages of database based search engines over online search engines. Explain (1) Robot protocol (2) URL Processor.	07	CO5	BL2	2.1.1 2.4.4
OR					
(c)	Let there are three documents with following keywords identified in these documents. Doc 1: Algo, Internet, Client Doc 2: Internet, Client, Algo, Client Doc 3: Algo, Book, Internet, Algo For these three documents, show how reverse indexing is prepared by the search engine?	07	CO5	BL2	1.4.1

**Department of Information Technology
Mid Sem. Test – I (Jan-Jun2024)
Compiler Design (IT38506)**

Time: 1Hour

Max Marks: 20

Note: ALL questions are compulsory. Complete the exam in the given answer book. No extra sheets will be provided. Answers should be brief and to the point.

T1:a?(b|c)*a? T2:b?(a|c)*b T3:c?(b|a)*c

What is the sequence of tokens it outputs for string “bbaccaba”?

- Q4 Construct the DFA for given regular expression using syntax tree method (Show the sets firstpos(), lastpos(), and followpos() for each node also): 05 CO2

$ab(a|b^*)ba$

Time: 1 hour

Note: All questions are compulsory. Complete the exam in the given answer book. No extra sheets will be provided. Answers should be brief and to the point.

What is the sequence of tokens it outputs for string “ bbaaacabc”?

- Q4 Construct the DFA for given regular expression using syntax tree method
 (Show the sets firstpos(), lastpos(), and followpos() for each node also):
 $(a|b)abc^*$

Department of Information Technology

Mid Sem. Test – II (Jan - Jun 2024)

Compiler Design (IT38506)

Time: 1 hour

Max Marks: 20

Note: ALL questions are compulsory. Complete the exam in the given answer book. No extra sheets will be provided.

Q1 Draw the model of the LR parser and explain its working. What are the different actions that can be performed based on the current state and input symbol? 05 CO1

Q2 A Arrange the following parsers in the increasing order of ease of implementation: 01 CO1

LR (0), LALR (1), CLR (1), SLR (1)

B Define Kernel Item. 01

C What is backpatching? 01

D Write three address codes for the following code where a is an integer array. 02

$$X=a[i]$$

Q3 Convert the following expression into three address codes and write quadruples, triples, and indirect triples: 05 CO5

$$(a + b) * (c + d) - (a + b + c)$$

Q4 Compute LR (0) items for the following grammar and check whether the grammar is LR (0) and SLR (1): 05 CO2

$$S \rightarrow L=R \mid R, \quad L \rightarrow *R \mid \text{id}, \quad R \rightarrow L$$

06/11/2018

APRIL 2023 EXAMINATION
III BE (4YDC) INFORMATION TECHNOLOGY
IT38506: COMPILER DESIGN

Time: 3 Hrs.)

[Max. Marks : 70]
[Min. Pass Marks : 22]

TOTAL NO. OF QUESTIONS IN THIS PAPER: 5

Note: Attempt all the questions. Each question has five subparts A, B, C, D, and E. Part A, B, and C are compulsory. Attempt any one part from D and E. Answers should be brief and to the point. Make suitable assumptions wherever necessary and clearly state the same.

- | | Marks | CO | BL | PI |
|---|-------|-----|----|-------|
| Q1A Why lexical analysis phase separated from the syntax analysis phase? | (02) | CO1 | 1 | 1.4.1 |
| B The program analysis techniques are used in the code optimization phase of the compiler. List some of the other uses of program analysis techniques. | (02) | CO1 | 1 | 1.4.1 |
| C Explain the concept of retracting state with a suitable example. | (03) | CO1 | 1 | 1.4.1 |
| D Construct minimum state DFA for the following regular expression using syntax tree, followpos method (also show nullable, firstpos, lastpos, and follow sets): | (07) | CO1 | 3 | 1.4.1 |

$(a+b)^*c(ab)(a+b)^*$

OR

- | | | | | |
|--|------|-----|---|-------|
| E Define lexeme, token, and pattern. Identify the lexemes that make up the tokens in the following program segment. Indicate the corresponding token and pattern. | (07) | CO3 | 3 | 1.4.1 |
|--|------|-----|---|-------|

```
printf("i = %d, &i = %x", &i);
int float (int a, int b)
{if (a> b)
    return x+y;
else
    a=x+z
return a
```

- | | | | | |
|---|------|-----|---|-------|
| Q2A Briefly explain the conflicts that occur during shift-reduce parsing. | (02) | CO2 | 1 | 1.4.1 |
| B What is the advantage of the precedence function over the precedence table? In what conditions precedence function cannot be used? | (02) | CO2 | 1 | 1.4.1 |
| C How do bottom-up parsers differ from top-down parsers? | (03) | CO2 | 2 | 1.4.1 |

- D Compute LR(1) items and construct CLR parsing table for (07) CO2 3 1.4.1
the following grammar:

$$S \rightarrow L=R \mid R$$

$$L \rightarrow *R \mid id$$

$$R \rightarrow L$$

OR

- E Compute First and Follow sets and construct the predictive (07) CO2 3 1.4.1
parsing table for given grammar. Check whether the grammar is LL(1) or not.

$$S \rightarrow aAS \mid c$$

$$A \rightarrow ba \mid SB$$

$$B \rightarrow bA \mid S$$

- Q3A** Define S-attribute grammar and L-attribute grammar. (02) CO3 1 1.4.1

- B Identify the function performed by following SDT: (02) CO3 3 1.4.1

$$S \rightarrow aSb \quad \{S.n \rightarrow S.n + 2\}$$

$$S \rightarrow bSa \quad \{S.n \rightarrow S.n + 2\}$$

$$S \rightarrow \epsilon \quad \{S.n \rightarrow 0\}$$

- C What is the output printed by following SDT for the string (03) CO3 3 1.4.1
“aaaabcbcb” also find the number of reductions performed.

$$S \rightarrow aaBb \quad \{\text{Print}(11);\}$$

$$S \rightarrow b \quad \{\text{Print}(1);\}$$

$$B \rightarrow Sc \quad \{\text{Print}(111);\}$$

- D What is the run time environment? Explain various types of (07) CO4 3 1.4.1
function calling in a run time environment.

OR

- E Describe the storage allocation strategies. (07) CO4 3 1.4.1

- Q4A** Write an intermediate code template for the following (02) CO5 1 1.4.1
statement:

while (E) do S;

- B What is backpatching? (02) CO5 1 1.4.1

- C Consider a situation where there are five source languages (03) CO5 1 1.4.1
and three target languages. Find out the number of

translations required with the absence and presence of Intermediate Code. Justify your answer.

- D Briefly explain different types of intermediate code with suitable examples. (07) CO5 2 1.4.1

OR

- E Generate the three-address code for the following 'C' code (07) CO5 3 1.4.1
segment:

```
int a[10], b[10], dot_prod, i;
dot_prod=0;
for (i=0;i<12;i++)
    dot_prod+=a[i]*b[i];
```

- Q5A What is debugging? (02) CO6 1 1.4.1
- B Explain, how we define loops in a flow graph. (02) CO6 1 1.4.1
- C What is a basic block? How do we identify a basic block in the flow graph? (03) CO6 1 1.4.1
- D What do you mean by peephole optimization? Explain different transformations that are characteristic of peephole optimization. (07) CO6 2 1.4.1

OR

- E What are the issues in the design of the code generator? Explain. (07) CO6 2 1.4.1

**APRIL 2024 EXAMINATION
III BE (4YDC) INFORMATION TECHNOLOGY
IT38506: COMPILER DESIGN**

Time: 3 Hrs.]

[Max. Marks : 70
[Min. Pass Marks : 22

TOTAL NO. OF QUESTIONS IN THIS PAPER: 5

Note: Attempt all the questions. Each question has five subparts A, B, C, D, and E. Part A, B, and C are compulsory. Attempt any one part from D and E. Answers should be brief and to the point. Make suitable assumptions wherever necessary and clearly state the same.

		Marks	CO	BL	PI
Q1A	Define the process of bootstrapping a compiler with the help of suitable T-diagrams.	(02)	CO1	1	1.4.1
B	Explain the concept of retracting state with a suitable example.	(02)	CO1	1	1.4.1
C	Define Token, Pattern, and Lexeme with suitable examples.	(03)	CO1	1	1.4.1
D	Construct minimum state DFA for the following regular expression using syntax tree, followpos method (also show nullable, firstpos, lastpos, and followpos sets):	(07)	CO1	3	1.4.1

$$a(a+b)^*abb^*$$

OR

- E** a. Identify the lexemes that make up the tokens in the following C program segment. (04) CO1 3 1.4.1

```
int max (i, j) int i, j ;
/* return maximum of integers i and j */
{
    return i > j ? i : j ;
}
```

- b. A lexical analyzer uses the following patterns to recognize three tokens T1, T2, and T3 over the alphabet {a,b,c}. (03)

$$T1: a?(b|c)^* a? \quad T2: b?(a|c)^* b \quad T3 : c?(b|a)^* c?$$

Note that 'x?' means 0 or 1 occurrence of the symbol x. Note also that the analyzer outputs the token that matches the longest possible prefix. If the string "bbaacacb" is processed by the analyzer, identify the sequence of tokens it outputs.

- Q2A** What language is generated by the following grammar? (Hint: convert binary to decimal) (02) CO2 2 1.4.1

$$S \rightarrow 11 \mid 1001 \mid S0 \mid SS$$

- B** Show that the following grammar is ambiguous by constructing two different leftmost derivations for the sentence "abab". (02) CO2 3 1.4.1

$$S \rightarrow aSbS \mid bSaS \mid \epsilon$$

- C** Find operator precedence functions for the given operator precedence relations: (03) CO2 3 1.4.1

	a	c)	,	\$
q	<	<	=	>	>
(<	<	=	<	>
)	<	<	=	>	>
,	<	<	=	>	>
\$	<	<	=		

- D Compute LR(1) items and construct LALR parsing table for the following grammar: (07) CO2 3 1.4.1

$$E \rightarrow E + T \mid T$$

$$T \rightarrow TF \mid F$$

$$F \rightarrow F^* \mid a \mid b$$

OR

- E Compute First and Follow sets and construct the predictive parsing table for given grammar. Check whether the grammar is LL(1) or not. (07) CO2 3 1.4.1

$$E \rightarrow E + T \mid T$$

$$T \rightarrow TF \mid F$$

$$F \rightarrow F^* \mid a \mid b$$

- Q3A Differentiate between S-attribute and L-attribute SDT. (02) CO3 2 1.4.1

- B Identify the function performed by following SDT: (02) CO3 3 1.4.1

$$E \rightarrow E + T \quad \{print ("+");\}$$

$$E \rightarrow T \quad \{\}$$

$$T \rightarrow T * F \quad \{print ("*");\}$$

$$T \rightarrow F \quad \{\}$$

$$F \rightarrow num \quad \{print(num.val);\}$$

- C Differentiate between Static, Heap, and Stack storage allocation. (03) CO4 2 1.4.1

- D a. Explain the following parameter-passing methods: (04) CO4 2 1.4.1

- Call-by-reference
- Call-by-value
- Call-by-name
- Call-by-value-result

- b. What will be the output (print statements) of the following program from the above 4 parameter passing methods? (03) CO4 4

1. `void swap (int x, int y)`
2. `{ int temp;`
3. `temp = x;`

```

4.   x = y;
5.   y = temp;
6.   /*swap*/
7.   ...
8.   i = 1;
9.   a[i] = 10; /* int a[5]; */
10.  print(i, a[i]);
11.  swap(i, a[i]);
12.  print(i, a[i]); }

```

OR

- E** A context-free grammar for language $L_1 = \{a^{2m}b^{2n}c^{2p}; m, n, p \geq 1\}$ is given below. Construct Syntax Directed Definition for language $L_2 = \{a^{2n}b^{2n}c^{2n}; n \geq 1\}$. Also, construct the annotated parse tree for the string "aaaabbbbeccc" to check whether the string belongs to language L_2 or not.

$$\begin{aligned} S &\rightarrow ABC, & A &\rightarrow aaA, & A &\rightarrow aa, & B &\rightarrow bbB \\ B &\rightarrow bb, & C &\rightarrow ccC, & C &\rightarrow cc \end{aligned}$$

- Q4A** Consider a situation where there are four source languages and four target languages. Find out the number of code generators required with the absence and presence of an Intermediate Code. (02) CO5 2 1.4.1

- B** What is backpatching? (02) CO5 1 1.4.1
C Write an intermediate code template for the following statement: (03) CO5 2 1.4.1

if (E) S₁ else S₂

- D** Briefly explain different types of intermediate code with suitable examples. (07) CO5 2 1.4.1

OR

- E** Generate the three-address code for the following 'C' code segment: (07) CO5 3 1.4.1

C-program (function)

```

int dot_prod ( int x[], int y[] ) {
    int d, i; d = 0;
    for (i=0; i<10; i++) d += x[i] * y[i];
    return d;
}

```

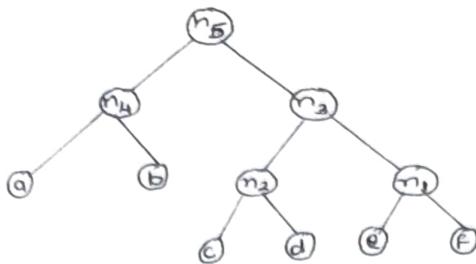
C program (main)

```

main () {
    int p; int a[10], b[10];
    p = dot_prod (a, b);
}

```

- Q5A** Apply the labeling algorithm to find the minimum number of registers required to evaluate the tree with no intermediate store to memory:



(02) CO6 3 1.4.1

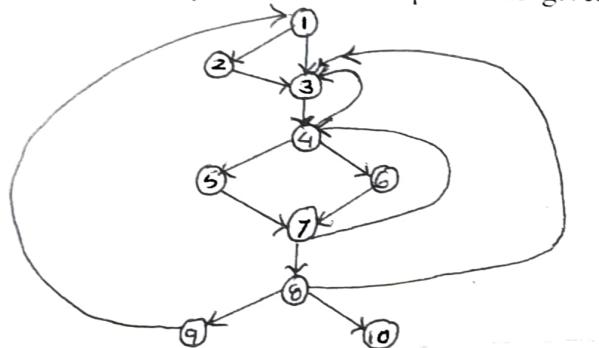
- B** List the properties that an optimizing compiler should have.

(02) CO6 1 1.4.1

- C** What is a basic block? How do we identify a basic block in the flow graph?

(03) CO6 1 1.4.1

- D** What are the two essential properties of a natural loop? List three techniques that are important for loop optimization. Construct a Dominator tree and identify the natural loops in the given flow graph:



OR

- E** Consider the flow graph given in Fig. 1. The $Def[.]$ and $Use[.]$ set for each block is given below. Compute the live variables at the end of each block:

(07) CO6 3 1.4.1

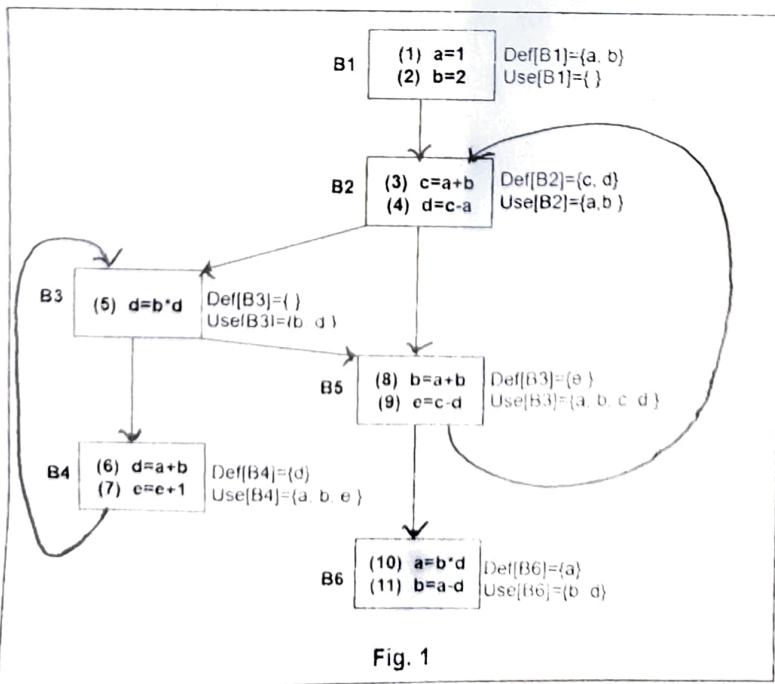


Fig. 1

DEPARTMENT OF INFORMATION TECHNOLOGY
III YEAR B.TECH. MIDTERM-I (March-2023)
DATABASE MANAGEMENT SYSTEM (IT-38513)

Max Marks: 20

Time: 1 Hour

Instructions:

- Attempt all questions.
- Make suitable assumptions wherever necessary.

Sr.No	Questions	Marks	CO	BL	PI
Q.1	What is DBA? Explain the architectures of DBMS.	[3]	CO1	BL2	1.6.1
Q.2	What is database management system? Explain database languages.	[3]	CO3	BL2	1.6.1
Q.3	Compute the closure of the following set of functional dependencies for relation schema R (P, Q, R, S, T, U, V, W, X, Y) and list the candidate keys for R. PQS → T R → Y PQ → V RX → X Q → U V → WX	[2]	CO4	BL2	1.6.1
Q.4	<p>Consider an Entity-Relationship (ER) model in which entity sets E1 and E2 are connected by an $m : n$ relationship R12, E1 and E3 are connected by a $l : n$ (l on the side of E1 and n on the side of E3) relationship R13. E1 has two attributes a11 and a12 of which a11 is the key attribute and a12 is the multi-valued attribute. E2 has two single-valued attributes a21 and a22 of which a21 is the key attribute. E3 has two single-valued attributes a31 and a32 of which a31 is the key attribute. The relationships do not have any attributes.</p> <p>(i) What is the minimum number of tables required (ii) Give the correct set of attributes for all tables.</p>	[3]	CO2	BL2	2.7.2
Q.5	Construct an E-R diagram for the department of Information Technology to store the information of department stakeholders. Document all assumptions that you make about the mapping constraints. After ER model construction convert it into RDBMS model.	[4]	CO2	BL2	2.7.2
Q.6	Identify the highest normal form of given relation and apply the normalization process to Normalized the relation till BCNF. R = (ABCDEFHIJ) F = {AB → C, A → DE, B → F, F → GH, D → IJ} After normalization check (i) Whether the decomposition is lossless or not? (ii) New decomposition is dependency preserving or not?	[5]	CO4	BL3	1.6.1

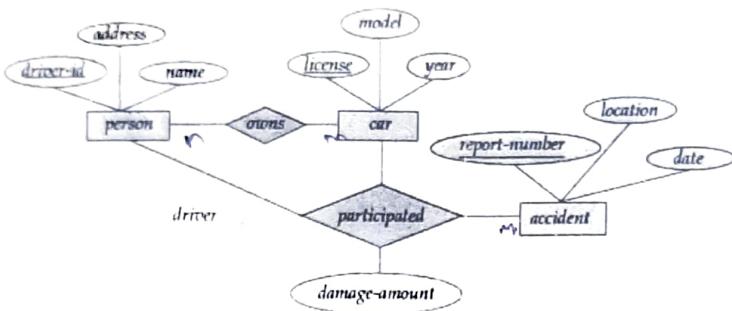
DEPARTMENT OF INFORMATION TECHNOLOGY
III YEAR B.TECH. MID TERM-I (FEB-2024)
DATABASE MANAGEMENT SYSTEM (IT-38513)

Time: 1 Hour

Max Marks: 20

Instructions: Attempt all questions.

	Questions	CO	BL	Marks
Q.1	What are the advantages of RDBMS over conventional file system? Explain with an example.	CO1	2	4
Q.2	How weak entity set is related to total participation constraint? Explain with an example.	CO2	2	3
Q.3	What is discriminator attribute? Convert given ER Model into RDBMS and show the number of tables with their attributes.	CO2	3	3



- Q.4 Why we should not design only a single relational table for a whole problem? Justify your answer with an example. CO4 2 3
- Q.5 Identify the highest normal form of given relation and apply the normalization process to Normalized the relation till 3NF. CO4 3 4
- R = (A,B,C,E,F,G,H)
 $F = \{A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG, CH \rightarrow G\}$
- Consider the relation schema R(A,B,C,D) with set of FD's:
 $AB \rightarrow C, AB \rightarrow D, C \rightarrow A, D \rightarrow B$.
- Indicate all 3 NF violations.
 - Decompose the relation into collection of relations that are in BCNF.

$\alpha \rightarrow \beta$

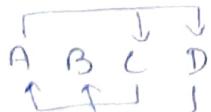
Table - 2

1. $B \rightarrow$ No prime attr:
 $CH \rightarrow (CFD)$

2. $ABEF \rightarrow 3NF$

$2^{nd} NF$ hai

Q.6



$C \rightarrow 4$ 1. AB

2. AD

3. CD

4. BC

3NF

Ans. \rightarrow No violation.

6

at most one relation.

**APRIL-MAY 2023 EXAMINATION
III YEAR B.TECH.(4YDC) EXAM
IT38513/IT38503 DATABASE MANAGEMENT SYSTEM**

TIME : 3 HRS

Marks : 70**Min. Pass Marks: 22****TOTAL NO. OF QUESTIONS IN THIS PAPER: 5**

Note: Attempt all five questions. Each Question has 5 subparts A, B, C, D and E. Questions A, B, and C are compulsory. Attempt any one part from D & E. Make suitable assumption if required.

	Questions	Marks	CO	BL	PI
Q 1	A List five responsibilities of a database management system. B What are five main functions of a database administrator? C Give the comparison between DBMS and conventional file system. D Design an E-R diagram for keeping track of your favourite IPL cricket team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics Should be modelled as derived attributes. After Design convert your E-R diagram into RDBMS.	2 2 3 7	CO1 CO1 CO1 CO2	2 2 3 4	1.6.1 1.6.1 1.6.1 3.5.6

OR

E	Explain following with an example: i. Weak Entity Set ii. Identifying Relationship iii. Total Participation iv. Partial Participation v. Generalization vi. Specialization	7	CO2	2	1.6.1
Q 2	A What are DDL and DML? B Explain referential Integrity constraints. C Consider the following relational database. <i>Employee(person_name, street, city)</i> <i>Works(person_name, company_name, salary)</i> <i>Company(company_name, city)</i> Give an sql query for the following: i. Find the name of all employees who live in city “Indore”. ii. Find the name of all employees whose salary is greater than \$100,000. iii. Find the name of all employees who live in “Indore” and work for “SGSITS”.	2 2 3	CO3 CO3 CO3	2 2 3	1.6.1 1.6.1 1.6.1
D	Explain Following: i. Super key ii. Candidate key iii. Primary key iv. Foreign Key v. Composite key and Alternate Key	7	CO3	2	1.6.1

OR

E	What are aggregate functions? Explain all with an example.	7	CO3	2	1.6.1
Q 3	A What are axiom's rules of functional dependencies?	2	CO4	2	1.6.1
B	Consider the relation R (A, B, C, D, E, F) and functional dependencies are $\{AB \rightarrow C, C \rightarrow DE, E \rightarrow F, F \rightarrow A\}$. Find the number of candidate keys.	2	CO4	3	1.6.1

- C** Given Below are two set of FDs for a relation R (A, B, C, D, E). Are both FDs equivalent? Justify your answer.

(FD1) : A \rightarrow B, AB \rightarrow C, D \rightarrow AC, D \rightarrow E
 (FD2) : A \rightarrow BC, D \rightarrow AE.

- D** What are anomalies in database? Explain all the anomalies with an example and give the solution for each anomaly.

3 CO4 3

OR

- E** Identify the highest normal form of given relation and apply the normalization process to Normalized the relation till BCNF.

$$R = (A, B, C, D, E)$$

$$F = \{AB \rightarrow C, C \rightarrow D, D \rightarrow E, E \rightarrow A, D \rightarrow B\}$$

After normalization check

- (i) Whether the decomposition is lossless or not?
 (ii) New decomposition is dependency preserving or not?

18
92
136
224
285
285

- Q 4** **A** When is it preferable to use a dense index rather than a sparse index? Explain Your answer.

- B** What is spanned and unspanned mapping?

- C** Give the comparison between hashing and indexing.

- D** Explain the types of indexing in detail with an example.

2 CO5 3 1.6.1

2 CO5 2 1.6.1

3 CO5 3 1.6.1

7 CO5 2 1.6.1

OR

- E** What is multilevel indexing? Explain the role of B-Tree in multi level indexing. Create a B-tree having 17 keys with order 4.

- Q 5** **A** Explain the importance of concurrency control in transaction.

- B** What is the role of database pointer in transaction?

- C** Can precedence graph be used to detect a conflict serializable schedule? What is the cost to detect conflict serializable schedule?

- D** Consider following schedule :

$$S = R1(X), R1(Y), W1(X), R2(Y), W3(Y), W1(X), R2(Y)$$

Find out the following in schedule :

- a. Conflict serializable
- b. View serializable
- c. Cascading Rollback or Cascadeless
- d. Strict or not?

OR

- E** Explain the following:

- i. Blind Write problem.
- ii. View serializable schedule
- iii. Cascadeless schedule
- iv. Cascade rollback schedule
- v. Strict schedule

7 CO6 2 1.6.1

**APRIL 2024 EXAMINATION
III YEAR B.TECH (4YDC) EXAM
IT38513/IT38503 DATABASE MANAGEMENT SYSTEM**

TIME: 3 HRS

Marks: 70

Min. Pass Marks: 22

TOTAL NO. OF QUESTIONS IN THIS PAPER: 5

Note: Attempt all five questions. Each Question has 5 subparts A, B, C, D and E. Questions A, B, and C are compulsory. Attempt any one part from D & E. Make suitable assumption if required.

Sr. No.	Questions	Marks	CO	BL	PI
Q 1	A Give the difference between DB and DBMS. B What are OLAP and OLTP? C What is weak entity set? We can convert any weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity sets? D Explain different types of DBMS architecture with suitable diagrams.	2 2 3 7	1 1 2 1	1 1 2 3	1.4.1 1.4.1 1.4.1 1.4.1
	OR				
	E Explain all the mapping rules of ER-Model to RDBMS-Model with appropriate example.	7	2	3	1.4.1
Q 2	A Give the difference between super key and candidate key. B What is the purpose of the GROUP BY and HAVING clauses in SQL? C Explain the key constraints of foreign key with suitable example. D Explain all types of join operations with suitable example.	2 2 3 7	3 3 3 3	2 1 3 2	1.4.1 1.4.1 1.4.1 1.4.1
	OR				
	E What is normalization? Explain insert, update and delete anomalies with an example.	7	4	2	1.4.1
Q 3	A Given a relation R(A, B, C, D) with the functional dependencies $\{A \rightarrow B, B \rightarrow C, D \rightarrow A\}$, identify the candidate keys for R. B Discuss the trade-offs involved in normalization versus denormalization. C Why we should remove partial functional dependency in 2NF? Explain with an example. D Give an example of a database schema and demonstrate the normalization process through it?	2 2 3 7	3 4 3 4	2 2 3 3	1.4.1 1.4.1 1.4.1 1.4.1
	OR				
	E Suppose you have a relation R=(ABCDEFGH) with the functional dependencies $F=\{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$. Identify the highest normal form of given relation and apply the normalization process to Normalized the relation till 3NF. After normalization decomposition is lossless or not? New decomposition is dependency preserving or not?	7	4	4	1.4.1

- Q 4 A What is primary indexing? 2 5 2 1.4.1
 B Give the difference between hashing and indexing. 2 5 1 1.4.1
 C Consider B+ tree in which the search key is 12 bytes long, block size is 1024 bytes, record pointer is 10 bytes long and block pointer is 8 bytes long. The maximum number of keys that can be accommodated in each non-leaf node of the tree is? 3 5 2 1.4.1
 D Ram and Shyam are working on a project Car rental system, they have a file consisting of 10000 records, having block size 1024 bytes, record size 100 bytes. Search key size 9 bytes, pointer 7 bytes. They want to implement single level indexing. Shyam suggested to implement 1st level index using dense index, however Ram suggested implementing sparse index. How many blocks are saved by Ram considering only 1st level index? 7 5 2 1.4.1

OR

- E Consider a file of 50000 records. Each record is 40 bytes long and its key field is of size 4 bytes. The size of the memory is 512 KB. The disk block size is 512 bytes, and the size of a block address is 8 bytes. If we want to order the file on key field, which indexing technique (primary, clustering, secondary, multilevel) gives better results for accessing a record? Give the justification. 7 5 3 1.4.1

- Q 5 A How to ensure the consistency in transaction? 2 6 2 1.4.1
 B What is the role of db pointer in transaction? 2 6 2 1.4.1
 C Describe the ACID properties in the context of database transactions. 3 6 2 1.4.1
 D What is serializability? Explain following with example:
 a. Conflict serializable 7 6 3 1.4.1
 b. View serializable
 c. Cascadless schedule
 e. Strict schedule.

OR

- E Explain the advantages and problems with concurrency in transactions with an example. 7 6 2 1.4.1

***** ALL THE BEST *****

DEPARTMENT OF INFORMATION TECHNOLOGY

BE III YEAR (IT)

IT-38509: Advance Computer Network (ACN)

Mid Test-I

Time: 1 Hr.

Marks: 20

Note: Attempt all questions.

	CO	PO	PI	Marks
Q1. Briefly discuss the difference between Public IP & Private IP.	1	1	1.4	4
Q2. How to determine the IP address of your computer system? Enlist all steps with proper explanation. Explain in brief any five networking commands with their use.	3	5	5.2	4
Q3. Explain the working of Authoritative DNS server with four numbers of common Resource Records.	4	2	2.3	4
Q4. Explain the Network Address Translator (NAT) protocol. Also, explain the potential problem with the NAT protocol.	2	1	1.3	4
Q5. Suppose computers A and B have IP addresses 10.105.1.113 and 10.105.1.91 respectively and they both use the same netmask N. Which of the values of N given below should not be used if A and B should belong to the same network? CIDR mask A8 , B16 , C=24, D = 20.	3	2	2.2	4

DEPARTMENT OF INFORMATION TECHNOLOGY
BE III YEAR (IT)
IT-38609: Advanced Computer Networks
Mid Test-II

Time: 1 Hr.

Marks: 20

Note: Attempt all questions. Assume additional data, if necessary and clearly state the steps.

	CO	BL	PI	Marks
Q1. Explain the TCPs three-way handshake mechanism for connection establishment and connection release.	3	2	1.4	3
Q2. Explain the working of Go-Back-N protocol used to transfer packets reliably in a pipelined mode. Consider a Go-back-n protocol with a sender window size of 3 and a sequence number range of 1024. Suppose at time 't', the next in-order packet that the receiver is expecting has a sequence number of 'k'. Assume that the medium does not reorder the messages. What are the possible sets of sequence numbers inside the sender's window at time 't'? Justify your answer.	5	2	1.4	5
Q3. Consider the GBN protocol with a sender window size of 4 and a sequence number range of 1,024. Suppose that at time t , the next in-order packet that the receiver is expecting has a sequence number of k . Assume that the medium does not reorder messages. Answer the following questions: a. What are the possible sets of sequence numbers inside the sender's window at time t ? Justify your answer. b. What are all possible values of the ACK field in all possible messages currently propagating back to the sender at time t ? Justify your answer.	3	3	1.4	5
Q4. Draw the UDP Header format and explain its various fields. Also explain why UDP in some situations is desirable over TCP.	5	1	1.4	2
Q5. What is the role of a 'Congestion Window' variable used in the TCP protocol suite? Also explain the TCP's Slow Start mechanism.	5	3	1.4	5

Department of Information Technology
APRIL - MAY 2024 EXAMINATION
B.E./B.Tech. (IT)
IT38509: Advanced Computer Networks

[Time: 3 Hrs.]

[Max. Marks: 70]

Note: All questions are compulsory. Each question had five parts a, b, c, d, & e. Part a, b, & c are compulsory. Attempt any one part from d & e. Make suitable assumptions wherever necessary and clearly state the same.

S.No.	Questions	Marks	CO	BL	PI
Q1(a)	What are the five layers in the TCP/IP protocol stack? What are the principle responsibilities of each of these layers?	2	1	1	1.4.1
(b)	If the TCP server were to support n simultaneous connections, each from a different client host, how many sockets would the TCP server need? Explain.	2	6	2	1.4.1
(c)	Draw the IPv6 datagram format. Explain the following fields of the IPv6 header:	3	2	2	1.4.1
	• Traffic Class • Flow Label				
(d)	Write the structure “ addrinfo ” used in TCP/IP socket programming using ‘C’ language. Explain the use of various fields of the structure. Also explain the following system calls used in socket programming: 1. <code>socket()</code> 2. <code>bind()</code> 3. <code>listen()</code>	7	6	3	1.4.1
OR					
(e)	Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119.40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?	7	2	3	1.4.1
Q2(a)	The network layer functionality can be broadly divided into data plane functionality and control plane functionality. What are the main functions of the data plane?	2	3	1	1.4.1
(b)	Suppose that an arriving packet matches two or more entries in a router’s forwarding table. With traditional destination-based forwarding, what rule does a router apply to determine the output port to which the arriving packet should be switched?	2	3	3	1.4.1
(c)	What is a private network address? Should a datagram with a private network address ever be present in the larger public Internet? Explain.	3	2	2	1.4.1
(d)	Compare and contrast link-state and distance-vector routing algorithms. Give an example of each. Also explain the “count to infinity” problem in distance vector routing.	7	3	4	1.4.1

OR

(e)	Define and contrast the following terms: subnet, prefix, and BGP route. How does BGP use the NEXT-HOP attribute? How does it use the AS-PATH attribute?	7	3	3	1.4.1
Q3(a)	Draw the UDP header format. Also explain the various fields of UDP protocol header.	2	2	1	1.4.1
(b)	Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?	2	5	3	1.4.1
(c)	Suppose a process in Host C has a UDP socket with port number 6789. Suppose both Host A and Host B, each send a UDP segment to Host C with destination port number 6789. Will both of these segments be directed to the same socket at Host C? If so, how will the process at Host C know that these two segments originated from two different hosts?	3	5	2	1.4.1
(d)	Consider the Go Back N protocol with a sender window size of 4 and a sequence number range of 1,024. Suppose that at time t , the next in-order packet that the receiver is expecting has a sequence number of k . Assume that the medium does not reorder messages. Answer the following questions: a. What are the possible sets of sequence numbers inside the sender's window at time t ? Justify your answer. b. What are all possible values of the ACK field in all possible messages currently propagating back to the sender at time t ? Justify your answer.	7	5	3	1.4.1
OR					
(e)	Answer true or false to the following questions and briefly justify your answer: a. With the Selective Repeat protocol, it is possible for the sender to receive an ACK for a packet that falls outside of its current window. b. With Go Back N, it is possible for the sender to receive an ACK for a packet that falls outside of its current window. c. The alternating-bit protocol is the same as the Selective Repeat protocol with a sender and receiver window size of 1. d. The alternating-bit protocol is the same as the Go Back N protocol with a sender and receiver window size of 1.	7	5	3	1.4.1
Q4(a)	In the client-server programming the UDP server needs only one socket, whereas the TCP server needs two sockets. Why?	2	3	3	1.4.1
(b)	Explain the TCPs three-way handshake mechanism for connection establishment.	2	2	2	1.4.1
(c)	Suppose Host A sends two TCP segments back-to-back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110. a. How much data is in the first segment? b. Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgment that Host B sends to Host A, what will be the acknowledgment number?	3	5	4	1.4.1
(d)	Draw the TCP header format and briefly explain all its fields. What is the role of Congestion Window variable used in TCP protocol?	7	5	1	1.4.1

OR

DEPARTMENT OF INFORMATION TECHNOLOGY

BE. III YEAR (IT)

IT-38509: Advance Computer Network (ACN)

Mid Test-I

Time: 1 Hr.

Marks: 20

Note: Attempt all questions.

		CO	PO	PI	Marks
Q1.	Briefly discuss the difference between Public IP & Private IP.	1	1	1.4	4
Q2.	How to determine the IP address of your computer system? Enlist all steps with proper explanation. Explain in brief any five networking commands with their use.	3	5	5.2	4
Q3.	Explain the working of Authoritative DNS server with four numbers of common Resource Records.	4	2	2.3	4
Q4.	Explain the Network Address Translator (NAT) protocol. Also, explain the potential problem with the NAT protocol.	2	1	1.3	4
Q5.	Suppose computers A and B have IP addresses 10.105.1.113 and 10.105.1.91 respectively and they both use the same netmask N. Which of the values of N given below should not be used if A and B should belong to the same network?	3	2	2.2	4.

CIDR MASK A8 , B16 C.24 . d.20
 ~~~~~~

ifconfig.  
 route

- (e) Consider the TCP procedure for estimating RTT. Suppose that  $\alpha=0.1$ . Let  $SampleRTT_1$  be the most recent sample RTT, let  $SampleRTT_2$  be the next most recent sample RTT, and so on.
- a) For a given TCP connection, suppose four acknowledgments have been returned with corresponding sample RTTs:  $SampleRTT_4$ ,  $SampleRTT_3$ ,  $SampleRTT_2$ , and  $SampleRTT_1$ . Express  $EstimatedRTT$  in terms of the four sample RTTs.
- b) Generalize your formula for  $n$  sample RTTs.

7 6 4 1.4.1

- Q5(a) In our reliable data transfer protocols (rdt), such as TCP, why did we need to introduce timers? 2 5 3 1.4.1
- (b) Explain the TCP's "Slow Start" mechanism for the congestion control. 2 6 3 1.4.1
- (c) With the help of a diagram explain the working of Network Address Translation (NAT) protocol. What are Public and Private IP addresses? Give examples. 3 1 2 1.4.1
- (d) Draw a schematic showing the principle components of a Network Management System (NMS). Also explain the benefits of Network Management tools. 7 4 1 1.4.1

**OR**

- (e) Explain the help of a suitable example the working of an Authoritative DNS server. Also, explain the following resource records:
- A record
  - NS record
  - MX record

7 5 3 1.4.1

**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**BE III YEAR (IT)**  
**IT-38509: Advanced Computer Networks**  
**Mid Test-II**

Time: 1 Hr.

Marks: 20

Note: Attempt all questions. Assume additional data, if necessary and clearly state the same.

CO BL PI Marks

- Q1. Explain the TCPs three-way handshake mechanism for connection establishment and connection release. 3 2 1.4 3
- Q2. Explain the working of Go-Back-N protocol used to transfer packets reliably in a pipelined mode. Consider a Go-back-n protocol with a sender window size of 3 and a sequence number range of 1024. Suppose at time 't', the next in-order packet that the receiver is expecting has a sequence number of 'k'. Assume that the medium does not reorder the messages. What are the possible sets of sequence numbers inside the sender's window at time 't'? Justify your answer. 5 2 1.4 5
- Q3. Consider the GBN protocol with a sender window size of 4 and a sequence number range of 1,024. Suppose that at time  $t$ , the next in-order packet that the receiver is expecting has a sequence number of  $k$ . Assume that the medium does not reorder messages. Answer the following questions: 3 3 1.4 5
- a. What are the possible sets of sequence numbers inside the sender's window at time  $t$ ? Justify your answer.
  - b. What are all possible values of the ACK field in all possible messages currently propagating back to the sender at time  $t$ ? Justify your answer.
- Q4. Draw the UDP Header format and explain its various fields. Also explain why UDP in some situations is desirable over TCP. 5 1 1.4 2
- Q5. What is the role of a 'Congestion Window' variable used in the TCP protocol suite? Also explain the TCP's Slow Start mechanism. 5 3 1.4 5

**Department of Information Technology**  
**APRIL - MAY 2023 EXAMINATION**  
**B.E./B.Tech. (IT)**  
**IT38509: Advanced Computer Networks**

[Max. Marks: 70]

[Time: 3 Hrs.]

Note: All questions are compulsory. Each question had five parts a, b, c, d, & e. Part a, b, & c are compulsory. Attempt any one part from d & e. Make suitable assumptions wherever necessary and clearly state the same.

| S.No.     | Questions                                                                                                                                                                                                                                                                                      | Marks | CO | BL | PI    |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|----|-------|
| Q1(a)     | What are the five layers in the Internet protocol stack? What are the principle responsibilities of each of these layers?                                                                                                                                                                      | 2     | 1  | 1  | 1.4.1 |
| (b)       | For the client-server application over TCP, why must the server program be executed before the client program? For the client-server application over UDP, why may the client program be executed before the server program?                                                                   | 2     | 6  | 2  | 1.4.1 |
| (c)       | Compare and contrast the IPv4 and the IPv6 header fields. Do they have any fields in common?                                                                                                                                                                                                   | 3     | 2  | 3  | 1.4.1 |
| (d)       | Write the structure “ <b>addrinfo</b> ” used in TCP/IP socket programming using ‘C’ language. Explain the use of various fields of the structure. Also explain the following system calls used in socket programming: 1. <code>socket()</code> 2. <code>bind()</code> 3. <code>listen()</code> | 7     | 6  | 2  | 1.4.1 |
| <b>OR</b> |                                                                                                                                                                                                                                                                                                |       |    |    |       |
| (e)       | Explain the Classless Inter-Domain Routing (CIDR) protocol. Calculate the number of subnets and their addresses in a network with a network ID of 192.168.1.0/24 and with 20 hosts per subnet.                                                                                                 | 7     | 2  | 2  | 1.4.1 |
| Q2(a)     | We made a distinction between the forwarding function and the routing function performed in the network layer. What are the key differences between routing and forwarding?                                                                                                                    | 2     | 3  | 2  | 1.4.1 |
| (b)       | Suppose that an arriving packet matches two or more entries in a router’s forwarding table. With traditional destination-based forwarding, what rule does a router apply to determine the output port to which the arriving packet should be switched?                                         | 2     | 3  | 3  | 1.4.1 |
| (c)       | What is a private network address? Should a datagram with a private network address ever be present in the larger public <sup>no</sup> Internet? Also, explain how Network Address Translation (NAT) protocol works.                                                                           | 3     | 2  | 2  | 1.4.1 |
| (d)       | Compare and contrast link-state and distance-vector routing algorithms. Give an example of each. Also explain the “count to infinity” problem in distance vector routing.                                                                                                                      | 7     | 3  | 3  | 1.4.1 |
| <b>OR</b> |                                                                                                                                                                                                                                                                                                |       |    |    |       |
| (e)       | What is an Autonomous System (AS)? Why are different inter-AS and intra-AS protocols used in the Internet? Explain the working of Border Gateway Protocol (BGP) as an inter-autonomous system routing protocol.                                                                                | 7     | 3  | 2  | 1.4.1 |
| Q3(a)     | Draw the UDP header format. Also explain the various fields of UDP protocol header.                                                                                                                                                                                                            | 2     | 5  | 1  | 1.4.1 |
| (b)       | Describe why an application developer might choose to run an application over UDP rather than TCP.                                                                                                                                                                                             | 2     | 5  | 3  | 1.4.1 |
| (c)       | Suppose that a Web server runs in Host C on port 80. Suppose this Web server uses persistent connections, and is currently receiving requests from two different Hosts, A and B. Are all of the requests                                                                                       | 3     | 5  | 2  | 1.4.1 |

being sent through the same socket at Host C? If they are being passed through different sockets, do both of the sockets have port 80? Discuss and explain.

- (d) Explain the working of Go-Back-N protocol used to transfer packets reliably in a pipelined mode. Consider a Go-back-n protocol with a sender window size of 3 and a sequence number range of 1024. Suppose at time 't', the next in-order packet that the receiver is expecting has a sequence number of 'k'. Assume that the medium does not reorder the messages. What are the possible sets of sequence numbers inside the sender's window at time 't'? Justify your answer. 7 5 2 1.4.1

**OR**

- (e) Draw the Finite State Machine (FSM) models and explain the working of a sender and a receiver side of reliable transport layer protocol operating over a lossy channel with bit errors. 7 5 2 1.4.1

- Q4(a) In the client-server programming the UDP server needs only one socket, whereas the TCP server needs two sockets. Why? If the TCP server were to support  $n$  simultaneous connections, each from a different client host, how many sockets would the TCP server need? 2 3 2 1.4.1

- (b) Explain the TCP's fast retransmit mechanism. 2 5 2 1.4.1  
(c) Explain the TCP's three-way handshake mechanism for connection establishment and release. 3 5 2 1.4.1  
(d) Define the following terms in the context of SNMP: managing server, managed device, network management agent, MIB 7 4 1 1.4.1

**OR**

- (e) Consider the TCP procedure for estimating RTT. Suppose that  $\alpha=0.1$ . Let  $\text{SampleRTT}_1$  be the most recent sample RTT, let  $\text{SampleRTT}_2$  be the next most recent sample RTT, and so on.  
a) For a given TCP connection, suppose four acknowledgments have been returned with corresponding sample RTTs:  $\text{SampleRTT}_4$ ,  $\text{SampleRTT}_3$ ,  $\text{SampleRTT}_2$ , and  $\text{SampleRTT}_1$ . Express  $\text{EstimatedRTT}$  in terms of the four sample RTTs.  
b) Generalize your formula for  $n$  sample RTTs. 7 5 4 1.4.1

- Q5(a) In our reliable data transfer protocols (rdt), such as TCP, why did we need to introduce timers? 2 5 2 1.4.1

- (b) What is the role of a "Congestion Window" variable used in TCP protocol? 2 6 2 1.4.1

- (c) Write a short note on the working of DNS protocol. Is it possible for an organization's Web server and mail server to have exactly the same alias for a hostname (for example, **foo.com**)? What would be the type for the Resource Record that contains the hostname of the mail server? 3 1 3 1.4.1

- (d) Draw the TCP header format and briefly explain all its fields. 7 5 1 1.4.1

**OR**

- (e) With the help of a diagram explain the working of "Leaky Bucket" algorithm. Also explain how Leaky bucket can be used to police burst size and average rate? 7 5 2 1.4.1

## DEPARTMENT OF INFORMATION TECHNOLOGY

BE III YEAR (IT)

IT-38509: Advanced Computer Networks

Mid Test-I

Marks: 20

Time: 1 Hr.

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CO | BL | PI  | Marks |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|-----|-------|
| Q1. | Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?<br><b>OR</b><br>For the client-server application over TCP, why must the server program be executed before the client program? For the client-server application over UDP, why may the client program be executed before the server program?                                                                                                                                                                          | 1  | 2  | 1.4 | 2     |
| Q2. | Is it possible for an organization's Web server and mail server to have exactly the same alias for a hostname (for example, <i>foo.com</i> )? What would be the type for the Resource Record that contains the hostname of the mail server?<br><b>OR</b><br>Recall that TCP can be enhanced with SSL to provide process-to-process security services, including encryption. Does SSL operate at the transport layer or the application layer? If the application developer wants TCP to be enhanced with SSL, what does the developer have to do? | 2  | 1  | 1.4 | 3     |
| Q3. | In the client-server programming the UDP server needs only one socket, whereas the TCP server needs two sockets. Why? If the TCP server were to support $n$ simultaneous connections, each from a different client host, how many sockets would the TCP server need?                                                                                                                                                                                                                                                                              | 3  | 2  | 1.4 | 3     |
| Q4. | Write the structure " <b>addrinfo</b> " used in TCP/IP socket programming using 'C' language. Also explain the use of various fields of the structure.                                                                                                                                                                                                                                                                                                                                                                                            | 3  | 1  | 1.4 | 3     |
| Q5. | Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form .b.c.d/x) that satisfy these constraints.                                                                                | 2  | 3  | 1.4 | 4     |
| Q6. | Suppose a process in Host C has a UDP socket with port number 6789. Suppose both Host A and Host B each send a UDP segment to Host C with destination port number 6789. Will both of these segments be directed to the same socket at Host C? If so, how will the process at Host C know that these two segments originated from two different hosts?                                                                                                                                                                                             | 2  | 3  | 1.4 | 3     |
| Q7. | Suppose that the UDP receiver computes the Internet checksum for the received UDP segment and finds that it matches the value carried in the checksum field. Can the receiver be absolutely certain that no bit errors have occurred? Explain.                                                                                                                                                                                                                                                                                                    | 2  | 1  | 1.4 | 2     |

