Course Code : CST 206 **CIOU/RS – 16/3391**

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

OBJECT ORIENTED PROGRAMMING

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All question carry equal marks.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Mobile phones are prohibited in examination hall.

1. (A) What is object oriented programming ? How is it different from procedure oriented programming ? 3

(B) Write a java class that represents a clock (24 hour clock) that keeps track of time as hours, minutes and seconds. Provide constructor with parameters as hour, minute and second. Include methods that will allow user to set the time (i. e. change the hour, minute or second). Create a method display Time (int mode) to display the time of the clock, the display of which depends on the mode.
Mode 1 indicates time in 24 hour clock. Mode 2 indicates time in 12 hour clock. Write a class to include main ( ), create object of class clock and use all the methods. 5

(C) What is a constructor ? How is it different from function ? 2

2. (A) State true/false and justify :—

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

(2) Base class members can access derived class members.

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

(4) If a variable is declared in an interface, the value cannot be changed. 2

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

(C) Design package P1 to contain class arithmetic with member function as add ( ) and sub ( ). Create class Package Demo in package P2 which uses functionality add ( ) and sub ( ). 3

3. Solve any **two** :—

(A) Write a java program that accepts vehicle name and vehicle registeration number. The vehicle registration number should be in the format CC – 99 CC – 9999, C stands for character and 9 stands for number example : MH - 31 AZ – 8207. Throw user defined exception if registration number is not in the standard format. Use appropriate main ( ) and handle exception. 5

(B) Write a generic method to exchange the positions of two elements in an array.
Demonstrate the use of generic method with an integer array, string array and double array. 5

(C) Write a program to create an ArrayList of students. The student class contain name. marks of 3 subjects. Sort the ArrayList using comparator on total marks in descending order. 5

4. (A) Explain Runnable interface. 2

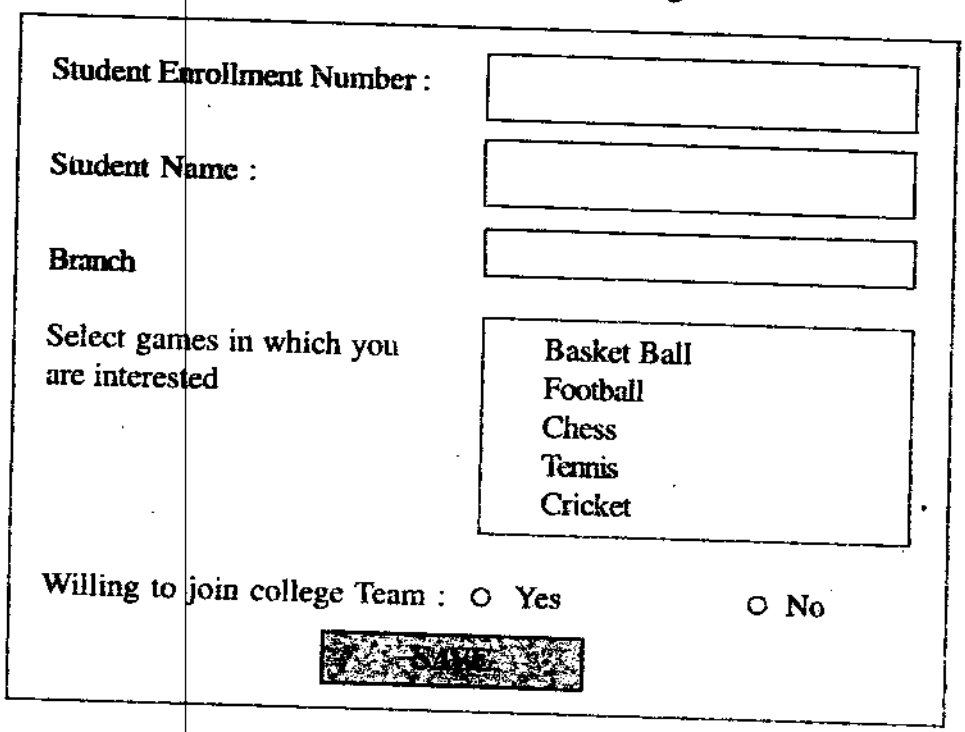
Solve any **two** :—

(B) What is the use of synchronized keyword ? Briefly explain with an example. 4

(C) Write a program to take input from user, change the case of the character and write it to file. Use character based streams. 4

(D) Write a program to read input from a file employee.txt. The format of Employee.txt is given as EmployeeName Basic Salary (Example : Ram Verma 5000). Compute HRA as 20% of Basic Salary, DA as 80% of Basic Salary. Compute Gross Salary as Basic + HRA + DA. Display the output. 4

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



7

(B) Explain JTable with an example. 3

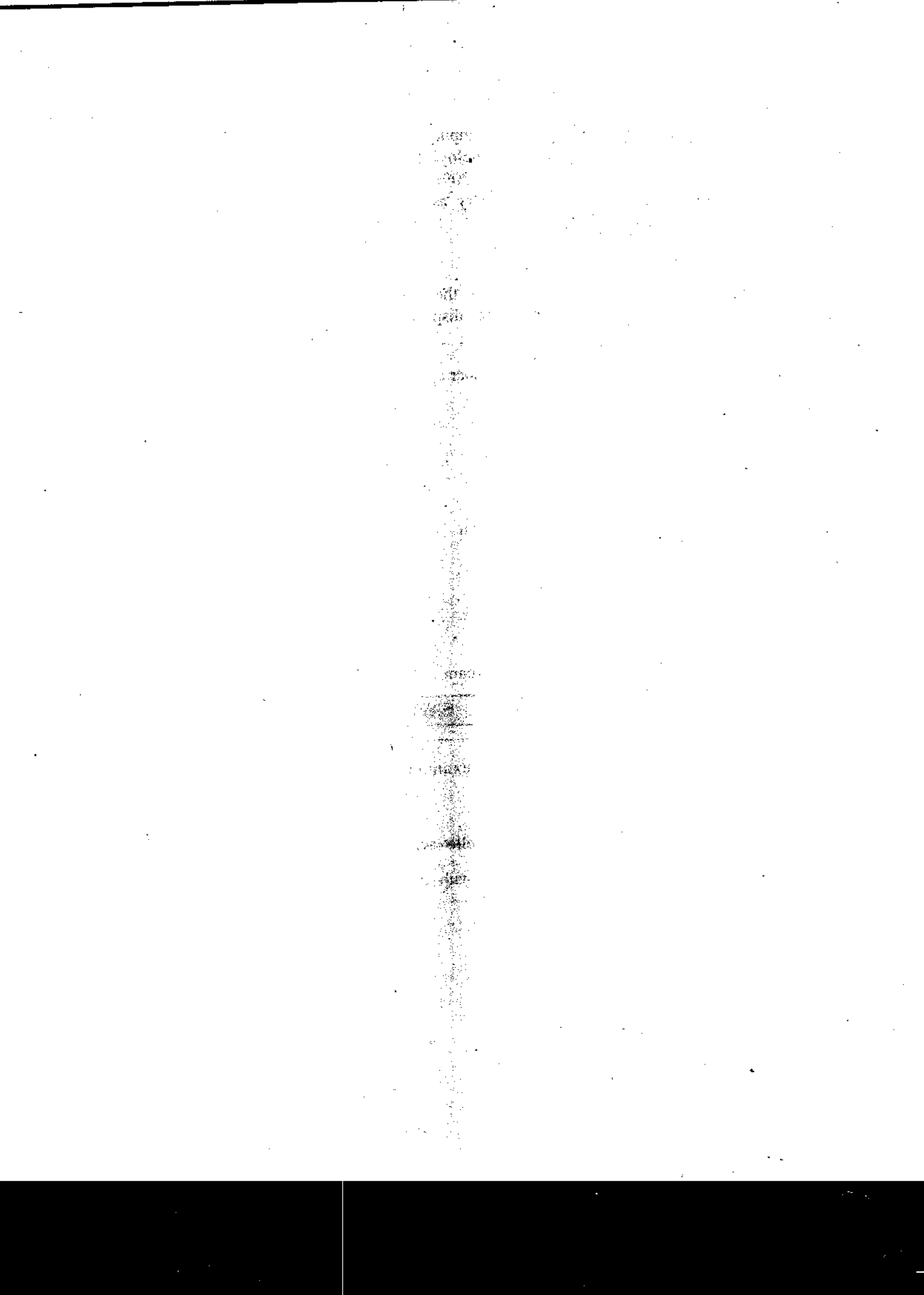
6. (A) Write a program to print hello world using servlet. 5

(B) Explain the following terms with example :—

(i) Connection.

(ii) Resultset.

(iii) Statement. 5



Course Code : CST 207

CIOU/RS – 16/3392

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

OPERATING SYSTEMS

Time : 3 Hours]

[Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry marks as shown.
(2) Due credit will be given to neatness.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of examples.
(5) Mobile phones are prohibited in examination hall.

1. Solve any **two** :—

(a) Explain Loosely coupled and Tightly coupled Systems with the help of diagram along with the application where one 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. (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

3. (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	9	0	5
P2	6	1	3
P3	5	2	2
P4	3	3	1
P5	4	4	4

Using Non preemptive SJF and 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. 2+3

(b) Explain process state diagram. 2

(c) Explain different multithreading models with advantages and disadvantages for each. 3

4. (a) Given the page reference string

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

How many page faults would occur for the following replacement algorithms for three and five frames ?

(1) FIFO (2) LRU (3) Optimal. 6

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

5. Solve any **two** :—

(a) Explain Bakery 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.

Contd.

Consider the following synchronization construct used by the processes :

```
/* P1 */                          /* P2 */
while (true) {                    while (true) {
 wants1 = true;                    wants2 = true;
 while (wants2 = true);            while (wants 1 = true);
/* Critical                       /* Critical
 Section */                         Section */
 wants1 = false;                   wants2 = false;
}                                 }
/* Remainder section */           /* Remainder section */
```

Here, wants 1 and wants 2 are shared variables, which are initialized to false. Which one of the following statements is TRUE about the above construct ? Explain your answer.

(a) It does not ensure mutual exclusion.

(b) It does not ensure bounded waiting.

(c) It required that processes enter the critical section in strict alternation.

(d) It does not prevent deadlocks, but ensures mutual exclusion. 5

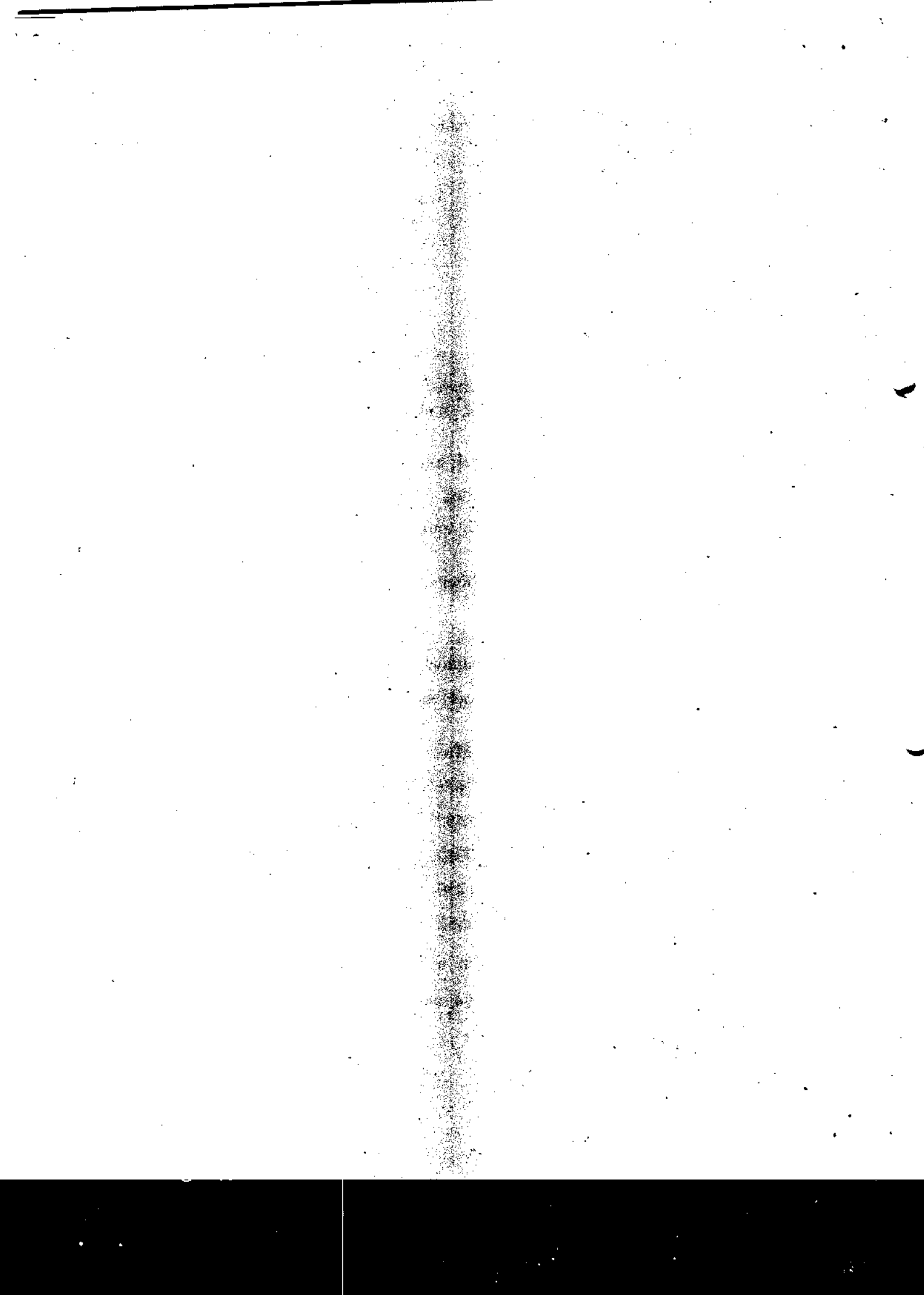
6. (a) What are the four necessary conditions for deadlock to occur ? 2

(b) A particular system uses the deadlock avoidance approach. At time t_0 the system state is :

Process	Allocation	Max	Available
P0	1004	1656	1520
P1	1422	2457	
P2	0012	0012	
P3	0210	1750	
P4	0632	0652	

Determine whether the system is in a safe state. 4

(c) Explain different operations performed on Access Matrix. 4



Course Code : CST 208 **CIOU/RS – 16 / 3393**

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) Due credit 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) Retain the construction lines.
(6) Mobile phones are prohibited in examination hall.

1. (a) Discuss the properties of relation. Explain equivalence relation with example. 3

(b) Attempt any **one** :—

(i) Discuss the Diagonalization principle with suitable example.

(ii) Explain the application of pigeon hole principle. 3

(c) Explain the principle of mathematical induction. Prove by mathematical induction $n^4 - 4n^2$ us divisible by 3 for $n >= 0$. 4

2. (a) Construct a Deterministic Finite Automata equivalent to the Finite automata whose transition table is defined by the following table. Hence find an optimized DFA :

Δ	a	B
q0	q1, q3	q2, q3
q1	q1	q3
q2	q3	q2
*q3	--	--

6

OR

(b) Compare Mealy machine and Moore machine. Convert the following Mealy machine into Moore machine :

Present State	Input = a		Input = b	
	State	Output	State	Output
Q0	Q2	1	Q3	0
Q1	Q0	0	Q1	1
Q2	Q1	1	Q2	0
Q3	Q2	0	Q0	1

6

(c) Solve any **Two** :—

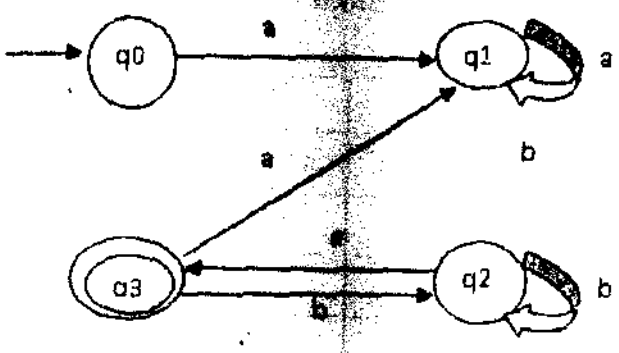
(i) Design Finite Automata over alphabet {0, 1} which accepts set of strings either starts with 01 or end with 01.

(ii) Design DFA accepting the set of strings over alphabet {0 1} such that in each string number of 0's is divisible by 5 and number of 1's is divisible by 3.

(iii) Design DFA for the language $L = \{Na(w) = 2,\ Nb(w) > 2,\ w \in [a,\ b]^*\}$.

(iv) Design a DFA for the language, contains strings in which leftmost symbol differs from the rightmost symbol. 4

3. (a) Find the regular expression corresponding to the automata given below :



4

(b) Construct Context free grammar for the language :

(i) $L = \{a, b\}^*$ where number of b's is one more than the number of a's.

(ii) $L = \{a, b\}^*$ consist of string containing equal number of a's and b's.

(iii) The regular expression $(a + b)^* a a (a + b)^*$. 3

(c) Attempt any **one** :—

(i) Prove that language $L = \{0^n | n \text{ is a perfect square}\}$ is not regular.

(ii) Convert the grammar with production rule into Chomsky Normal form :

$$S \longrightarrow AB \mid BC$$

$$A \longrightarrow aB \mid bA \mid a$$

$$B \longrightarrow bB \mid cC \mid b$$

$$C \longrightarrow c$$

3

4. Construct a Push Down Automata for the language $L = \{a^m b^n | n < m\}$ by null store. Construct the corresponding Context free grammar for Push down automata accepting the same set. 10

OR

5. (a) If A is a PDA accepting L by final state, find a PDA which accepts L by empty store with suitable example. 5

(b) Design Push down automata for the Context free grammar $S \rightarrow aSa \mid bSb \mid c$. Also slow the execution of abbcbba. 5

6. Design Turing machine that computes the following function :

$F(n, m) = n + m$ 10

OR

7. (a) Design Turing machine which accepts the language $L = \{w \text{ belongs to } (a, b)^* \mid w$ has equal number of a's and b's$\}$. 5

(b) Compare Recursive language and Recursive enumerable language. Show that the union of two recursive language is recursive. 5

8. (a) Find atleast three solution to Post Correspondence problem defined by the list $x = \{1, 10, 10111\}$, $y = \{111, 0, 10\}$. 3

(b) Discuss partial, total and primitive recursive function. Show that proper subtraction of two integers is a primitive recursive function :

$$\text{Sub } (x, y) = x - y \text{ if } x > y$$

$$= 0 \quad \text{otherwise.}$$ 4

(c) Show that HALTtm = {(M, w)| the Turing machine M halts on input w} is undecidable. 3

Course Code : HUT 201 **CIOU/RS – 16 / 3417**

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

TECHNICAL COMMUNICATION

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Due credit will be given to neatness and adequate dimensions.
(2) Assume suitable data wherever necessary.
(3) Illustrate your answers wherever necessary with the help of neat sketches.
(4) Mobile phones are prohibited in examination hall.

1. The National Commission on writing concluded that "in today's work place writing is a 'threshold skill', for hiring and promotion among the salaried employees. Survey results indicate that writing is a ticket to professional opportunity. While poorly written job applications are a figurative kiss of death." Explain the importance of technical communication as a significant factor in one's work experience in light of the statement given.

OR

Explain various collaborative writing tools used in technical communication. 10

2. What are three main parts of writing process ? Explain them.

OR

What guidelines should one follow to write to a multicultural audience ? 10

3. Explain effective document design in technical communication. 10

OR

(i) Describe the important components of a formal letter. 5

(ii) What are the skills examined in a group discussion during any recruitment process ? 5

4. (A) Revise the following sentences that are in sexist language:

(1) The President of the corporation, a woman, met with her sales staff.

(2) Throughout the history of mankind, each scientist has tried to make to his mark with a discovery of significant intellectual worth.

(3) All the system mangers and their wives attended the annual general body meeting.

(4) The CEO of Yahoo is a woman named Carol A. Bartz.

(5) Current tax regulations allow a head of household to deduct for the support of his children. 5

Cite the following source details in any two reference styles viz IEEE or MLA or APA or CSE

Authors : Robert B Cortell, James Jackmann, E M Kruger and Hugh Depp.

Title of the chapter: Random Patterns

Title of the book: Computers and We

Page numbers 57-78

Year: 2006

City: New York

Publisher: Orient Longman Publicatins. 2.5x2=5

(B) Attempt the following as per the instructions :

(1) Replace the following obscure words with alternate modern words: (any 5) :—

(a) In lieu of.

(b) Subsequent.

(c) supersede.

(d) Aforementioned.

(e) Initial.

(f) Remittance.

(g) Disclose. 5

(2) Fill in the blanks with appropriate forms of verb.

(a) If you send your order by fax, we ———— (deliver) the goods immediately.

(b) KARAN————(sign/already) the memorandum of understanding.

(c) Thank you for the letter ———— (dated/dating) 30th March 2012. 3

(C) Punctuate the following :—

Sunil the programming head of our team chose to lead the new project. 2

5. (A) You are Shamit/Shirin, Team leader, Research and development, Acme Inc. You have observed that some of the executives working under you in are not able to meet company's deadlines as a result of their lethargic approach towards work. This is affecting the Company's reputation in the market as well. Write a memo addressing this situation. 5

OR

Write a user manual on any **One** of the following :—

(B) (1) How to use Facebook ?

(2) How to use an electric kettle ? 5

IT

Course Code : MAT 245 **CIOU/RS – 16 /3418**

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

DISCRETE MATHEMATICS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry equal marks.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Mobile phones are prohibited in examination hall.
(4) Use of non programmable calcualtor is permitted.

1. Solve any **two** :—

(a) Prove that for any sets A, B and C

$$A \times (B - C) = (A \times B) - (A \times C)$$

(b) The following relations are defined on the set R of real numbers. Find whether these relations are reflexive, symmetric or transitive.

(i) aRb if and only if $|a - b| > 0$

(ii) aRb if and only if $1 - ab > 0$.

(c) Let f be a function from set $A = \{1, 2, 3, 4\}$ to set $B = \{a, b, c, d\}$. Determine whether f^{-1} is a function,

(i) $f = \{(1, a), (2, a), (3, c), (4, d)\}$

(ii) $f = \{(1, a), (2, c), (3, b), (4, d)\}$ 10

2. Solve any **two** :—

(a) Without using truth table find whether the following formula is tautology, contradiction or contingency

$(p \vee q) \wedge \neg (\neg p \wedge (\neg q \vee \neg r)) \vee (\neg p \wedge \neg q) \vee (\neg P \wedge \neg r)$

(b) State whether the argument given is valid or not. If it is valid, identify the tautology or tautologies on which it is based.
If it rains, then we will have a party today. If we do not have party today, then we will have a party tomorrow. We will have a party tomorrow. Therefore, if it rains, then we will have a party tomorrow.

(c) Obtain the principle disjunctive normal of the following formula
$p \rightarrow (p \wedge (q \rightarrow p)$ 10

3. Solve any **two** :—

(a) Let $(G , *)$ and $(G' , *')$ be groups and $f : G' \rightarrow G''$ be a homomorphism. Show that Kernel of f is a normal subgroup of a group G.

(b) Show that set of all positive rational numbers forms an abelian group under the composition defined by

$$a * b = \frac{ab}{2}$$

(c) If $(G , *)$ is a group of order n, then show that for any a in G, $a^n = e$, where e is the identity of the group G. 10

4. Solve any **two** :—

(a) Let R be the set of all even integers. Define addition as usual and multiplication by

$a\,b = \frac{ab}{2}$, show that R is a ring. Is there an identity in R ?

(b) Let $S = \{ [0], [2], [4], [6], [8] \}$, where $[n]$ denotes equivalence class of n modulo 10. Prove that S is a subring of Z_{10}. Also show that S has an identity which is different from that of Z_{10}.

(c) Show that the mapping defined by $f : Z \rightarrow M_2 (Z)$

$f(r) = \begin{bmatrix} r & 0 \\ 0 & r \end{bmatrix}$ is a homomorphism of rings. Find Ker (f), is the mapping an isomorphism ? 10

II.

5. (a) Construct the switching circuit of the following Boolean expression : $z(x' + y) + x'z' + (y + z)z'$. Simplify and construct an equivalent switching circuit. 5

(b) Let $(L, \leq)$ be any lattice. Then for any a, b, c in L, show that

(i) $a \vee (b \vee c) = (a \vee b) \vee c$

(ii) $a \vee (a \wedge b) = a$. 5

6. (a) Using generating function, solve the recurrence relation.

$a_n = a_{n-1} + n$, $a_0 = 1$. 5

(b) State generalized pigeonhole principle. 2

(c) If we select any group of 1000 students on campus, show that at least three of them must have the same birthday. 3