Course Code : HUT 201 **EIQU/RW – 16/1610**

Fourth Semester B. E. (Computer Science and Engineering / Information Technology) Examination

TECHNICAL COMMUNICATION

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Mobile are not allowed in the examination hall.
(2) All questions carry marks as indicated against them.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data and illustrate answers with neat sketches wherever necessary.

1. (a) Explain any two 21st century business management methodologies geared to ensure quality.

OR

(b) Enlist strategies for successful collaboration at workplace. 10

2. (a) What are the three main parts of the writing process ?

OR

(b) How can you achieve clarity in your technical writing ? 10

3. (a) How can one establish an effective multicultural communication in today's global economy ? 10

OR

(b) What are the three ways to avoid sexist writing ? 10

4. (a) Write short notes on (any **two**) :—

(1) Fog Index.

(2) Importance of detail in technical communication.

(3) Components of a resume. 10

5. Do as directed :—

(1) Overtime is favoured by hourly workers. (Change the voice).

(2) We collaborated together on the project. (Remove redundancy).

(3) The company is in need of funds in order to purchase new Machineries. (Remove wordy phrase)

(4) Give modern alternatives to any two obscure words: issuance/disclose/ in lieu of.

(5) When setting up his experiments, the researcher must always check for errors. (Avoid sexist language and rewrite the sentence).

(6) Choose from the expressions labeled a.b.c.d.e which is most nearly opposite in meaning to the expression in italics :
Although negotiations have recently broken off we are making efforts to have them ——

(a) Resumed (b) Reinstated.

(c) Redo (d) Returned

(e) Redeemed

(7) Because electron-beam welding is a slower process, it is used more when speed is not a major factor in prodction. (Rewrite as a compound sentence).

(8) I told you the truth why aren't you believing me ? (Correct the sentece).

(9) I wandered through the forest with my dog beside (I, myself me). (Choose the appropriate word to complete the sentence).

(10) Punctuate the following sentence :

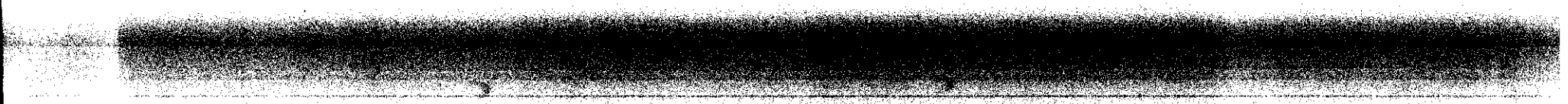
Some people work well in the mornings others do better in the evenings. 10

6. Attempt any **one** of the following :—

(a) Write a report on an industrial visit that was organized by your college. Invent necessary details.

OR

(b) Write a user–manual for Samsung Galaxy S7 android phone. 10



Course Code : CST 206

EIQU/RW – 16 / 1585

Fourth Semester B. E. (Computer Science and Engineering) Examination

OBJECT ORIENTED PROGRAMMING

Time : 3 Hours]

[Max. Marks : 60

Instructions to Candidates :—

(1) Question No. 1 and 7 are compulsory.
(2) Solve any One from Q.2, Q.3
(3) Internal Choice in Q.4, Q.5 and Q.6

1. (A) Explain the following terms :—

(i) Abstraction.

(ii) Inheritance

(iii) Encapsulation. 3

(B) How access modifiers work in Java ? Draw the table showing the accessibility inside and outside the package. 2

(C) Write a class Vote Counter that can be used to keep track of the votes on a yes/no question. The class should contain two instance variable to count the number of yes votes and the number of no votes. It should have a method vote Yes ( ) that is called to cast a "yes" vote, and a method vote No ( ) that is called to cast a "no" vote. Include method, get winner ( ), to report whether "yes" or "no" got the most votes. This method should return 1 if "yes" has more votes, 2 if "no" has more votes, or 0 if both have the same number of votes.
Write an appropriate main to create objects of class VoteCounter and use them. 5

2. (A) Write a program to create a class student with data members as Student_name, Roll_no, test_marks [3], course_grade. Add appropriate methods to provide the functionalities.

(i) Store student information.

(ii) Store test score.

(iii) Compute Result.

(iv) Display the information.

Derive two classes post-graduate and under-graduate from student. Add funactionality to find whether the student has qualified the exam or not. The student is successful for post-graduation if he secures an average marks more than 80. The student is successful for under-graduation if he secures an average marks more than 70.
Create an array of 10 students which can store either the details of undergraduate or post graduate students. Demonstrate all the functionalities. 8

(B) State true / False and justify.

(1) If a method is declared as final, it means it cannot be overloaded by subclass.

(2) If any class is declared as abstract, it is not necessary to declare the method as abstract. 2

OR

3. (A) Create an interface IQueue which includes functions to insert and delete elements of queue and function to display the queue. IQueue is implemented by Queue. Include IQueue and Queue in package Data Structure. Create another class demo in another package to use the object of queue and demonstrate all the functions. 5

(B) What is dynamic method dispatch ? Explain with an example. Can we use dynamic method dispatch with interfaces ? Explain with an example. 5

4. Solve any **Two** :—

(A) Explain generic class with two type parameter with an example. What is meant by wild card ? Explain with an example. 5

(B) Create an ArrayList to store information about account. Class account consists of data members name, account number and amount. Write a program using iterator to display all the account numbers having amount greater than 1 lakh in their account. 5

(C) Consider a class which has data members as username and password. A password is consdered as valid if the minimum length of password is 8 characters. The password should also contain a special character (!, @, #, $, %, ^, *). If the password doesn't contain a special character throw a user defined exception PasswordException. Use proper error handling mechanism to handle the exception. 5

5. Solve any **Two** :—

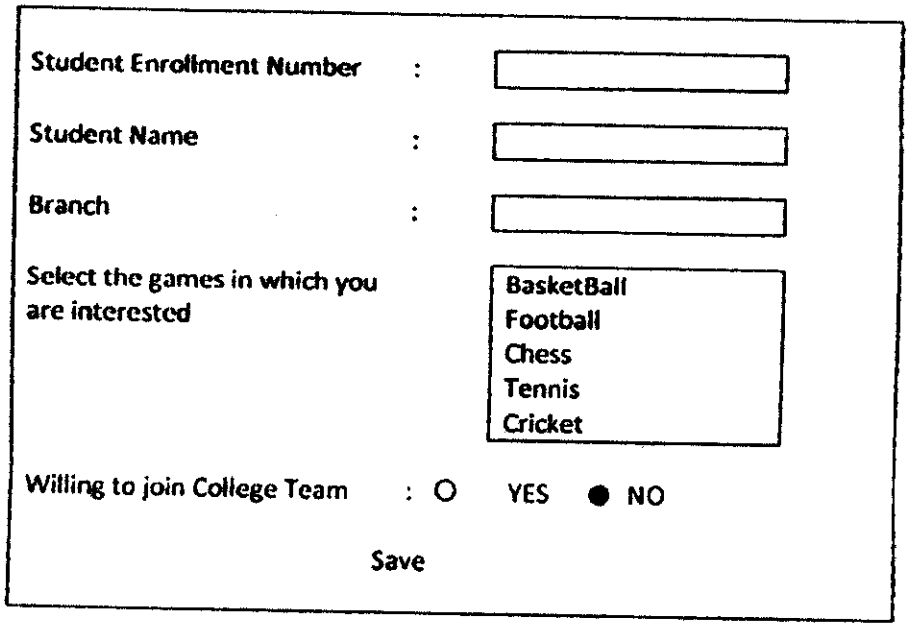
(A) Write a program to count vowels in the file "File.txt" and display the count. Use character based reading and writing. 5

(B) Create a class "Simple Thread" which extends Thread. Decide the code to be entered in run ( ) method. Create two thread of this class having higher and lower priority in main. Demonstrate how priorities affect the output. 5

(C) Explain Serialization with an example. 5

6. Solve any **One** :—

(A) Write a program to design the form below. When user clicks on save button the data should be displayed in message box.



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(B) Create a swing form with tabs, Tab 1 contains 3 radio buttons: red, green, blue. The background color of form should change according to the button selected. Tab 2 contains a list with names of 6 countries. Multiple items can be selected from the list. Display the name of the countries selected from the list in message box. 10

7. (A) Explain the following terms with example :—

(i) Servlet request

(ii) Servlet response

(iii) get ( )

(iv) post ( ) 5

(B) Consider a table Orders in database. It contains Item Name, Quantity and Rate. Write a program to fetch all the records from Orders, calculate total amount and display 5

Course Code : CST 207 **EIQU/RW – 16/1586**

Fourth Semester B. E. (Computer Science and Engineering) Examination

OPERATING SYSTEMS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Questions **1 , 2** and **3** have internal choices.
(2) Due credit will be given to neatness.
(3) Assume suitable data wherever required.

1. Solve any **two** :—

   (a) Explain batch operating system along with the application where it is preferably used over the other. 5

   (b) How Memory and CPU Protection is provided by OS ? Explain with the help of neat diagram. 5

   (c) How communication between processes is coordinated by operating system ? 5

2. Solve any **two** :—

   (a) Consider the following set of processes, with the length of the CPU – burst time given in milliseconds :

Process	Burst Time	Arrival Time	Priority
P1	6	0	5
P2	9	1	3
P3	3	2	2
P4	5	3	1
P5	4	4	4

Using preemptive SJF and Non Preemptive Priority scheduling algorithms

(i) Draw Gantt chart illustrating the execution of these processes.

(ii) Calculate waiting time of each process for both the scheduling algorithms. 5

(b) List different queues where processes are scheduled. Also explain when a process is moved between these queues using queuing diagram. 5

(c) Explain different multithreading models with advantages and disadvantages for each. 5

3. Solve any **two** :—

(a) Explain algorithm for multiple process synchronization. 5

(b) Give a monitor solution to the dining – philosopher problem. 5

(c) Two processes, P1 and P2, need to access a critical section of code. Consider the following synchronization construct used by processes :

/ * P1 * /	/ * P2 * /
while (true) {	while (true) {
wants 1 = true ;	wants 2 = true ;
while (wants 2 = = true) ;	while (wants 1 = = true) ;
/* Critical Section * /	/* Critical Section * /
wants 1 = false ;	wants 2 = false ;
}	}
/ * Remainder section */	/* Remainder section */

Here, wants 1 and wants 2 are shared variables, which are initialized to false. Does it prevent deadlocks ? Does it ensure mutual exclusion ? Explain your answer. 5

4. (a) What are the four necessary conditions for deadlock to occur ? Which out of these conditions can be used to prevent deadlock ? 2

(b) A particular system uses the deadlock avaoidance approach. At time t0 the system state is :

Process	Allocation	Max	Available
P0	1 0 0 4	1 6 5 6	1 5 2 0
P1	1 4 2 2	2 4 5 7	
P2	0 0 1 2	0 0 1 2	
P3	0 2 1 0	1 7 5 0	
P4	0 6 3 2	0 6 5 2	

Determine whether the system is in a safe state. 4

(c) Access control list to each file for protecting the right to open that file is given as the access control matrix :

Alice	R/W	R	R	–
Bob	R	R/W		R
Carol	R	R	R/W	R
Dave		R/W	R/W	R
	File 1	File 2	File 3	File 4

Giving corresponding :—

(i) Capability list representation of this matrix

(ii) Access Lists of this matrix. 4

5. (a) When disk space is allocated with the contiguous–allocation algorithm which approach for free–space management will be more useful ? 4

(b) Explain different directory structures. 6

6. (a) Given the page reference string

1 , 5 , 6 , 2 , 1 , 2 , 3 , 7 , 6 , 3 , 2 , 3 , 6 , 1 , 2 , 3 , 4 , 2

How many page faults would occur for the following replacement algorithms for THREE and FIVE frames ?

(i) FIFO (ii) LRU (iii) Optional 6

(b) Write a note on thrashing and working set model. 4

Course Code : CST 208 **EIQU/RW – 16/1587**

Fourth Semester B. E. (Computer Science and Engineering) Examination

THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry equal marks.
(2) Assume suitable data wherever necessary.
(3) Due credit will be given to neatness and adequate answers.

1. (a) Prove using principle of mathematical induction,

$$1+2+3+.....n=\frac{n(n+1)}{2}$$ 3

(b) Construct grammar and regular expression for the language which consists of 'aa' substring. 3

(c) Identify type of grammar and automata corresponding to that grammar along with type of language.

(i) $S \rightarrow aSbS \mid bSaS \mid \in$

(ii) $S \rightarrow ACaB$
$Ca \rightarrow aaC$
$CB \rightarrow DB$
$CB \rightarrow E$
$aD \rightarrow Da$
$AD \rightarrow AC$
$aE \rightarrow Ea$
$AE \rightarrow \in$

(iii) $S \rightarrow 10A \mid 0$
$A \rightarrow 0A \mid 1$

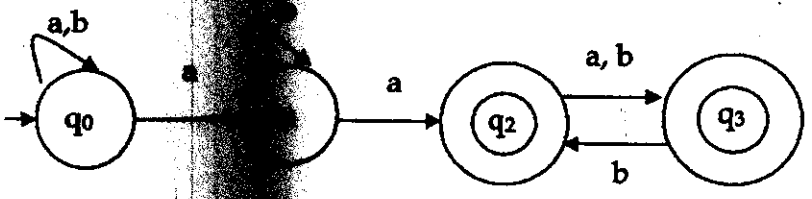
(iv) $S \rightarrow aSBC$
$S \rightarrow aBC$
$CB \rightarrow BC$
$aB \rightarrow ab$
$bB \rightarrow bb$
$bC \rightarrow bc$
$cC \rightarrow cc$ 4

2. (a) Construct DFA for (any one) :—

(i) the language which consists of strings which are perfectly divisible by 5.

(ii) $L = \{ w : n_a(w) = 1 , n_b(w) = 2 , w \in \{ a , b \}^* \}$ 6

(b) Convert given NFA to optimized DFA



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3. (a) Construct CFG

(i) $L = \{ 0^n 1^n \mid n \geq 1 \} \cup \{ 1^n 0^n \mid n \geq 0 \}$.

(ii) $R . E = 0^* 1 (0+1)^*$. 4

(b) Convert given Right Linear Grammar to equivalent Left Linear Grammar.

$S \rightarrow bB \;\; ; \;\; B \rightarrow bB \;\; ; \;\; B \rightarrow aB \;\; ; \;\; C \rightarrow a \;\; ; \;\; B \rightarrow b$ 4

OR

(b) Find Chomsky Normal Form of the given grammar

$S \rightarrow abAB$
$A \rightarrow bAB \mid \in , B \rightarrow Ba \mid \in$ 4

(c) Check whether given grammar is Ambiguous or not by considering the string $w = a + b * c$.
$E \rightarrow I \mid E + E \mid E * E \mid (E)$
$I \rightarrow a \mid b \mid c$. 2

4. (a) Construct PDA for the given language (solve any **one**) :—

(i) $L = \{ w \in \{ a, b \}^* \mid w$ has equal number of a's and b's $\}$

(ii) $L = \{ 0^n 1^{n+1} \mid n \geq 1 \}$. 6

(b) List out closure properties of Context Free Language. 2

(c) Comment on Determinstic PDA and Non – Determinstic PDA. 2

5. (a) Construct Turing Machine for the language $L(aba^*b)$. 5

(b) Construct Turing Machine for the language which consists of set of strings with equal number of 0's and 1's over $\{0, 1\}^*$. 5

OR

6. (a) Construct Turing Machine for the language
$L = \{ a^n b^n a^n \mid n \geq 1 \}$ 6

(b) Construct Turning Machine to find 2's Complement of a number. 4

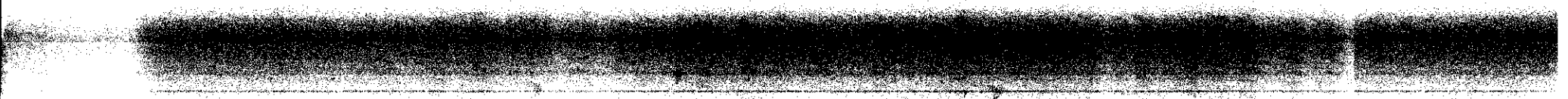
7. (a) Compare

(i) Recursive and Recursively Enumerable Language

(ii) Linear Bounded Automata and Turing Machine. 3

(b) Determine whether given instance of PCP has solution or not
$A = \{ b, babb, ba \}$ $B = \{ bb, ba, ba \}$
$A = \{ 1^2, 10^2, 1^3 \}$ $B = \{ 1^3, 0^2 1, 1^2 \}$ 4

(c) Calculate
(1) $A(1, 2)$ (2) $A(2, 2)$
by using Ackermann's function. 3



Course Code : MAT 245 **EIQU/RW – 16/1611**

Fourth Semester B. E. (Computer Science and Engineering/ Information Technology) Examination

DISCRETE MATHEMATICS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry equal marks.
(2) Due cretit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.
(5) Use of calcualtor is permitted.

1. Solve any **two** :—

(a) Draw Venn diagrams showing :

(i) $A \cup B \subset A \cup C$ but $B \not\subset C$

(ii) $A \cap B \subset A \cap C$ but $B \not\subset C$

(iii) $A \cup B = A \cup C$ but $B \neq C$

(iv) $A \cap B = A \cap C$ but $B \neq C$

where A, B, C are non – empty, not mutually disjoint sets. 5

(b) Let R be the relation of congruence modulo 5 on the set Z of integers denoted by $x \equiv y \pmod 5$ i. e. $x - y$ is divisible by 5. Prove that R is an equivalence relation. Also find all equivalence classes. 5

(c) Let functions f, g, h from N to N be defined by $f(n) = n + 2$, $g(n) = 2^n$, $h(n) =$ number of positive divisors of n. Decide which functions are

(i) one – to – one

(ii) onto

(iii) bijiective

(iv) neither

(v) Find $m(n) = \{ x \in \mathbb{N} : \tau(x) = 2 \}$ 5

2. Solve :—

(a) Let $A = \{1, 2, 3, 4, 5\}$, determine the truth value of each of the following statements :

(i) $(\exists x \in A)\ (x + 3 = 10)$

(ii) $(\forall x \in A)\ (x + 3 < 10)$

(iii) $(\exists x \in A)\ (x + 3 < 6)$

(iv) $(\forall x \in A)\ (x + 3 \leq 7)$ 4

(b) Test the validity of the following argument :
"If I study, then I will pass Mathematics. If I do not play Basketball, then I will study. But I will not pass Mathematics. Therefore I must have played Basketball". 3

(c) Show that : $(\neg p \rightarrow (\neg p \rightarrow q))) \Longleftrightarrow p \vee q$ without constructing truth table. 3

3. Solve any **two** :—

(a) Let $S = N \times N$. Let $*$ be a binary operation on S defined by $(a, b) * (c, d) = (ac, bd)$, $a, b, c, d \in N$.

(i) Show that $*$ is commutative.

(ii) Define $f : (S, *) \rightarrow (\mathbb{R}, \times)$ by $f(a, b) = \frac{a}{b}$;

show that f is a homomorphism. 5

(b) Let **H** be a subgroup of a group **G**, then prove that, the right cosets **Ha** form a partition of **G.** 5

(c) Define

(i) order of an element of a group

(ii) cyclic group

Find order of every element in the multiplicative group.
$G = \{ a , a^2 , a^3 , a^4 , a^5 , a^6 = e \}$ 5

4. Solve :—

(a) Define an integral domain.
Let D be an integral, show that if $ab = ac$ with $a \neq 0$ then $b = c$. 3

(b) Let J be an ideal in a ring R, then prove that the cosets $\{ a + J \mid a \in R \}$ form a ring under the coset operations $(a + J) + (b + J) = a + b + J$ and $(a + J)(b + J) = ab + J$. 4

(c) Let
$R = \left\{ \begin{bmatrix} a & b \\ b & a \end{bmatrix} \mid a , b \in Z \right\}$ and f be the mapping that takes $\begin{bmatrix} a & b \\ b & a \end{bmatrix}$ to $a - b$.
Show that f is a ring homomorphism. 3

5. Solve any **two** :—

(a) Let L be a bounded distributive lattice. Prove that complements are unique, if they exist. 5

(b) Define Sublattice.
Show with an example that the "Union of two sublattices may not be a sublattice". 5

(c) Construct the switching circuit for the Boolean expression $ABC + A'B + AB + AB'C$. Simplify and draw the equivalent circuit. 5

6. Solve :—

(a) Consider a tournament of n players where each player plays against every other player. Suppose each player wins at least once. Show that at least two of the players have the same number of wins. 3

(b) Solve the following recurrencce relation using generating function :
$$a_{n+2} + 2a_{n+1} - 15a_n = 6n + 10 , a_0 = 1 , a_1 = -0.5$$ 4

(c) Prove following Binomial coefficient identity :
$$\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1}$$ 3