Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80096

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third/Fourth Semester

Computer Science and Engineering

CS 8392 — OBJECT ORIENTED PROGRAMMING

(Common to Computer and Communication Engineering/Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/ Information Technology)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Can a Java source file be saved using a name other than the class name? Justify.

2. What are inline functions? Give examples.

3. State the conditions for method overriding in Java.

4. Write the syntax for importing packages in a Java source file and give an example.

5. What happens when the statement: int value = 25/0; is executed?

6. Give an example for reading data from files using File Input Stream.

7. Sketch the lifecycle of a thread.

8. Give the syntax of a generic class with an example.

9. Write the class hierarchy for panel and frame.

10. State the purpose of getRed( ), getBlue( ) and getGreen( ) methods.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss the three OOP principles in detail. (7)

(ii) What are literals? Explain the types of literals supported by java. (6)

Or

(b) (i) Explain the selection statements in Java using suitable examples. (7)

(ii) Write a Java code using do-while loop that counts down to 1 from 10 printing exactly ten lines of "hello'. (6)

12. (a) Explain hierarchical and multi-level inheritances supported by Java and demonstrate the execution order of constructors in these types. (13)

Or

(b) (i) Explain simple interfaces and nested interfaces with examples. (7)

(ii) Present a detailed comparison between classes and interfaces. (6)

13. (a) (i) Give an example for nested try statements in Java source file and explain. (7)

(ii) Write a note on built-in exceptions. (6)

Or

(b) Create an IN file in Java to store the details of 100 students using a STUDENT class. Read the details from IN file, convert all the letters in IN file to lowercase letters and write it into OUT file. (13)

14. (a) Describe the creation of a single thread and multiple threads using an example. (13)

Or

(b) (i) Using an example, explain inter-thread communication in Java. (7)

(ii) Write a generic method for sorting an array of integer objects. (6)

15. (a) (i) Use graphics objects to draw an arc and a semicircle inside a rectangular box. (4)

(ii) Sketch the hierarchy of Java AWT classes and methods. Create a 'checkbox' using these classes and methods. (9)

Or

(b) (i) State the differences between AWT and swing. (4)

(ii) Present the hierarchy of Java swing classes and methods of component class. Create a simple 'combo box' in Java swing using the classes and methods. (9)

PART C — (1 × 15 = 15 marks)

16. (a) The following is a system that can be used to synchronize threads. In some shops a machine issues numbered tickets to customers and customers are served in numeric order.

* A ticket machine holds an integer, initially zero, and has a single atomic operation:

  turn( ) - which increments the integer and returns its previous value.

* A scheduler also holds an integer, initially zero, and has two atomic operations:

  next( ) - which increments the integer count

  queue(value) - suspends the calling thread until the count is atleast as large as the value given as an argument

Given a ticket machine, m, and a scheduler, s, a critical region could then be coded as follows:

```
number = m.turn( );
s.queue(number);
        .
        .        protected code
        .
s.next( );
```

Write Java classes Ticket Machine, with a turn method, and Scheduler, with next and queue methods to implement the system.

Or

(b) Define Java classes of your own without using any library classes to represent linked lists of integers. Provide it with methods that can be used to reverse a list and to append two lists.

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Question Paper Code : 80094

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third Semester

Computer Science and Engineering

CS 8351 – DIGITAL PRINCIPLES AND SYSTEM DESIGN

(Common to Electronics and Telecommunication Engineering/Information Technology)

(Regulation 2017)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Represent 3856 in BCD and 2421 code.

2. Simplify the following Boolean function.

   $F = x'y' + xy + x'y$.

3. Construct a full adder using two half adders and OR gate.

4. Write the truth table of 2 to 4 line decoder and draw its logic diagram.

5. State the difference between latches and flipflops.

6. What is meant by edge triggered flip flops?

7. Draw the logic diagram and write the function table of D Latch.

8. What is meant by race free condition in sequential circuits?

9. What are error detecting codes? Give examples.

10. List the advantages of using sequential programmable devices.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Convert the following numbers to decimal (4)

$(11011.101)_2, (5432)_6$.

(ii) Perform the following arithmetic operation using 2's complement arithmetic. (3)

$(11011100)_2 - (10011011)_2$.

(iii) Express the following functions in sum of minterms and product of maxterms. (6)

$F(ABCD) = A'B + BD + AC'$.

Or

(b) (i) Demonstrate by means of truth tables the validity of the DeMorgan's theorem for three variables: (4)

$(XYZ)' = X' + Y' + Z'$

(ii) Simplify the following Boolean functions by means of a 4-variable map $F(A, B, C, D) = \sum m(0, 2, 4, 5, 8, 10, 14, 15)$. (5)

(iii) Implement the following Boolean function only with NAND gates, using a minimum number of gate inputs: $F(A, B, C, D) = AB + CD$. (4)

12. (a) (i) Design of 4 bit binary adder-subtractor circuit. (5)

(ii) Design a combinational circuit that accepts a 3-bit number and generates a 6-bit binary number output equal to the square of the input number. Write a high-level behavior VHDL description for the circuit. (8)

Or

(b) (i) Explain the Logic Diagram of a 4-Input Priority Encoder. (8)

(ii) Implement the following Boolean function with an 8–to–1–line multiplexer and an inverter. $F(A, B, C, D) = \sum (2, 4, 6, 9, 10, 11, 15)$. (5)

13. (a) (i) Describe the operations of R-S flip flop with a neat sketch. (5)

(ii) Design a sequential circuit with two D flip- flops A and B and one input X. When $X = 0$, the state of the circuit remains the same. When $X = 1$, the circuit goes through the state transitions from 00 to 10 to 11 to 01, back to 00 and then repeats. (8)

Or

(b) (i) Construct a clocked Master Slave J-K Flip flop and explain. (5)

(ii) A sequential circuit with two D flip- flops A and B, two inputs X and Y, and one output Z is specified by the following input equations: (8)

$$A(t+1) = x'y + xA$$
$$B(t+1) = x'B + xA$$
$$z = B$$

Draw the logic diagram of the circuit. Derive the state table and state diagram and state whether it is a Mealy or a Moore machine.

14. (a) (i) Write the difference between synchronous and asynchronous sequential circuit. (4)

(ii) Outline the procedure for analyzing asynchronous sequential circuit. (9)

Or

(b) (i) Discuss about the possible hazards and methods to avoid them in combinational circuits. (5)

(ii) Discuss about the possible hazards in sequential circuits. (8)

15. (a) (i) Discuss briefly about RAM and its types. (5)

(ii) Explain the logical construction of a 256 × 8 RAM using 64 × 8 RAM chips. (8)

Or

(b) (i) Given the 8 bit data word 10011010 generate the 13 bit composite word for the Hamming code that corrects single errors and detect double errors. (4)

(ii) Implement the following two Boolean functions with a PLA: (9)

$$F1(A, B, C) = AB' + AC + A'BC'$$

$$F2(A, B, C) = (AC + BC)'.$$

PART C — (1 × 15 = 15 marks)

16. (a) (i) Design a BCD to excess-3 code converter and explain. (8)

(ii) Draw and explain the logic circuit of a 4-bit magnitude comparator. (7)

Or

(b) (i) Explain the operations of a 4-bit bidirectional Shift Register. (8)

(ii) Write the VHDL code for a 4-bit binary –up counter and explain. (7)

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Question Paper Code : 80212

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third Semester

Computer Science and Engineering

MA 8351 — DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Write the inverse of the statement, "If you work hard then you will be rewarded".

2. If the universe of discourse consists of all real numbers and if $p(x)$ and $q(x)$ are given by $p(x): x \geq 0$ and $q(x): x^2 \geq 0$, then determine the truth value of $(\forall x)(p(x) \rightarrow q(x))$.

3. Prove that if n and k are positive integers with $n = 2k$, then $\frac{n!}{2^k}$ is an integer.

4. How many solutions does the equation, $x_1 + x_2 + x_3 = 11$ have, where x_1, x_2 and x_3 are non-negative integers?

5. If G is a simple graph with $\delta(G) \geq \frac{|V(G)|}{2}$ then show that G is connected.

6. Give an example of a graph which is Hamiltonian but not Eulerian.

7. Is it true that $(\mathbb{Z}_5^*, \times_5)$ a cyclic group? Justify your answer.

8. Prove that group homomorphism preserves identity.

9. Show that in a lattice if $a \leq b$ and $c \leq d$ then $a * c \leq b * d$.

10. Is it true that every chain with at least three elements is always a complemented lattice? Justify your answer.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Obtain the principal conjective normal form of the formula $(\neg P \rightarrow R) \wedge (P \rightarrow Q) \wedge (Q \rightarrow P)$. (6)

(ii) Using indirect method, show that $R \rightarrow \neg Q$, $R \vee S$, $S \rightarrow \neg Q$, $P \rightarrow Q \Rightarrow \neg P$. (10)

Or

(b) (i) Show that the premises "A student in this class has not read the book" and "Everyone in this class passed the Semester Exam" imply the conclusion "Someone who passed the Semester Exam has not read the book". (10)

(ii) Prove that $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x) P(x) \wedge (\exists x) Q(x)$. (6)

12. (a) (i) Let $m \in Z^+$ with m odd. Then prove that there exists a positive integer n such that m divides $2^n - 1$. (6)

(ii) Determine the number of positive integers n, $1 \leq n \leq 2000$ that are not divisible by 2, 3 or 5, but are divisible by 7. (10)

Or

(b) (i) Using mathematical induction, prove that every integer $n \geq 2$ is either a prime number or product of prime numbers. (6)

(ii) Using generating function method solve the recurrence relation, $a_{n+2} - 2a_{n+1} + a_n = 2^n$, where $n \geq 0$, $a_0 = 2$ and $a_1 = 1$. (10)

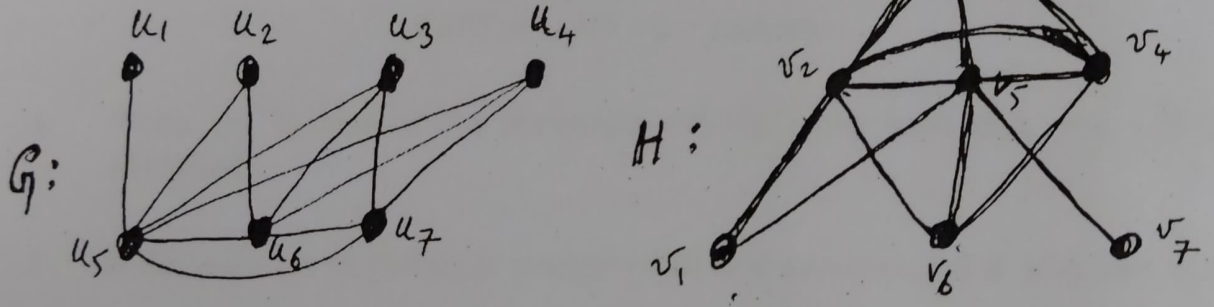
13. (a) (i) Let G be a graph with adjacency matrix A with respect to the ordering of vertices $v_1, v_2, v_3, \ldots, v_n$. Then prove that the number of different walks of length r from v_i to v_j, where r is a positive integer, equals to $(i, j)^{th}$ entry of A^r. (8)

(ii) Show that the complete bipartite graph $K_{m,n}$, with $m, n \geq 2$ is Hamiltonian if and only if $m = n$. Also show that the complete graph K_n is Hamiltonian for all $n \geq 3$. (8)

Or

(b) (i) Define incidence matrix of a graph. Using the incidence matrix of a graph G, show that the sum of the degrees of vertices of a graph G is equal to twice the number of edges of G. (6)

(ii) When do we say two simple graphs are isomorphic? Check whether the following two graphs are isomorphic or not. Justify your answer. (10)



14. (a) (i) Prove that every subgroup of a cyclic group is cyclic. (6)

(ii) Prove that every finite group of order n is isomorphic to a permutation group of degree n. (10)

Or

(b) (i) Define monoid. Give an example of a semigroup that is not a monoid. Further prove that for any commutative monoid $(M, *)$, the set of idempotent elements of M form a submonoid. (8)

(ii) Let $(G, *)$ be a group and let H be a normal subgroup of G. If G/H be the set $\{aH \mid a \in G\}$ then show that $(G/H, \otimes)$ is a group, where $aH \otimes bH = (a * b)H$, for all $aH, bH \in G/H$. Further, show that there exists a natural homomorphism $f : G \to G/H$. (8)

15. (a) (i) If (A, R) is a partially ordered set then show that the set (A, R^{-1}) is also a partially ordered set, where $R^{-1} = \{(b, a) / (a, b) \in R\}$. (6)

(ii) Let $(L, *, \oplus)$ and $(M, \wedge, \vee)$ be two lattices. Then prove that $(L \times M, \Delta, \nabla)$ is a lattice, where $(x, y)\Delta(a, b) = (x * a, y \wedge b)$ and $(x, y)\nabla(a, b) = (x \oplus a, y \vee b)$, for all $(x, y), (a, b) \in L \times M$. (10)

Or

(b) (i) Prove that in every lattice distributive inequalities are true. (8)

(ii) Define modular lattice. Prove that a lattice L is modular if and only if $x, y \in L$, $x \oplus (y * (x \oplus z)) = (x \oplus y) * (x \oplus z)$. (8)

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Question Paper Code : 25061

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third Semester

Computer Science and Engineering

CS 8392 — OBJECT ORIENTED PROGRAMMING

(Common to : Information Technology/ Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Objects and classes in java.

2. Define access specifier.

3. What is object cloning?

4. What is class hierarchy? Give example.

5. Define runtime exceptions.

6. What is the use of assert keyword?

7. What is multithreading?

8. What is the need for generic code?

9. What is meant by window adapter classes?

10. Enumerate the features of AWT in Java.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the characteristics of OOPs. (6)

(ii) Explain the features and the characteristics of JAVA. (7)

Or

(b) (i) What is method? How method is defined? Give example. (6)

(ii) State the purpose of finalize() method in java? With an example explain how finalize() method can be used in java program. (7)

12. (a) Define Inheritance. With diagrammatic illustration and java programs illustrate the different types of inheritance with an example. (13)

Or

(b) Write a Java program to create a student examination database system that prints the mark sheet of students. Input student name, marks in 6 subjects. This mark should be between 0 and 100.

If the average of marks is > = 80 then prints Grade 'A'.

If the average is <80 and > = 60 then prints Grade 'B'.

If the average is <60 and > = 40 then prints Grade 'C'.

else prints Grade 'D'. (13)

13. (a) Explain the different types of exceptions and the exception hierarchy in java with appropriate examples. (13)

Or

(b) What are input and output streams? Explain them with illustrations. (13)

14. (a) Explain in detail the different states of a thread. (13)

Or

(b) Demonstrate Inter thread Communication and suspending, resuming and stopping threads. (13)

15. (a) State and explain the basic of AWT Event handling in detail. (13)

Or

(b) Describe in detail about the different layout in Java GUI. Which layout is the default one? (13)

PART C — (1 × 15 = 15 marks)

16. (a) Create a Bank database application program to illustrate the use of multithreads.

Or

(b) Code a java program to implement the following: Create four check boxes. The initial state of the first box should be in checked state. The status of each check box should be displayed. when we change the state of a check box, the status should be display is updated.

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Question Paper Code : 25139

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third Semester

Computer Science and Engineering

MA 8351 — DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Construct the truth table for the following $P \wedge (P \vee Q)$.

2. Let $Q(x,y,z)$ denote the statement "$x+y=z$" defined on the universe of discourse Z, the set of all integers. What are the truth values of the propositions $Q(1,1,1)$ and $Q(1,1,2)$.

3. Show that in any group of 8 people at least two have birthdays which falls on same day of the week in any given year.

4. Solve $a_n - 5a_{n-1} + 6a_{n-2} = 0$.

5. An undirected graph G has 16 edges and all the vertices are of degree 2. Find the number of vertices?

6. Define incidence matrix of a simple graph.

7. Prove that in any group, identity element is the only idempotent element.

8. Let $f:(G,*) \to (G',\Delta)$ be a group homomorphism. Then prove that $[f(a)]^{-1} = f(a^{-1}), \forall a \in G$.

9. Define partial ordered set.

10. Determine whether D_8 is a Boolean algebra?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the principle disjunctive normal form (PDNF) of

$(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$ without using truth table also find its Principle conjunctive normal form. (8)

(ii) Show that if x and y are integers and both xy and $x + y$ are even, then both x and y are even. (8)

Or

(b) (i) Show that $(P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R)) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a tautology without using truth table. (8)

(ii) Show that the premises "A student in this class has not read the book" and "Everyone in this class passed the first examination" imply the conclusion "Someone who passed the first examination has not read the book". (8)

12. (a) (i) Prove by mathematical induction. (8)

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

(ii) Solve the recurrence relations $S(n) = S(n-1) + 2S(n-2)$ with $S(0) = 3, S(1) = 1; n \geq 2$ using generating function. (8)

Or

(b) (i) Find the number of integers between 1 to 100 that are not divisible by any of the integers 2,3,5 or 7. (8)

(ii) How many permutations can be made out of the letters of the word "Basic"? How many of these (8)

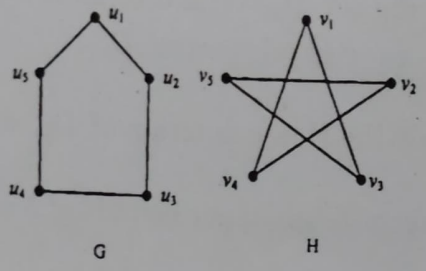
(1) Begin with B?

(2) End with C?

(3) B and C occupy the end places?

13. (a) (i) Prove that for a bipartite graph with n vertices has maximum of $\frac{n^2}{4}$ edges. (8)

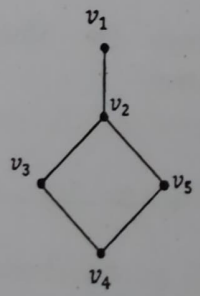
(ii) Establish the isomorphic for the following graphs. (8)



G H

Or

(b) (i) Define a subgraph. Find all the subgraphs of the following graph by deleting an edge. (8)



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(ii) Prove that a connected graph has an Euler path if and only if and only if it has exactly two vertices of odd degree. (8)

14. (a) (i) Let $< S, * >$ be a semi group such that for $x, y \in S, x * x = y$, where $S = \{x, y\}$. Then prove that (8)

(1) $x * y = y * x$

(2) $y * y = y$

(ii) Find all the non-trivial subgroups of $(Z_{12}, +_{12})$. (8)

Or

(b) (i) Prove that $G = \{[1], [2], [3], [4]\}$ is an abelian group under multiplication modulo 5. (8)

(ii) Prove that intersection of two normal subgroups of a group G is again a normal subgroup of G. (8)

15. (a) (i) State and prove distributive inequalities in lattices. (8)

(ii) Prove that every chain is a distributive lattice. (8)

Or

(b) (i) Consider the set $D_{50} = \{1,2,5,10,25,50\}$ and the relation divides ($/$) be a partial ordering relation on D_{50}. (8)

(1) Draw the Hasse diagram of D_{50} with relation divides.

(2) Determine all upper bounds of 5 and 10.

(3) Determine all lower bounds of 5 and 10.

(4) Determine LUB. of 5 and 10.

(5) Determine GLB. of 5 and 10.

(ii) State and prove De Morgan's laws in complemented and distributive lattice. (8)

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Question Paper Code : 25059

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third Semester

Computer Science and Engineering

CS 8351 — DIGITAL PRINCIPLES AND SYSTEM DESIGN

(Common to Electronics and Telecommunication Engineering / Information Technology)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the classification of binary codes.
2. Define Associative law.
3. Draw 1:8 Demultiplexer using two 1:4 Demultiplexers.
4. What is propagation delay?
5. State the operation of T flip-flop.
6. Mention the different types of shift registers.
7. What is race around condition?
8. Define state table.
9. List the major differences between PLA and PAL.
10. What is field programmable logic array?

PART B — (5 × 13 = 65 marks)

11. (a) Write short notes on Demorgan's theorem, Absorption law and Consensus law. (13)

Or

(b) (i) Convert the following Boolean expression into standard SOP form :

$AB'C + A'B' + ABC'D$ (6)

(ii) Express the Boolean function $F = A + B'C$ in a sum of minterms (SOP). (7)

12. (a) Explain in detail about encoders and decoders. (13)

Or

(b) Design 32 to 1 multiplexer using four 8 to 1 multiplexer and 2 to 4 decoder. (13)

13. (a) Design and implementation of SR Flip-Flop using NOR gate. (13)

Or

(b) Explain in detail about 4 bit Johnson counter. (13)

14. (a) Find the circuit that has no static hazards and implement the Boolean function $F(A,B,C,D) = \sum m(1, 5, 6, 7)$. (13)

Or

(b) What are called as essential hazards? How does the hazard occur in sequential circuits? How can the same be eliminated using SR latches? Give an example. (13)

15. (a) Illustrate with neat sketch and describe the categories of RAM. (13)

Or

(b) With neat diagrams describe the working principle of Programmable Array Logic. (13)

PART C — ($1 \times 15 = 15$ marks)

16. (a) Design a decade counter using JK Flip flops using IC 74LS112D. (15)

Or

(b) Declare a module that describe a circuit that is specified with the following two Boolean expressions : (15)

$E = A + BC + B'D$

$F = B'C + BC'D$.

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Question Paper Code : 90151

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Computer Science and Engineering

CS 8351 – DIGITAL PRINCIPLES AND SYSTEM DESIGN

(Common to Electronics and Telecommunication Engineering/Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What is the main difference between canonical and standard form ?
2. Given two binary numbers A = 1010010 and B = 1000011, find A – B and B – A using 2's complements.
3. What is multiplexer ? Show the block diagram of 4 × 1 multiplexer.
4. What is magnitude comparator ?
5. Why is the stimulus signals in a test bench be synchronized to the inactive edge of the clock of the sequential circuit that is to be tested ?
6. Differentiate between synchronous and asynchronous sequential circuit.
7. What is hazard and what is the cause of hazard in combinational and sequential circuits ?
8. What are the needs for asynchronous circuits ?
9. How many 32K × 8 RAM chips are needed to provide a memory capacity of 512K bytes ?
10. Compare SRAM and DRAM.

PART – B (5×13=65 Marks)

11. a) Simplify the following Boolean function into (i) sum-of-products form and (ii) product-of-sums form and implement the simplified functions using AND, OR gates $F(A, B, C, D) = \Sigma(0, 1, 2, 5, 8, 9, 10)$. (13)

(OR)

b) What are universal gates ? Construct any four basic gates using only NOR gates and using only NAND. (13)

12. a) What is BCD adder ? Design an adder to perform arithmetic addition of two decimal digits in BCD. (13)

(OR)

b) i) Design a 4-bit adder/subtractor circuit and explain. (8)

ii) Implement Boolean function $F(x, y, z) = \Sigma(1, 2, 6, 7)$ using multiplexer. (5)

13. a) Design a 3-bit binary counter using T flip flops. (13)

(OR)

b) i) What are registers ? Construct a 4-bit register using D flip-flops and explain the operations on the register. (7)

ii) With diagram explain how two binary numbers are added serially using shift registers. (6)

14. a) Draw the block diagram of a typical asynchronous sequential circuit and explain. Also write the procedure for obtaining transition table from circuit diagram of an asynchronous sequential circuit. (13)

(OR)

b) An asynchronous sequential circuit is described by the following excitation and output functions :

$Y = x_1x'_2 + (x_1 + x'_2)y$

$Z = y$

i) Draw the logic diagram of the circuit. (6)

ii) Derive the transition table and output map. (7)

15. a) What is PLA ? Draw a PLA circuit to implement the Boolean functions : (13)

$F1 = AB' + AC + A'BC'$

$F2 = (AC + BC)'$

(OR)

b) What is ROM and why is it necessary to use ROM in a computer ? Explain various types of ROM in detail. (13)

PART – C

(1×15=15 Marks)

16. a) A sequential circuit with two D flip-flops A and B, two inputs x and y; and one output z is specified by the following next-state and output equations :

$A(t+1) = xy' + xB$

$B(t+1) = xA + xB'$

$z = A$

i) Draw the logic diagram of the circuit. **(8)**

ii) List the state table for the sequential circuit. **(4)**

iii) Draw the corresponding state diagram. **(3)**

(OR)

b) Design a combinational circuit that converts a four-bit Gray code to a four-bit binary number using exclusive-OR gates.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90152

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Computer Science and Engineering

CS8391 – DATA STRUCTURES

(Common to : Computer and Communication Engineering/Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define Linked List.
2. Define an Abstract Data Type.
3. List the applications of stacks.
4. State the rules to be followed during infix to postfix conversions.
5. What do you mean by level of the tree ?
6. Define a binary search tree.
7. What is meant by strongly connected in a graph ?
8. Define adjacency list.
9. What do you mean by internal and external sorting ?
10. Define radix sort.

PART – B (5×13=65 Marks)

11. a) Explain the insertion operation linked list. How nodes are inserted after a specified node ?

(OR)

b) What are the applications of linked list in dynamic storage management ?

12. a) Write an algorithm for Push and Pop operations on Stack using Linked list.

(OR)

b) What is a DeQueue ? Explain its operation with example.

13. a) Explain the tree traversal techniques with an example.

(OR)

b) How to insert and delete an element into a binary search tree and write down the code for the insertion routine with an example.

14. a) Explain depth first and breadth first traversal.

(OR)

b) Explain the various applications of Graphs.

15. a) Write an algorithm to implement selection sort with suitable example.

(OR)

b) Write an algorithm for binary search with suitable example.

PART – C **(1×15=15 Marks)**

16. a) There are 'N' numbers of balls in the box. The colours of the balls are red and blue. You are requested to stack the balls in the bottom sealed basket one by one. The order of placing the balls is two consecutive red balls followed by the two consecutive blue balls. Later, Create two empty queues Q1 and Q2. Remove the last inserted ball from the basket and place it in Q1. Similarly remove the next ball from the basket and insert in Q2. Develop a program to repeat this process until the basket is empty and also print the colour of the balls in both queues.

(OR)

b) Implement a priority queue using linked list.

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90153

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Third/Fourth/Fifth Semester
Computer Science and Engineering
CS 8392 – OBJECT ORIENTED PROGRAMMING
(Common to Electrical and Electronics Engineering/Computer and Communication Engineering/Electronics and Communication Engineering/ Electronics and Instrumentation Engineering/Electronics and Telecommunication Engineering/Instrumentation and Control Engineering/Information Technology)
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What is access specifier ?
2. What is javadoc ?
3. What is object cloning ?
4. Describe the uses of interfaces in Java.
5. What is exception handling ?
6. What is the use of assert key word ?
7. Describe the various states of thread.
8. "Thread is a light weight process" – Comment.
9. Write the code segment to handle two mouse events.
10. What are the purposes of JPanel.

PART – B

(5×13=65 Marks)

11. a) Explain the various features of java in detail.

(OR)

b) What is JVM ? Explain the internal architecture of JVM with neat sketch.

12. a) Explain in detail about various types of inheritance in java with neat diagram.

(OR)

b) What is an abstract class ? Illustrate with an example to demonstrate abstract class.

13. a) Explain different types of exceptions in java.

(OR)

b) Explain in detail about the following with sample program :

i) Reading from a file

ii) Writing in a file.

14. a) What is a thread ? Explain multithreading and multitasking in detail.

(OR)

b) What is t synchronization ? Explain the different types of synchronization in java.

15. a) Describe in detail about the different layouts in Java GUI. Which layout is the default one ?

(OR)

b) Discuss mouse listener and mouse motion listener. Give an example program.

PART – C

(1×15=15 Marks

16. a) Develop a java program to find a smallest number in the given array by creating one dimensional array and two dimensional array using new operator.

(OR)

b) Create a simple real life application program in Java to illustrate the use of multithreads.

Reg. No. : | | | | | | | | | | | |

Question Paper Code : 25060

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third Semester

Computer Science and Engineering

CS 8391 – DATA STRUCTURES

(Common to Information Technology / Computer and Communication Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the advantage of ADT.
2. What are the disadvantage of linked list over array?
3. What are the application of stacks?
4. What are priority queues? What are the ways to implement priority queue?
5. For the tree in Figure 1.
   (a) List the siblings for node E.
   (b) Compute the height.

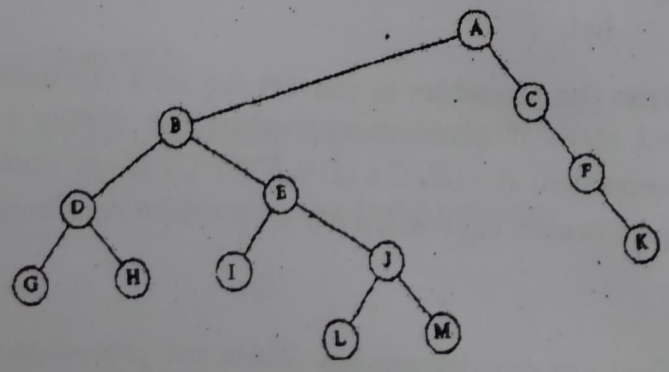

Figure 1

6. Show the result of in order traversal of the binary search tree given in Figure 2.

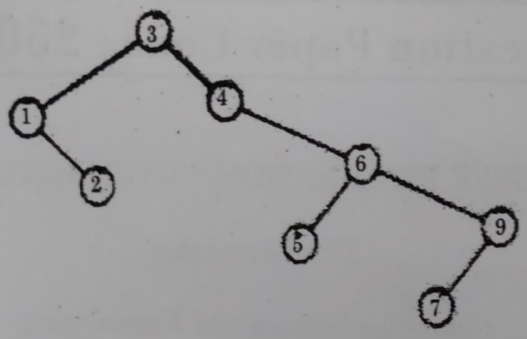

Figure 2

7. What are the representation of the graphs?

8. Define Euler circuits.

9. What are the advantage and disadvantage of separate chaining and linear probing?

10. State the complexity of binary search.

PART B — (5 × 13 = 65 marks)

11. (a) (i) State the polynomial representation for $6x^3 + 9x^2 + 7x + 1$ using linked list. Write procedure to add and multiply two polynomial and explain with suitable example. (7)

(ii) What are the ways to insert a node in linked list? Write an algorithm for inserting a node before a given node in a linked list. (6)

Or

(b) (i) What are the various operations on array? Write a procedure to insert an element in the middle of the array. (7)

(ii) Write a procedure to deleting the last node from a circular linked list. (6)

12. (a) Write the procedure to convert the infix expression to postfix expression and steps involved in evaluating the postfix expression. Convert the expression $A-(B/C+(D\%E^*F)/G)^*H$ to postfix form. Evaluate the given postfix expression 9 3 4 * 8 + 4 / –.

Or

(b) What are circular queues. Write the procedure to insert an element to circular queue and delete an element from a circular queue using array implementation.

13. (a) Write the following routines to implement the basic binary search tree operations.

(i) Perform search operation in binary Search Tree.

(ii) Find_min and Find_max.

Or

(b) Distinguish between B Tree and B+ tree. Create a B tree of order 5 by inserting the following elements: 3, 14, 7, 1, 8, 5, 11, 17, 13, 6, 23, 12, 20, 26, 4, 16, 18, 24, 25, and 19.

14. (a) Distinguish between breadth first search and depth first search with example.

Or

(b) State and explain topological sort with suitable example.

15. (a) (i) State and explain the shell sort. State and explain the algorithm for shell sort. Sort the elements using shell sort. (7)

(ii) Explain Open Addressing in detail. (6)

Or

(b) (i) Distinguish between linear search and binary search. State and explain the algorithms for both the search with example. (7)

(ii) Explain Rehashing and extendible hashing. (6)

PART C — ($1 \times 15 = 15$ marks)

16. (a) What are expression Trees. Write the procedure for constructing an expression Tree.

Or

(b) Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function $h(x) = x \pmod{10}$, show the resulting

(i) open hash table

(ii) closed hash table using linear probing

(iii) closed hash table using quadratic probing

(iv) closed.

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 25079

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third Semester

Computer Science and Engineering

EC 8395 — COMMUNICATION ENGINEERING

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the relationship between phase modulation and frequency modulation?

2. A signal $m(t)$, band limited to 5 kHz is multiplied by a carrier wave $\cos(w_c t)$ to yield a DSB-SC signal $S(t)$. For what value of the carrier frequency, will the bandwidth of $S(t)$ be 2% of f_c.

3. What is sampling and quantization?

4. What is meant by aliasing? How do you avoid aliasing?

5. Draw the modulated waveform representing PSK and FSK.

6. Explain the term 'ISI'? How do you alleviate ISI?

7. Define entropy.

8. What is prefix code? Give examples.

9. What is Viterbi decoding?

10. What is the aim of error control coding? List the different error control mechanisms.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss the generation of SSB using Filter and phasing method. (8)

(ii) Compare AM and Narrow band FM with phasor diagram and expressions. (5)

Or

(b) Derive the expression for AM. Draw the spectrum and phasor diagram. Draw the waveform representing modulating signal, carrier signal and modulated signal for AM. (13)

12. (a) Explain the steps involved in PCM encoder and decoder. Derive the expression for signal to noise ratio for PCM. (13)

Or

(b) Draw the block diagram of delta modulation and explain the working principle. Discuss the distortion occuring in delta modulation with neat waveform. Explain the ways to overcome the distortion. (13)

13. (a) Discuss the operation of QPSK modulator with neat diagram. Draw its phasor and constellation diagram. (13)

Or

(b) Define DPSK. Draw the waveform representing DPSK. With neat diagram, explain the generation and detection of DPSK with neat block diagram. (13)

14. (a) (i) A source produces three symbols A, B and C with probabilities $P(A)=1/2$, $P(B)=1/4$, $P(c)=1/4$. Determine the source entropy. (4)

(ii) Find the entropy of a binary memory less source and find when it is maximum. (9)

Or

(b) (i) Explain Shannon's channel capacity theorem.

(ii) A transmission channel has a bandwidth of 4 KHz and signal to noise power ratio of 31.

(1) how much should the bandwidth be in order to have the same channel capacity, if S/N ratio is reduced to 15?

(2) what will be the signal to noise power ratio required if the bandwidth is reduced to 3 KHZ.

15. (a) (i) What are PN sequences? What are the properties of PN sequences? (4)

(ii) What are the differences between FHSS and DSSS? (4)

(iii) What are the advantages of spread spectrum? (5)

Or

(b) Explain the various multiple access techniques with neat diagram. List the advantages and disadvantages of each technique. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Explain the modulation technique which is used for television signal transmission. Draw the spectrum. Explain the generation and detection of the same. List the advantages and disadvantages. (15)

Or

(b) Discuss the working principle of Superhetrodyne receiver? Explain the following terms

(i) Sensitivity

(ii) Selectivity

(iii) Image signal. (15)

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Question Paper Code : 90181

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Third/Fourth Semester
Computer Science and Engineering
EC 8395 – COMMUNICATION ENGINEERING
(Common to Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)
(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. For an AM-DSBFC wave with a peak unmodulated carrier voltage Vc = 10 Vp, a load resistance R_L = 1 ohm and a modulation coefficient m = 1. Determine power of the carrier and the USB, LSB, total sideband power.

2. A carrier wave of amplitude 10 V and frequency 100 MHz is frequency modulated by a sinusoidal voltage. The modulating voltage has amplitude of 5 V and frequency fm = 20 KHz. Frequency deviation constant is 2 KHz/V. Given : J_0 = 0.94, J_1 = 0.24, J_2 = 0.03. Draw the FM spectrum.

3. Define sampling theorem.

4. Bandwidth of the input to PCM system is restricted to 4 KHz. The input varies from 3.8 V to –3.8 V and has average power of 30 mW. The required signal to quantization noise power ratio is 20 dB. The modulator produces binary output. Assume uniform quantization. Calculate the number of bits required / sample.

5. Consider the data bit sequence 10111010. Sketch the nature of wave transmitted by BPSK transmitter.

6. State the necessity of equalizers.

7. A message source generating four message with probabilities 0.5, 0.25, 0.125 and 0.125. Calculate the entropy of source.

8. A discrete memory less source has the letters A, B, C, D, E, F and G with corresponding probabilities {0.08, 0.2, 0.12, 0.15, 0.03, 0.02, 0.4}. Devise a Huffman code for the above source and determine the average length of the code word.

9. List the advantages of spread spectrum modulation.

10. What do you mean by jamming margin ?

PART – B **(5×13=65 Marks)**

11. a) With a neat sketch, explain the working of a super heterodyne receiver.

(OR)

b) Outline the principle of slope detector and explain the operation of balanced slope detector method of FM demodulation technique.

12. a) Explain the basic elements of a PCM system in detail. 15

(OR)

b) Outline Delta modulation transmitter and receiver blocks in detail and comment on the quantization noise.

13. a) Discuss on the operation of balanced modulator, and say how the second order harmonics are eliminated in the QPSK receiver. 16

(OR)

b) Explain Duobinary signaling scheme. Draw the frequency response and impulse of duobinary scheme. How modified Duobinary scheme overcomes the basic method ?

14. a) The parity check matrix of a particular (7,4) linear block code is given by

$$[H] = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

i) Find the generator matrix (G).

ii) List all the code vectors.

iii) What is the minimum distance between code vectors ?

iv) How many errors can be detected ? How many errors can be corrected ?

(OR)

rks) b) For a data compression technique, performance of Huffman coding and Shannon-Fano coding are essential.

Given :

$p(x_1) = 0.3$, $p(x_2) = 0.25$, $p(x_3) = 0.2$, $p(x_4) = 0.12$, $p(x_5) = 0.08$, $p(x_6) = 0.05$.

Calculate entropy of the source, average length of the code, efficiency and reduncy of the code and compare them.

15. a) Explain the generation of PN sequence and prove its properties.

(OR)

b) With a neat sketch describe the principle of CDMA technique.

PART – C **(1×15=15 Marks)**

16. a) A communication channel matrix for the ternary channel is given as

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & p & 1-p \\ 0 & 1-p & p \end{bmatrix}$$ Assuming source probabilities as $P(X_1) = P$ and $P(X_2) = P(X_3)$.

Determine the source entropy H(X) and the mutual information I(X; Y). Also determine the capacity of the channel. **(15)**

(OR)

b) For the encoder shown in figure below for a rate r=1/2, constraint length K = 4, Convolutional code. Determine the encoder output produced by the message sequence 10111 ... using time domain approach and transform domain approach. (15)

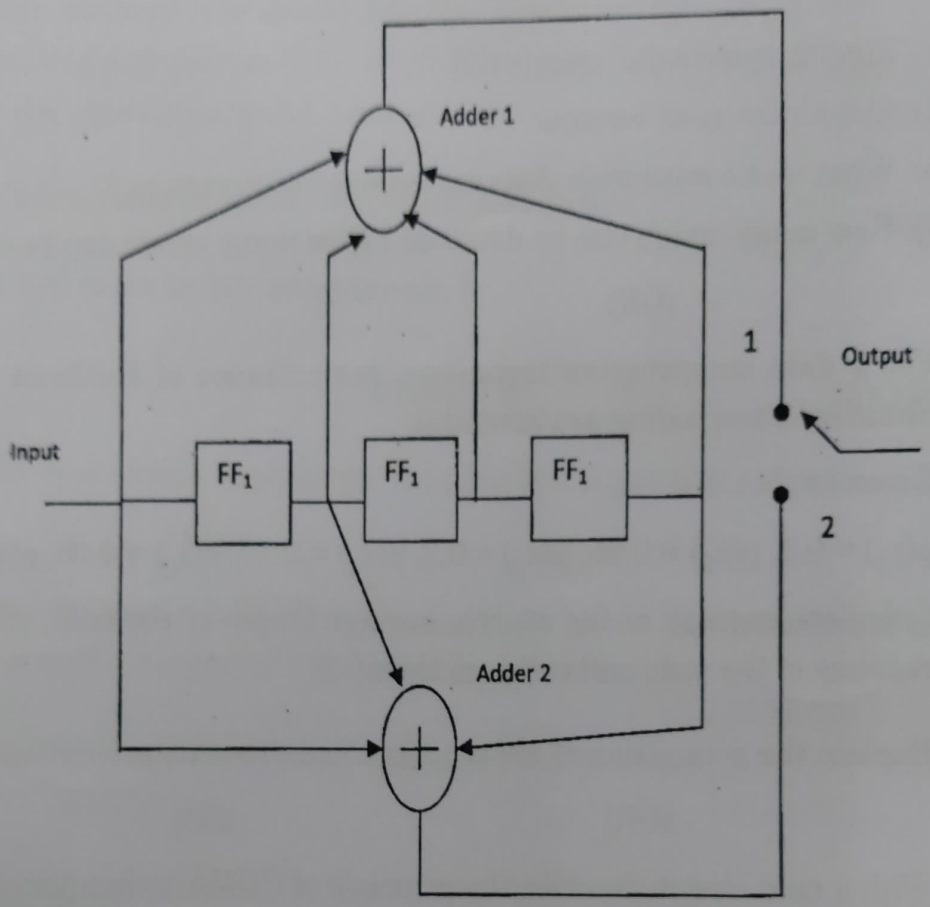

Fig. 16(b)

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Question Paper Code : 80101

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Computer Science and Engineering

CS 8494 — SOFTWARE ENGINEERING

(Common to Computer and Communication Engineering)

(Regulation 2017)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define: Software Engineering.

2. List any two agile process models.

3. Differentiate: Functional and Non-functional requirements.

4. State two advantages of using Petri Nets.

5. How does the Data Flow diagram help in design of software system?

6. List the levels of testing.

7. Define : Reverse Engineering.

8. List two advantages of using COCOMO model.

9. Compare: Project Risk vs Business Risk.

10. List CASE tools for the following phases of SDLC : Design, Testing.

PART B — (5 × 13 = 65 marks)

11. (a) Compare the Waterfall, Prototyping and Spiral model. List the features of each model, advantages and disadvantages and a type of application where the model will be acceptable. (13)

Or

(b) (i) Define Agility. List any five principles of agility. (5)

(ii) Explain the phases in Extreme Programming process. (8)

12. (a) Develop the Software requirements document for the following requirement. A Coffee Vending Machine serves coffee to customers. A customer can choose a type of coffee among a list often options, supply the amount required and get served. Each coffee is prepared by adding units of hot water, coffee powder, milk and sugar. The recipe for each coffee is stored. (13)

Or

(b) List any two techniques used for eliciting requirements. Compare the two techniques and list where each is applicable. (13)

13. (a) List and explain any five fundamental software design concepts. (13)

Or

(b) (i) Define Software Architecture. (2)

(ii) Explain and compare the following architectural styles :

(1) Call and return architecture (4)

(2) Object-oriented architecture (4)

(3) Layered architecture. (3)

14. (a) (i) Compare white box and black box testing. (4)

(ii) Write a procedure for the following: Given three sides of a triangle, return the type of triangle i.e. equilateral, isosceles and scalene triangle. Draw the Control Flow Graph and calculate cyclomatic complexity to calculate the minimum number of paths. Enumerate the paths to be tested. (9)

Or

(b) (i) Define : Refactoring. (2)

(ii) List the phases in software reengineering process model and explain each phase. (11)

15. (a) List the features of LOC and FP based estimation models. Compare the two models and list the advantages of one over other. (7 + 6)

Or

(b) (i) Define: Risk. (2)

(ii) List the types of risk and give examples for each. (5)

(iii) List and explain the phases in risk management. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Given the requirements for an Automated Teller Machine (ATM) system (see below), design the following :

(i) Use case diagram. (4)

(ii) Activity diagram detailing each use case. (6)

(iii) List test cases for any one functionality from your Use Case diagram. (5)

The ATM will service one customer at a time. A customer will be required to insert an ATM card and enter a personal identification number (PIN) - both of which will be sent to the bank for validation as part of each transaction. The customer will then be able to perform one or more transactions.

The ATM must be able to provide the following services to the customer:

A customer must be able to make a cash withdrawal from any suitable account linked to the card, in multiples of $20.00. Approval must be obtained from the bank before cash is dispensed.

A customer must be able to make a deposit to any account linked to the card, consisting of cash and/or checks in an envelope. The customer will enter the amount of the deposit into the ATM, subject to manual verification when the envelope is removed from the machine by an operator. Approval must be obtained from the bank before physically accepting the envelope.

A customer must be able to make a transfer of money between any two accounts linked to the card.

A customer must be able to make a balance inquiry of any account linked to the card.

Or

(b) (i) Draw the Level 0 and Level 1 Data Flow diagram for the following system. (8)

(ii) Identify entities in the system and draw a diagram showing the relationship between entities. (7)

The Chocolate Vending Machine (CVM) system requirements are as follows: The CVM dispenses chocolates: (1) very large chocolates (VC) at Rs. 15, (2) large chocolates (LC) at Rs. 10, and (3) a small chocolates (SC) at Rs. 5. The vending machine only deals in coins. The CVM gives the proper change after the product selection is made. The CVM must check the amount deposited by the customer. The vending machine operates in the following way. (A) The CVM remains idle until a customer or owner begins to interact with the machine. When a selection button is pressed the VCM indicates the required amount (Rs. 15/Rs. 10/Rs. 5). (B) If the full amount needed has been deposited then dispense the proper chocolate and display: Thank You!. (C) If an insufficient amount (possibly zero) has been deposited then display: remaining amount needed. (D) If an over amount has been deposited then dispense the proper candy and change and display: Thank You!.

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Question Paper Code : 80100

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Computer Science and Engineering

CS 8493 — OPERATING SYSTEMS

(Common to Information Technology)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is dual mode operation and what is the need of it?

2. List out some system calls required to control the communication system.

3. Give the queueing diagram representation of process scheduling.

4. List out the benefits and challenges of thread handling.

5. Consider the following segmentation table.

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the logical addresses 3400 and 0110?

6. What is thrashing? and how to resolve this problem?

7. Write short notes on file system mounting.

8. What is SSD?

9. Write short notes on driver registration in Linux.

10. List out the methods used to recover from the deadlock.

PART B — (5 × 13 = 65 marks)

11. (a) Explain in detail the different architectures of OS starting from simple structure, layered structure, micro kernels, modules and hybrid system with suitable example OS structures, including google's Android. (13)

Or

(b) (i) Discuss the pros and cons of single processor system, multi core system and clustered system. (8)

(ii) Explain the steps involved to transfer the stored historical information in a magnetic tapes to the CPU for further processing through various storage devices. (5)

12. (a) (i) Explain the dining-philosopher critical section problem solution using monitor. (8)

(ii) Write the algorithm using test-and-set( ) instruction that satisfy all the critical section requirements. (5)

Or

(b) Consider the following snapshot of a system.

Processes	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	2	0	0	1	4	2	1	2	3	3	2	1
P_1	3	1	2	1	5	2	5	2				
P_2	2	1	0	3	2	3	1	6				
P_3	1	3	1	2	1	4	2	4				
P_4	1	4	3	2	3	6	6	5				

Answer the following question using Bankers algorithm.

(i) Illustrate that the system is in safe state by demonstrating an order in which the processes may complete?

(ii) If a request from a process P_1 arrives for (1,1,0,0), can the request be granted immediately?

(iii) If the request from P_4 arrives for (0, 0, 2, 0), can the request be granted immediately? (13)

13. (a) (i) Consider a computer system with 16 bit logical address and 4 KB page size. The system supports upto 1 MB of physical memory. Assume that the actual process size is only 33 KB, page table base register contains 1000, and free frame list contains 13, 11, 9, 7, 5, 3, 1, 2, 4, 6, 8.

Construct the physical and logical memory structures, page table of the corresponding process.

Find the physical address of 13,256 and another logical address with page number 2 and offset of 128.

Discuss about the possible valid-invalid bit and possible protection bits in page table. (8)

(ii) Consider a paging system with page table stored in memory.

(1) If a memory reference takes 50 ns, how long does a paged memory reference take?

(2) If we add TLB and 75% of all page table references are found in TLB, what is the effective memory reference time? (Assume that find a page entry in TLB takes 2ns, if entry is present) (5)

Or

(b) (i) Explain the global and local frame allocation algorithms and their pros and cons. (3)

(ii) Consider the following page reference string.

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

How many page faults would occur for the following replacement algorithms, assuming 1 and 3 free frames. Remember that all frames are initially empty so that first unique page request will all cost one fault each. LRU replacement, FIFO, Optimal replacement, LFU and MFU. (10)

14. (a) Suppose that a disk drive has 5000 cylinders, numbered 0 through 4999. The drive is serving a request at cylinder 143. The queue of pending requests, in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 Starting from the head position what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms? FCFS, SSTF, SCAN, LOOK, C-SCAN C-LOOK. Explain the pros and cons of all disks scheduling algorithms. (13)

Or

(b) (i) Explain in detail the various allocation methods with their pros and cons. (8)

(ii) Brief the various procedures need to be followed in disk management. (5)

15. (a) Discuss the process and memory management in Linux. (13)

Or

(b) Explain the architecture of iOS. Discuss the media and service layers clearly. (13)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Consider the following set of processes with the length of CPU-burst time given in milliseconds.

Process	Burst time	Priority	Arrival time
P_1	10	3	0
P_2	1	1	1
P_3	2	3	2
P_4	1	4	1
P_5	5	2	2

Draw the Gantt chart for the execution of these processes using FCFS, SJF, SRTS, pre-emptive and non-pre-emptive priority, round robin with time slice of 2 ms. Find the average waiting and turnaround time using each of the methods. (10)

(ii) Explain – Multi level queue and multi level feedback queue scheduling with suitable example. (5)

Or

(b) (i) Consider two processes, p_1 and p_2, where $p_1 = 50$, $t_1 = 25$, $p_2 = -75$ and $t_2 = 30$. Can these two processes be scheduled using rate-monotonic scheduling and earliest deadline first scheduling. Illustrate your answer using Gantt charts. (10)

(ii) Explain in detail about paging in 32 bit and 64 bit architectures. (5)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80098

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Computer Science and Engineering

CS 8491 – COMPUTER ARCHITECTURE

(Common to Information Technology/Computer and Communication Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Amdahl's law.

2. Suppose that we are considering an enhancement to the processor of a server system used for Web Serving. The new CPU is 10 times faster on computation in the Web serving application than the original processor. Assuming that the original CPU is busy with computation 40% of the time and is waiting for I/O 60% of the time, what is the overall speedup gained by incorporating the enhancement?

3. Convert $(1.00101)_2$ to decimal.

4. Perform subtraction by two's complement method : 100 – 110000.

5. Convert the following code segment in C to MIPS instructions, assuming all variables are in memory and are addressable as offsets from $t0:

   $a = b + e; \quad c = b + f;$

6. Write down the five stages of instruction executions.

7. List the four multicore systems.

8. What is shared memory multiprocessor?

9. Draw the basic structure of a memory hierarchy.

10. How many total bits are required for a direct-mapped cache with 16KB of data and 4-word blocks, assuming a 32-bit address?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the different types of addressing mode with example. (7)

(ii) Explain the components of a computer with the block diagram in detail. (6)

Or

(b) (i) Explain the eight ideas of the Computer architecture which empowered the computer design over the past decades. (7)

(ii) Tabulate the difference between the RISC and CISC processor. (6)

12. (a) Calculate the following problems using BOOTH'S ALGORITHM (13)

(i) (+13) × (–6)

(ii) (+13) × (+6)

(iii) (–13) × (–6)

(iv) (-13) × (+6)

Or

(b) Calculate 10011 (–13) × 01011 (+11) using Signed-Operand Multiplication. (13)

13. (a) Explain the basic MIPs implementation with necessary multiplexers and control lines. (13)

Or

(b) Explain how the instruction pipeline works? What are the various situation where an instruction pipeline stalls? Illustrate with an example. (13)

14. (a) Explain in detail Flynn's classification of parallel hardware. (13)

Or

(b) Discuss the principle of hardware multithreading and elaborate its types. (13)

15. (a) Explain the various mapping functions that can be applied on cache memories in detail. (13)

Or

(b) (i) With a neat sketch explain the working principle of DMA. (8)

(ii) Explain about input-output processor (IOP) (5)

PART C — (1 × 15 = 15 marks)

16. (a) In a small town, there are three temples in a row and a well in front of each temple. A pilgrim came to the town with certain number of flowers.

Before entering the first temple, he washed all the flowers he had with the water of well. To his surprise, flowers doubled. He offered few flowers to the God in the first temple and moved to the second temple. Here also, before entering the temple he washed the remaining flowers with the water of well. And again his flowers doubled. He offered few flowers to the God in second temple and moved to the third temple. Here also, his flowers doubled after washing them with water. He offered few flowers to the God in third temple.

There were no flowers left when pilgrim came out of third temple and he offered same number of flowers to the God in all three temples. What is the minimum number of flowers the pilgrim had initially (X)? And find the value of (X/3) using Restoring Division method? How many flower did he offer to each God (Y)? And find the value of (Y/3) using Non-Restoring Division method? (15)

Or

(b) (i) You have been asked to design a cache with the following properties : (8)

(1) Data words are 32 bits each

(2) A cache block will contain 2048 bits of data

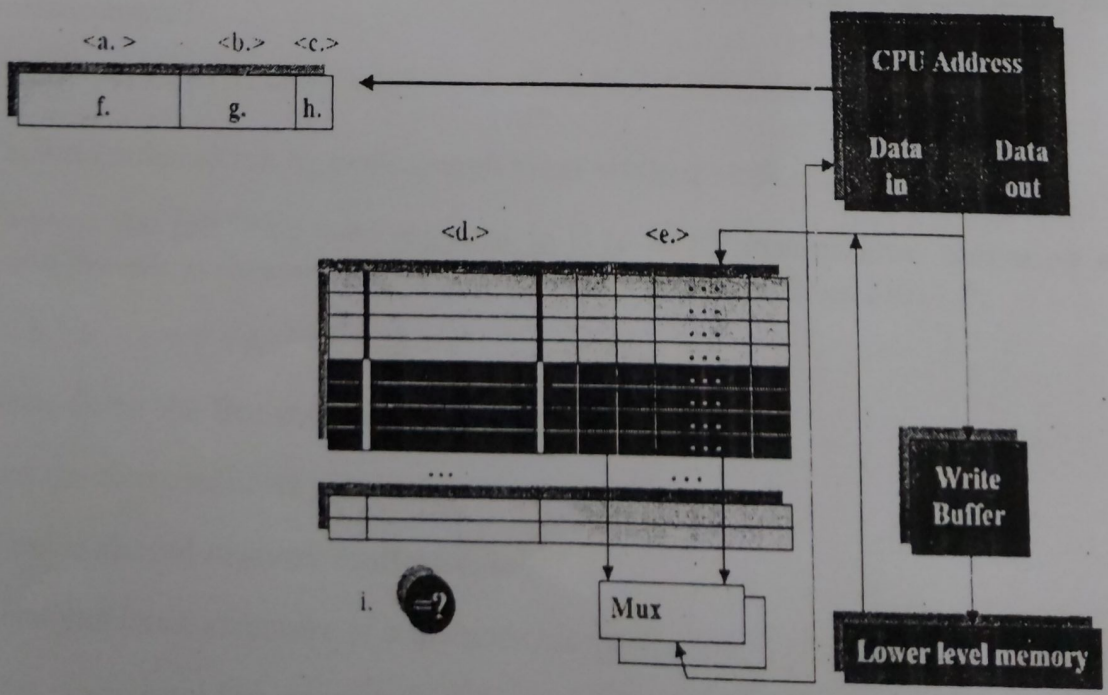
(3) The cache is direct mapped

(4) The address supplied from the CPU is 32 bits long

(5) There are 2048 blocks in the cache

(6) Addresses are to the word.

(ii) In the below picture, there are 8 fields (labeled a, b, c, d, e, f, g, and h), you will need to indicate the proper name or number of bits for a particular portion of this cache configuration. Explain the process of accessing data using this design. (7)



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Question Paper Code : 80097

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Computer Science and Engineering

CS 8451 — DESIGN AND ANALYSIS OF ALGORITHMS

(Common to Information Technology/Computer and Communication Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. How do you measure the efficiency of an algorithm?

2. Prove that the if $f(n) = O(g(n))$ and $g(n) = O(f(n))$, then, $f(n) = \theta\, g(n)$.

3. Write the brute force algorithm to string matching.

4. What is the time and space complexity of Merge sort?

5. State the principle of optimality.

6. What is the constraint for binary search tree insertion?

7. State the principle of duality.

8. Define the capacity constraint in the context of maximum flow problem.

9. Define NP completeness and NP hard.

10. State Hamiltonian Circuit problem.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Solve the following recurrence equation :

(1) $T(n) = T(n/2) + 1$, where $n = 2^k$ for all $k \geq 0$ (4)

(2) $T(n) = T(n/3) + T(2n/3) + cn$, where '$c$' is a constant and '$n$' is the input size. (4)

(ii) Explain the steps involved in problem solving. (5)

Or

(b) (i) Write an algorithm for determining the uniqueness of an array. Determine the time complexity of your algorithm. (10)

(ii) Explain time-space trade off of the algorithm designed. (3)

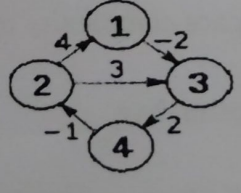
12. (a) What is the convex hull problem? Explain the brute force approach to solve convex-hull with an example. Derive the time complexity. (2 + 7 + 4)

Or

(b) Write the quicksort algorithm and explain it with an example. Derive the worst case and average case time complexity. (5 + 4 + 4)

13. (a) (i) Write the Floyd algorithm to find all pairs shortest path and derive its time complexity. (4 + 3)

(ii) Solve the following using Floyd's algorithm. (6)



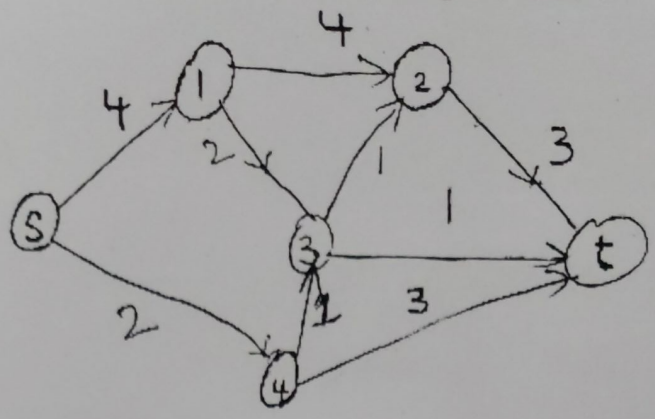
Or

(b) (i) Write the Huffman code algorithm and derive its time complexity. (5 + 2)

(ii) Generate the Huffman code for the following data comprising of alphabet and their frequency. (6)

$a : 1, b : 1, c : 2, d : 3, e : 5, f : 8, g : 13, h : 21$

14. (a) Determine the max-flow in the following network. (13)



Or

(b) Solve the following set of equations using Simplex algorithm : (13)

Maximize : $18x_1 + 12.5x_2$

Subject to : $x_1 + x_2 \leq 20$

$x_1 \leq 12$

$x_2 \leq 16$

$x_1, x_2 \geq 0.$

15. (a) Write an algorithm to solve the Travelling salesman problem and prove that it is a 2 time approximation algorithm. (13)

Or

(b) Write an algorithm for subset sum and explain with an example. (13)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Given a matrix of order $M \times N$, and two coordinates (p, q) and (r, s), which represents the top-left and bottom-right of a sub-matrix of the matrix, $M \times N$, calculate the sum of elements present in the sub-matrix in $O(1)$ time using dynamic programming. Determine the optimal sub-structure and write an algorithm. (10)

(ii) Prove that any algorithm that sorts by comparison, requires $\Omega(n \lg n)$ time. (5)

Or

(b) (i) The longest common subsequence (LCS) is the problem of finding the longest subsequence that is present in the given two sequences in the same order but not necessarily contiguously. Write an algorithm using dynamic programming that determines the LCS of two strings, 'x' and 'y' and returns the string 'z'. (10)

(ii) Prove that any algorithm that searches need to necessarily do $\Omega(\lg n)$ comparisons. (5)

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Question Paper Code : 90156

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Third/Fourth/Fifth Semester
Computer Science and Engineering
CS 8492 – DATABASE MANAGEMENT SYSTEMS
(Common to Computer and Communication Engineering /Mechanical and Automation Engineering/Information Technology)
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What are the four main characteristics that differentiate the database approach from the file-processing approach ?

2. Express in relational algebra, the division operation(/) using the project, cartesian product and minus operations. Give a simple example.

3. 'Boyce-Codd normal form is found to be stricter than third normal form'. Justify the statement.

4. What is the significance of "participation role name" in the description of relationship types ?

5. List the responsibilities of a DBMS has whenever a transaction is submitted to the system for execution ?

6. Brief any two violations that may occur if a transaction executes a lower isolation level than Serializable.

7. How do you represent leaf node of a B^+ tree of order p ?

8. Which cost components contribute to query execution ?

9. List information types of documents necessary for relevance ranking of documents in IR.

10. What one could understand from allocation schema ?

PART – B (5×13=65 Marks)

11. a) i) Consider the following schema :

Suppliers (sid : integer, sname : string, address : string)

Parts (pid : integer, pname : string, color : string)

Catalog (sid : integer, pid : integer, cost : real)

The key fields are underlined and the domain of each field is listed after the field name. Therefore sid is the key for Suppliers, pid is the key for Parts and sid and pid together form the key for Catalog. The Catalog relation lists the prices charged for parts by suppliers. (6)

Write the following queries in relational algebra :

1) Find the sids of suppliers who supply some red or green part.
2) Find the sids of suppliers who supply some red part or are at 221 Packer Street.
3) Find the pids of parts supplied by atleast two different suppliers.

ii) Sketch the typical component modules of DBMS. Indicate and explain the interactions between those modules of the system. (7)

(OR)

b) i) Consider the schema given in question no. 11.a) i) and write the following queries in SQL. (8)

1) Find the names of suppliers who supply some red part.
2) Find the sids of suppliers who supply some red part and some green part.
3) Find the sids of suppliers who supply every red part.
4) Find the pids of parts supplied by atleast two different suppliers.

ii) Explain the three schema architecture with a neat diagram. (5)

12. a) i) Discuss in detail the steps involved in the ER-to-Relational mapping in the process of relational database design. (7)

ii) Exemplify the multi-value dependency and the fourth normal form-4NF. (6)

(OR)

b) i) Explain with suitable example, the constraints of specialization and generalization in ER data modeling. (7)

ii) Exemplify the join dependency and the fifth normal form-5NF. (6)

13. a) i) Discuss elaborately the two-phase locking protocol that ensures serializability. (9)

ii) Brief the states of a transaction with a neat diagram. (4)

(OR)

b) i) Narrate the actions that are considered for deadlock detection and the recovery from deadlock. (9)

ii) Discuss the properties of a transaction that ensure integrity of data in the database system. (4)

14. a) i) Explain the various levels of RAID systems. (10)

ii) Why data dictionary storage is important ? (3)

(OR)

b) i) With simple algorithms explain the computing of Nested-loop join and Block Nested-loop join. (10)

ii) Sketch and concise the basic steps in Query Processing. (3)

15. a) i) Illustrate the usage of OQL, the DMG's query language. (9)

ii) Brief on the methods to store XML documents. (4)

(OR)

b) i) Illustrate the approaches to store relations in distributed database. (9)

ii) How effectiveness of retrieval is measured ? Discuss. (4)

PART – C (1×15=15 Marks)

16. a) Consider the following information about a university database :

i) Professors have an SSN, a name, an age, a rank and a research specialty.

ii) Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date and a budget.

iii) Graduate students have an SSN, a name, an age and a degree program (e.g., M.S. or Ph.D.).

iv) Each project is managed by one professor (known as the project's principal investigator).

v) Each project is worked on by one or more professors (known as the project's co-investigators).

vi) Professors can manage and/or work on multiple projects.

vii) Each project is worked on by one or more graduate students (known as the project's research assistants).

viii) When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.

ix) Departments have a department number, a department name and a main office.

x) Departments have a professor (known as the chairman) who runs the department.

xi) Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.

xii) Graduate students have one major department in which they are working on their degree.

xiii) Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Design and draw an ER diagram that captures the information about the university.

Use only the basic ER model here; that is, entities, relationships and attributes. Be sure to indicate any key and participation constraints. **(5+10)**

(OR)

b) i) For the following relation schema R and set of functional dependencies F : R(A, B, C, D, E), F = { AC → E, B → D, E → A}. List all candidate keys. **(6)**

ii) Consider the Table-16 and answer to queries given below. **(9)**

Table-16 User_personal.

Userid	U_Email	Fname	Lname	City	State	Zip
MA12	mani@ymail.com	Manish	Jain	Bilaspur	Chatisgarh	458991
PO45	pujag@gmail.com	Pooja	Magg	Kacch	Gujrat	832212
LA33	lavle98@jj.com	Lavleen	Dhalla	Raipur	Chatisgarh	853578
CH99	cheki9j@ih.com	Chimal	Bedi	Trichy	Tamil Nadu	632011
DA74	danu58@g.com	Dany	James	Trichy	Tamil Nadu	645018

1) Is this table in First Normal Form-1NF ? Justify and normalize to 1NF if needed.

2) Is this table in Second Normal Form-2NF ? Justify and normalize to 2NF if needed.

3) Is User_personal in Third Normal Form-3NF ? Justify and normalize to 3NF if needed.

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Question Paper Code : 90342

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth Semester

Computer Science and Engineering

MA8402 – PROBABILITY AND QUEUEING THEORY

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. A bag contains 8 white and 4 black balls. If 5 balls are drawn at random, what is the probability that 3 are white and 2 are black ?

2. Let $M_X(t) = \frac{1}{1-t}$, $|t| < 1$, be the moment generating function of a R.V. X. Find E(X) and $E(X^2)$.

3. If $f(x, y) = e^{-(x+y)}$, $x \geq 0, y \geq 0$, is the joint probability density function of (X, Y), Find $P(X + Y \leq 1)$.

4. Let X and Y be independent R.Vs with Var(X) = 9 and Var(Y) = 3. What is Var(4X – 2Y + 6) ?

5. Define : Markov process.

6. Let $\{X_n ; n \geq 0\}$ be a Markov chain having state space S = {1, 2} and one-step TPM $P = \begin{bmatrix} 1/2 & 1/2 \\ 0 & 1 \end{bmatrix}$. Find the stationary probabilities of the Markov chain.

7. In an M/M/1/∞/FCFS queue, the service rate, $\mu = \frac{1}{3}$ / minute and waiting time in the queue W_q = 3 minute, compute the arrival rate, λ.

8. For a M/M/C/N/FCFS (C < N) queueing system, write the expressions for P_0 and P_N.

9. In an M/D/1 queueing system, an arrival rate of customers is 1/6 per minute and the server takes exactly 4 minutes to serve a customer. Calculate the mean number of customers in the system.

10. For an open Jackson queueing network, write the expression for traffic equations and stability condition of the system.

PART – B (5×16=80 Marks)

11. a) i) There are 3 boxes containing respectively, 1 white, 2 red, 3 black balls, 2 white, 3 red, 1 black balls; 3 white, 1 red, 2 black balls. A box is chosen at random and from it two balls are drawn at random. The two balls are 1 red and 1 white. What is the probability that they came from second box ? (8)

ii) The p.d.f. of a continuous R.V. X is given by $f(x) = \begin{cases} \frac{x}{2}e^{-\frac{x}{2}}, & x > 0 \\ 0, & x \le 0 \end{cases}$. Obtain

1) C.D.F. of X, F(x)
2) P(X > 1)
3) P(1 < X < 2)
4) $E(X^2)$. (8)

(OR)

b) i) Let X be a binomial R.V with E(X) = 4 and Var(X) = 3. Find: (1) P(X = 5), (2) M.G.F. of X, $M_X(t)$, (3) $E(X^2 - 1)$, (4) $\text{Var}\left(-\frac{1}{2}X + 4\right)$. (8)

ii) A R.V. X is uniformly distributed on (–5, 15). Determine :

1) C.D.F. of X, F(x)
2) P(X < 5/X > 0)
3) P(|X – 1| < 5)
4) $E\left(e^{-\frac{X}{5}}\right)$. (8)

12. a) i) The joint p.d.f. of (X, Y) is given by $f(x, y) = \begin{cases} \frac{1}{240}, & 8.5 \le x \le 10.5, 120 \le y \le 240 \\ 0, & \text{otherwise} \end{cases}$.

Obtain

1) The marginal p.d.fs of X and Y.
2) E(X) and E(Y)
3) E(XY)
4) Are X and Y independent R.Vs ? Justify. (8)

ii) Let X and Y be two continuous R.Vs with joint p.d.f.

$f(x, y) = \begin{cases} 4xy, & 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$. Determine the joint p.d.f. of the R.Vs $U = X^2$ and V = XY and hence obtain the marginal p.d.f. of U. (8)

(OR)

b) i) The joint p.d.f. of R.V (X, Y) is given as $f(x, y) = \begin{cases} Ce^{-(2x+3y)}, & 0 \le y \le x < \infty \\ 0, & \text{otherwise} \end{cases}$.
Find :

1) The value of C.

2) Are the R.Vs X and Y independent ? (8)

ii) Let X and Y be random variables such that E(X) = 1, E(Y) = 2, Var(X) = 6, Var(Y) = 9 and the correlation coefficient $\rho_{XY} = -\frac{2}{3}$. Calculate :

1) The covariance, Cov(X, Y), of X and Y

2) E(XY)

3) $E(X^2)$ and $E(Y^2)$. (8)

13. a) i) Consider a random process X(t) = Cos (t + ϕ), where ϕ is a R.V. such that $P(\phi = 0) = P(\phi = \pi) = \frac{1}{2}$. Determine 1) E(X(t)), 2) $E(X^2(t))$, 3) $R_{XX}(t, t + \tau)$. Is the process X(t) wide-sense stationary ? Justify. (8)

ii) State the postulates of a Poisson process {X(t) ; t ≥ 0} with parameter λ. Derive the system of differential difference equations and hence obtain the probability distribution, $P(X(t) = n) = \frac{e^{-\lambda t}(\lambda t)^n}{n!}$, n = 0, 1, 2, ... (8)

(OR)

b) i) Let $\{X_n ; n \ge 0\}$ be a Markov chain having state space S = {1, 2, 3} with one-step TPM. $P = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 1 & 0 & 0 \end{bmatrix}$.

1) Draw a transition diagram.

2) Is the chain irreducible ? Explain.

3) Is the state – 2 ergodic ? Justify your answer. (8)

ii) Let X(t) and Y(t) be two independent Poisson processes with parameters λ_1 and λ_2 respectively. Obtain 1) P(X (t) + Y(t) = n), n = 0, 1, 2, ..., 2) P(X(t) – Y(t) = n), n = 0, ±1, ±2, ... (8)

14. a) i) A petrol station has one petrol pump. The cars arrive for service according to a Poisson process at a rate of 0.5 cars per minute and the service time for each car follows the exponential distribution with rate of 1 car per minute. compute :

1) The probability that the pump station is idle

2) The probability that 10 or more cars are in the system

3) The mean number, L_S of cars in the system.

4) The mean waiting time, W_q, in the queue and the mean waiting time, W_s, in the system. (8)

ii) Derive the steady state system size probabilities for a M/M/1/N/FCFS queueing model and hence obtain the mean number of customers in the queue. (8

(OR)

b) i) Derive the steady-state system-size probabilities for a M/M/C/∞ FCFS queueing model and hence obtain the mean number of customers in the system. (8

ii) Patients arrive at a clinic according to a Poisson process at a rate of 3 patients per hour. The waiting room cannot accommodate more than 6 patients. Examination time per patient is exponentially distributed random variable with rate of 4 per hour.

1) Find the effective arrival rate at the clinic.

2) What is the probability that an arriving patient will not wait ?

3) What is the expected waiting time W_s in the system ? (8

15. a) Discuss an M/G/1/∞ FCFS queueing system and hence obtain the Pollaczek-Khintchine (P-K) mean value formula for the system size. Deduce also the mean number of customers in the system for M/M/1/∞ FCFS queueing model from the P-K mean value formula. (16

(OR)

b) Derive the system of differential difference equations for the joint probabilities of the system size of two-station tandem queueing system. Under the steady-state conditions, determine the steady-state probabilities of the system size and obtain 1) Expected number of customers in the system, 2) The mean waiting time in the system. (16

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Question Paper Code : 90154

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth Semester

Computer Science and Engineering

CS8451 – DESIGN AND ANALYSIS OF ALGORITHMS

(Common to Computer and Communication Engineering / Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. State the transpose symmetry property of O and Ω.
2. Define recursion.
3. State the convex hull problem.
4. Outline the knapsack problem.
5. What is Brute Force method ?
6. Define a binary search tree.
7. When a linear program is said to be unbounded ?
8. What is a residual network in the context of flow networks ?
9. When is a problem said to be NP hard ?
10. State the Hamiltonian circuit problem.

PART – B (5×13=65 Marks)

11. a) i) Solve the following recurrence equations using iterative method or tree. (7)

ii) Elaborate asymptotic analysis of an algorithm with an example. (6)

(OR)

b) Write an algorithm using recursion that determines the GCD of two numbers. Determine the time and space complexity.

12. a) State the travelling salesman problem. Elaborate the steps in solving the travelling salesman problem using brute force approach. **(13)**

(OR)

b) Write the algorithm to find the closest pair of points using divide and conquer and explain it with an example. Derive the worst case and average case time complexity. **(5+4+4)**

13. a) i) Outline the Dynamic programming approach to solve the Optimal Binary search tree problem and analyse its time complexity. **(4+2)**

ii) Construct the Optimal binary search tree for the following 5 keys with probabilities as indicated. **(7)**

i	0	1	2	3	4	5
p_i		0.15	0.10	0.05	0.10	0.20
q_i	0.05	0.10	0.05	0.05	0.05	0.10

(OR)

b) Write a Greedy algorithm to solve the 0/1 knapsack problem. Analyse its time complexity. Show that this algorithm is not optimal with an example. **(5+2+6)**

14. a) What is iterative improvement ? Elaborate the steps in the simplex method with an example. **(13)**

(OR)

b) i) What is a bipartite graph ? Is the subset of a bipartite graph bipartite ? Outline with an example. **(2+1+4)**

ii) Outline the stable Marriage problem with an example. **(6)**

15. a) Elaborate how backtracking technique can be used to solve the n-queens problem. Explain with an example. **(13)**

(OR)

b) Outline the steps to find an approximate solution to NP-hard optimization problems using approximation algorithms with an example. **(13)**

PART – C

(1×15=15 Marks)

16. a) Sort the following numbers using quick sort.

999, 888, 777, 666, 555, 444, 333, 222, 111, 11, 22, 33, 44, 55, 66, 77, 88, 99.

Illustrate each step in the sorting process. **(15)**

(OR)

b) i) The Longest Increasing Subsequence (LIS) problem is to find the length of the longest subsequence of a given sequence such that all elements of the subsequence are sorted in increasing order. Write an algorithm using dynamic programming that determines the LIS of a string 'x'. For example, the length of LIS for {10, 22, 9, 33, 21, 50, 41, 60, 80} is 6 and LIS is {10, 22, 33, 50, 60, 80}. **(10)**

ii) Determine the Time and Space complexity of the above algorithm. **(5)**

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Question Paper Code : 90155

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth/Fifth Semester

Computer Science and Engineering

CS8491 – COMPUTER ARCHITECTURE

(Common to : Robotics and Automation Engineering/Computer and Communication Engineering/Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What is register indirect addressing mode ? When it is used ?
2. Define word length.
3. What is half adder ?
4. What are the main features of Booth's algorithm ?
5. Define datapath in the processor unit.
6. What is the role of cache memory in pipeline ?
7. What do you mean by static memories ?
8. Define Hit and Miss in cache.
9. What is Flynn's classification ?
10. What are the properties of Multi-Core Systems ?

PART – B **(5×13=65 Marks)**

11. a) Explain in detail the various components of computer system with neat diagram.

(OR)

b) Mr. Thomas has got a new laptop, at memory address 101 Add A, B instruction is residing. How will the processor fetch the instruction from the memory and execute the instruction based on various registers in the CPU. Also draw the architectural diagram for the above scenario.

12. a) Mr. John has been assigned a project by his Team Leader in ALS Technologies. His project is to design an algorithm for two's complement division using addition and subtraction operations. Help Mr. John in designing an algorithm by sketching the flowchart for restoring division and also check the working of it with the following numbers : 21 ÷ 4.

(OR)

b) Mr. David is Processor Designer at IBM and he is visiting your college for an internship interview. During the interview Mr. David asks you to sketch the flow chart for floating point multiplication and also check the working of it with the following numbers : $X = 4.5_{(10)}$ and $Y = 11.25_{(10)}$. Provide an appropriate solution.

13. a) Explain data path and its control in detail.

(OR)

b) What is pipelining ? Discuss about pipelined data path control.

14. a) Discuss about SISD, MIMD, SIMD, SPMD and vector systems.

(OR)

b) What is hardware multithreading ? Compare and contrast fine grained multi-threading and coarse grained multi-threading.

15. a) Consider a cache of 256 blocks in size, each block has 2^4 words. The main memory size is 2^{12} blocks, each block has 2^4 words. How many bits are required for each of the TAG, SET/BLOCK and WORD FIELDS for different mapping techniques ? Wherever needed assume that there are 8 ways in each set.

(OR)

b) Consider a system which transfers 2 MB file from memory to pendrive.

i) If memory is using Handshaking Protocol to send the file, depict clearly how the data transfer takes place in case of source initiated and destination initiated data transfer.

ii) When the file is being transferred there should be minimal intervention of the processor. Suggest a suitable technique for the above operation and explain it with proper justification and diagrams.

PART – C

(1×15=15 Mark

16. a) What is an addressing mode ? Explain the various addressing modes with suitable examples.

(OR)

b) Explain in detail about centralized shared memory and distributed memory multiprocessor.

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Question Paper Code : 90157

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth/Fifth Semester

Computer Science and Engineering

CS8493 – OPERATING SYSTEMS

(Common to Electronics and Communication Engineering/Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What are the main advantages of multiprocessor systems ?
2. Define the term trap or an exception.
3. State the primary distinction between short-term and CPU scheduler.
4. What are the conditions must hold for a deadlock to occur ?
5. State the differences between logical and physical addresses.
6. Under what circumstances do page faults occur ? State the actions taken by the operating system when a page fault occurs.
7. Why is it important to balance file system I/O among the disks and controllers on a system in a multitasking environment ?
8. Why is it important to scale up system-bus and device speeds as CPU speed increases ?
9. State the components of Linux system.
10. What are the advantages and disadvantages of writing an operating system in a high-level language, such as C ?

PART – B (5×13=65 Marks)

11. a) Distinguish multiprogramming and time-sharing environment. (7)

In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems.

i) What are two such problems ? (3)

ii) Can we ensure the same degree of security in a time-shared machine as in a dedicated machine ? Explain your answer. (3)

(OR)

b) i) What are system calls ? State and explain the types of system calls. (7)

ii) List five services provided by an operating system and explain how each creates convenience for users. In which cases would it be impossible for user-level programs to provide these services ? Explain your answer. (6)

12. a) What are threads ? Discuss different types of threads. What resources are used when a thread is created ? How do they differ from those used when a process is created ?

(OR)

b) What are the classical problems of synchronization ? State and explain any one of the problem with example.

13. a) State the need for page replacement. State and explain the procedure for FIFO page replacement with example. What is belady's anomaly ? Consider the following page reference string : 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six or seven frames ? Remember all frames are initially empty, so your first unique pages will all cost one fault each.

- LRU replacement
- FIFO replacement
- Optimal replacement.

(OR)

b) What is the need of swapping in storage management ? State and the explain in detail with example.

14. a) i) State and explain the swap space management. (6)

ii) Explain file system mounting and protection in detail. (7)

(OR)

b) i) State and explain streams in the I/O systems. (7)

ii) Discuss disk scheduling algorithms in detail. (6)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90158

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth/Fifth Semester

Computer Science and Engineering

CS 8494 – SOFTWARE ENGINEERING

(Common to : Information Technology/Computer and Communication Engineering)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What is a software process ?
2. Define an evolutionary prototype.
3. What are non-functional requirements ?
4. Define a Petri net.
5. What is inheritance ?
6. Define a component. Give example.
7. What is a test case ?
8. Outline the need for system testing.
9. What is budgeted cost of work scheduled ?
10. Write any two differences between "known risks" and "predictable risks".

PART – B (5×13=65 Marks)

11. a) Outline the spiral life cycle model with a diagram.

(OR)

b) What is agility ? Elaborate the agile principles.

12. a) i) Discuss the distinct tasks involved in requirement engineering process. (9

ii) What does win-win mean in the context of negotiation during the requirements engineering activity ? (4

(OR)

b) Draw a Petri Net that depicts the operation of an "Automated Teller Machine". State the functional requirements you are considering. (13

13. a) What is software architecture ? Outline the architectural styles with an example. (13

(OR)

b) Outline the steps in designing class based components with an example. (13

14. a) Elaborate path testing and regression testing with an example. (13

(OR)

b) i) Explain how Business Process Reengineering (BPE) helps to achieve a defined business outcome. (8

ii) Outline how the reverse engineering process helps to improve the legacy software. (5

15. a) Elaborate the cost estimation COCOMO II cost estimation model. (13

(OR)

b) Present a detailed note on risk management. (13

PART – C **(1×15=15 Marks)**

16. a) Prepare a software requirement specification document for a "Library Management System". (15

(OR)

b) Outline the steps in function point analysis with an example. (15

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90160

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Computer Science and Engineering

CS8591 – COMPUTER NETWORKS

(Common to Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What is transmission media ? Give example.
2. Outline the need for switching.
3. Distinguish between a point-to-point link and a broadcast link.
4. Outline the use of Cyclic Redundancy Check.
5. What is DHCP ?
6. Present an outline of IPv6 addressing.
7. What is piggybacking ?
8. Outline stop-and-wait ARQ mechanism.
9. What is HTTP ?
10. Present an outline of SSH.

PART – B (5×13=65 Marks)

11. a) Draw the ISO-OSI architecture and outline the functions performed by each layer.

(OR)

b) Describe Circuit-Switching and Packet-Switching with an example. (13)

12. a) Elaborate the working of CSMA and CSMA/CD protocol.

(OR)

b) Present an outline of HDLC protocol. (13

13. a) Outline Distance Vector Routing with an example and relevant diagrams.

(OR)

b) Explain the working of Address Resolution Protocol with an example.

14. a) Explain any two TCP congestion control mechanisms with an example.

(OR)

b) i) Compare the features of TCP and UDP. (8

ii) Explain the TCP header format. (5

15. a) Explain message transfer using Simple Mail Transfer Protocol.

(OR)

b) i) Explain DNS with an example. (7

ii) Write a short note on FTP. (6

PART – C (1×15=15 Marks)

16. a) i) Outline IPv4 classful and classless addressing with examples. (10)

ii) Assume that you are given a network ID 165.121.0.0. You are responsible for creating subnets on the network and each subnet must provide at least 900 host IDs. What subnet mask meets the requirement for the minimum number of host IDs and provides the greatest number of subnets ? (5)

(OR)

b) Explain Simple Network Management Protocol (SNMP) and its functions.

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90161

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Computer Science and Engineering

CS 8592 – OBJECT ORIENTED ANALYSIS AND DESIGN

(Common to Computer and Communication Engineering)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define an object. Give example.
2. What is a use case diagram ?
3. Define multiplicity of an association.
4. What is an association class ? Give example.
5. Outline the advantages of modeling a state machine diagram.
6. What is a deployment diagram ?
7. Define coupling and cohesion.
8. What is a design pattern ?
9. Define software quality assurance.
10. What is unit testing ?

PART – B (5×13=65 Marks)

11. a) i) Outline the steps to be followed to identify actors and use cases. (6)
ii) What is inception ? Outline the tasks that a project team performs during inception. (7)

(OR)

b) Let's say you own a small baking company, where you make and design custom cakes for different occasions. You now wish to take your business online, so that you could cater to a large customer base. You hire a web development company to build an online cake store for you. This software product is build on the basis of the Unified Process Model (UPM).

Define and explain UPM with its phases for developing the above online baking company. (13)

12. a) i) Outline aggregation and composition, with an example. (7)
ii) Elaborate generalization and specialization with an example. (6)

(OR)

b) Outline the steps in modeling a sequence diagram with an example. (13)

13. a) What is the purpose, how to draw and where to use UML component diagrams ? Illustrate with an example. (13)

(OR)

b) Why to use an activity diagrams ? Outline the steps in modeling an activity diagram with an example. (13)

14. a) Outline the GRASP principles with suitable example. (13)

(OR)

b) What are GoF patterns ? Outline the application of GoF design patterns with suitable example. (13)

15. a) Outline the object oriented testing strategies. (13)

(OR)

b) What is a test case ? Describe in detail the test case design for OO Software with relevant examples. (13)

PART – C (1×15=15 Marks)

16. a) Develop a use case model for activities involved in ordering food in a restaurant from the point when the customer enters a restaurant to the point when he leaves the restaurant. (15)

(OR)

b) Model a class diagram for a "Library Management System". State the functional requirements you are considering. (15)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90159

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Computer Science and Engineering

CS 8501 – THEORY OF COMPUTATION

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

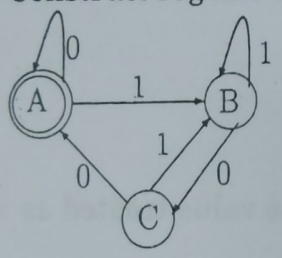
Answer ALL questions

PART – A (10×2=20 Marks)

1. Prove by induction on $n \geq 1$ that $\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1}$.

2. Formally define deterministic finite automata.

3. Construct regular expression corresponding to the state diagram.



4. State pumping lemma for regular languages.

5. When do you say a CFG is ambiguous ?

6. Give a formal definition of PDA.

7. What are the advantages of having a normal form for a grammar ?

8. Define the language recognized by the Turing machine.

9. When do you say a Turing machine is an algorithm ?

10. Define NP-Class.

PART – B (5×13=65 Marks)

11. a) Construct DFA equivalent to NFA ({p, q, r, s}, {0, 1}, δ, p, {s}), where δ is defined as

δ	0	1
p	{p, q}	{p}
q	{r}	{r}
r	{s}	–
s	{s}	{s}

(OR)

b) Give non-deterministic finite automata accepting the set of strings in (0 + 1)* such that two 0's are separated by a string whose length is 4i, for some i ≥ 0.

12. a) i) Prove that any language accepted by a DFA can be represented by a regular expression. **(7)**

ii) Construct a finite automata for the regular expression 10 + (0 + 11)0*1. **(6)**

(OR)

b) Prove that the following languages are not regular :

i) $\{w \in \{a, b\}^* \mid w = w^R\}$ **(7)**

ii) Set of strings of 0's and 1's, beginning with a 1, whose value treated as a binary number is a prime. **(6)**

13. a) Suppose L = L(G) for some CFG G = (V, T, P, S), then prove that L – {∈} is L(G') for a CFG G' with no useless symbols or ∈-productions.

(OR)

b) Prove that the languages accepted by PDA using empty stack and final states are equivalent.

14. a) State and prove Greibach normal form.

(OR)

b) Design a Turing machine to compute proper subtraction.

15. a) Prove that Post Correspondence Problem is undecidable.

(OR)

b) Prove that the universal language L_u is recursively enumerable but not recursive.

PART – C **(1×15=15 Marks)**

16. a) i) Suppose L = N(M) for some PDA M, then prove that L is a CFL. (7)

ii) Give a CFG for the language N(M) where M = $(\{q_0, q_1\}, \{0, 1\}, \{Z_0, X\}, \delta, q_0, Z_0, \Phi)$ and δ is given by

$\delta(q_0, 1, Z_0) = \{(q_0, XZ_0)\}$ $\quad$ $\delta(q_0, \in, Z_0) = \{(q_0, \in)\}$

$\delta(q_0, 1, X) = \{(q_0, XX)\}$ $\quad$ $\delta(q_1, 1, X) = \{(q_1, \in)\}$

$\delta(q_0, 0, X) = \{(q_1, X)\}$ $\quad$ $\delta(q_1, 0, Z_0) = \{(q_0, Z_0)\}$ (8)

(OR)

b) i) Design a Turing machine to compute multiplication of two positive integers. (8)

ii) Design a Turing machine to recognize the language $\{0^n1^n0^n \mid n \geq 1\}$. (7)

Reg. No. :

Question Paper Code : 80099

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third/Fourth Semester

Information Technology

CS 8492 — DATABASE MANAGEMENT SYSTEMS

(Common to Computer Science and Engineering/Computer and Communication Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a data model? List the types of data model used.
2. List any eight applications of DBMS.
3. Give the properties of decomposition.
4. Define the terms Entity set and Relationship set.
5. What are the states of transaction?
6. What is meant by log-based recovery?
7. Define dense index.
8. Mention all the operations of files.
9. Mention two features of Multimedia databases.
10. Compare sequential access devices versus random access devices with an example.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the three different groups of data models with suitable examples.

Or

(b) Describe about the static and dynamic SQL in detail.

12. (a) What is normalization? Explain in detail about all Normal forms.

Or

(b) Briefly discuss about the functional dependency concepts.

13. (a) Discuss in detail about the testing of serializability.

Or

(b) Explain deferred and immediate modification versions of the log based recovery scheme.

14. (a) What is RAID? Briefly discuss about RAID.

Or

(b) Describe the structure of B+ tree and give the algorithm for search in the B+ tree with example.

15. (a) Discuss in detail about the distributed databases.

Or

(b) Explain in detail about the Deductive DB and Spatial DB.

PART C — (1 × 15 = 15 marks)

(Application / Design / Analysis / Evaluation /Creativity/Case Study questions)

16. (a) Discuss in detail about the ACID properties of a transaction.

Or

(b) What is concurrency control? How it is implemented in DBMS? Briefly elaborate with suitable diagrams and examples.

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Reg. No. : 9 5 3 4 1 8 1 0 4 0 1 9

Question Paper Code : 90153

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third/Fourth/Fifth Semester

Computer Science and Engineering

CS 8392 – OBJECT ORIENTED PROGRAMMING

(Common to Electrical and Electronics Engineering/Computer and Communication Engineering/Electronics and Communication Engineering/ Electronics and Instrumentation Engineering/Electronics and Telecommunication Engineering/Instrumentation and Control Engineering/Information Technology)

(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. What is access specifier ?
2. What is javadoc ?
3. What is object cloning ?
4. Describe the uses of interfaces in Java.
5. What is exception handling ?
6. What is the use of assert key word ?
7. Describe the various states of thread.
8. "Thread is a light weight process" – Comment.
9. Write the code segment to handle two mouse events.
10. What are the purposes of JPanel.

PART – B (5×13=65 Marks)

11. a) Explain the various features of java in detail.

(OR)

b) What is JVM ? Explain the internal architecture of JVM with neat sketch.

12. a) Explain in detail about various types of inheritance in java with neat diagram.

(OR)

b) What is an abstract class ? Illustrate with an example to demonstrate abstract class.

13. a) Explain different types of exceptions in java.

(OR)

b) Explain in detail about the following with sample program :

i) Reading from a file

ii) Writing in a file.

14. a) What is a thread ? Explain multithreading and multitasking in detail.

(OR)

b) What is t synchronization ? Explain the different types of synchronization in java.

5. a) Describe in detail about the different layouts in Java GUI. Which layout is the default one ?

(OR)

b) Discuss mouse listener and mouse motion listener. Give an example program.

PART – C (1×15=15 Marks

a) Develop a java program to find a smallest number in the given array by creating one dimensional array and two dimensional array using new operator.

(OR)

b) Create a simple real life application program in Java to illustrate the use of multithreads.

Reg. No. : 9 5 3 4 1 8 1 0 4 0 1 9

Question Paper Code : 90336

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Computer Science and Engineering

MA 8351 – DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Write the following statement in symbolic form : If Avinash is not in a good mood or he is not busy, then he will go to New Delhi.
2. Write the truth table for $(p \wedge q) \rightarrow (p \vee q)$.
3. Find the number of bit strings of length 10 that either begin with 1 or end with 0.
4. In how many different ways can five men and five women sit around a table ?
5. Give an example of a graph which is Eulerian but not Hamiltonian.
6. Write the adjacency matrix and incidence matrix of $K_{2,2}$.
7. Show that the identity element of a group is unique.
8. Give an example of an integral domain which is not a field.
9. Draw the Hasse diagram of $(D_{20}, /)$, where D_{20} denotes the set of positive divisors of 20 and / is the relation "division".
10. In any lattice $(L, \leq)$, $\forall$ a, b $\in$ L, show that $a * (a \oplus b) = a$, where $a * b = glb(a, b)$ and $a \oplus b = lub(a, b)$.

PART – B (5×16=80 Marks)

11. a) i) Obtain the principal disjunctive and conjunctive normal forms of the formula $(\sim p \rightarrow r) \wedge (q \leftrightarrow p)$. (8)

ii) Show that $J \wedge S$ logically follows from the premises $P \rightarrow Q$, $Q \rightarrow \sim R$, R, $P \vee (J \wedge S)$. (8)

(OR)

b) i) Let K(x) : x is a two-wheeler, L(x) : x is a scooter, M(x) : x is manufactured by Bajaj. Express the following using quantifiers.

I. Every two wheeler is a scooter.

II. There is a two-wheeler that is not manufactured by Bajaj.

III. There is a two-wheeler manufactured by Bajaj that is not a scooter.

IV. Every two-wheeler that is a scooter is manufactured by Bajaj. (8)

ii) Use the rules of inference to show that the hypotheses "If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on", "If the sailing race is held, then the trophy will be awarded", and "The trophy was not awarded" imply the conclusion "It rained". (8)

12. a) i) Solve $a_n = 8a_{n-1} + 10^{n-1}$ with $a_0 = 1$ and $a_1 = 9$ using generating function. (8)

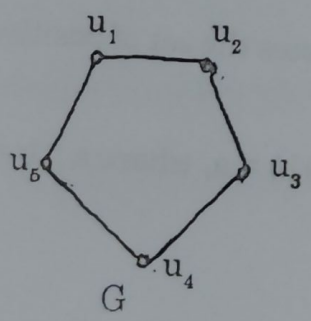
ii) How many positive integers not exceeding 1000 are divisible by none of 3, 7 and 11 ? (8)

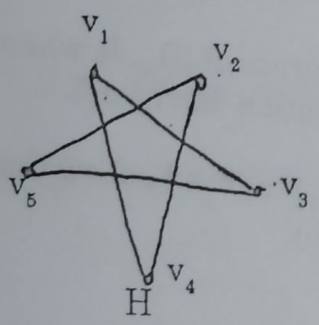
(OR)

b) i) Using mathematical induction prove that if n is a positive integer, then 133 divides $11^{n+1} + 12^{2n-1}$. (8)

ii) How many ways are there to assign five different jobs to four different employees if every employee is assigned at least one job ? (8)

13. a) i) Check whether the following graphs are isomorphic or not. (6)





ii) If A is the adjacency matrix of a graph G with $V(G) = \{v_1, v_2, \ldots, v_p\}$, prove that for any $n \geq 1$, the $(i, j)^{th}$ entry of A^n is the number of $v_i - v_j$ walks of length n in G. (10)

(OR)

b) i) Define self complementary graph. Show that if G is a self complementary simple graph with n vertices then $n \equiv 0$ or 1 (mod 4). (6)

ii) Show that a simple graph G is Eulerian if and only if all its vertices have even degree. (10)

14. a) State and prove Lagrange's theorem on groups. (16)

(OR)

b) i) Show that a non empty subset H of a group (G, *) is a subgroup of G if and only if $a * b^{-1} \in H$ for all $a, b \in H$. (8)

ii) Show that the Kernel of a group homomorphism is a normal subgroup of the group. (8)

15. a) i) Show that every chain is a distributive lattice. (8)

ii) Let $D_{100} = \{1, 2, 4, 5, 10, 20, 25, 50, 100\}$ be the divisors of 100. Draw the Hasse diagram of $(D_{100}, /)$ where / is the relation "division".

Find (I) glb {10, 20} (II) lub {10, 20} (III) glb {5, 10, 20, 25}

(IV) lub {5, 10, 20, 25}. (8)

(OR)

b) i) In a Boolean Algebra, show that $(a * b)' = a' \oplus b'$ and $(a \oplus b)' = a' * b'$. (8)

ii) Define a modular lattice and prove that every distributive lattice is modular but not conversely. (8)

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(b) An analog signal having 4 KHz bandwidth is sampled at 1.25 times the Nyquist rate and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.

(i) What is the information rate of this source?

(ii) Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10 KHz and an S/N ratio of 20 dB?

(iii) Find the S/N ratio required for error-free transmission for part (ii).

(iv) Find the bandwidth required for an AWGN channel for error-free transmission of the output of this source if the S/N ratio is 20 dB.

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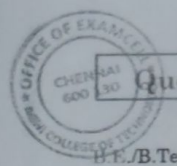

Question Paper Code : 80118

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third/Fourth Semester

Electronics and Instrumentation Engineering

EC 8395 — COMMUNICATION ENGINEERING

(Common to Computer Science and Engineering/Instrumentation and Control Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What will be the power in each sideband in amplitude modulated signal if power of carrier wave is 176 W and there is 60% modulation.

2. What is Pre-emphasis and De-emphasis circuit? Where these circuits are used?

3. What is bit depth in PCM?

4. What is Companding?

5. What is Duobinary encoding? Why precoding is used.

6. Draw the constellation diagram of QPSK.

7. What is the need of channel coding?

8. List the properties of cyclic codes.

9. What are the benefits of multiple access techniques in the communication system?

10. Define near-far problem in CDMA.

PART B — (5 × 13 = 65 marks)

11. (a) (i) The efficiency η of ordinary AM is defined as the percentage of the total power carried by the side bands, that is,

$$\eta = \frac{P_s}{P_t} \times 100\%$$

Where P_s is the power carried by the sidebands and p_t is the total power of the AM signal.

(1) Find η for $\mu = 0.5$.

(2) Show that for a single tone AM, η_{max} is 33.3 percent at $\mu = 1$. (6)

(ii) Explain the working of FM super heterodyne receiver with neat block diagram. (7)

Or

(b) (i) Discuss the method for the generation of FM using direct method. (6)

(ii) Explain the detection of FM using PLL detector. (7)

12. (a) Describe delta modulation in detail with neat block diagram. Also describe the quantization error in delta modulation.

Or

(b) Draw and explain the TDM with its applications.

13. (a) (i) Derive the expression of probability of error in BPSK. (8)

(ii) Explain QAM modulation system with its constellation and schematic diagrams. (5)

Or

(b) Explain coherent detection of BFSK signal and derive the expression for Probability of error.

14. (a) (i) Consider a binary memoryless source X with two symbols x_1 and x_2. Show that $H(X)$ is maximum when both x_1 and x_2 are equiprobable. (6)

(ii) A discrete memoryless source X has four symbols x_1, x_2, x_3 and x_4 with $P(x_1) = 0.5$, $P(x_2) = 0.25$ and $P(x_3) = P(x_4) = 0.125$. Construct a Shanon-Fanno code for X; show that this code has the optimum property that $n_i = I(x_i)$ and that the code efficiency is 100 percent. (7)

Or

(b) Consider the convolutional encoder shown in fig. 1.

(i) Find the impulse response of the encoder.

(ii) Find the output code word if the input code sequence is all 1's (1 1 1 1 1...)

(iii) Discuss the result of (ii).

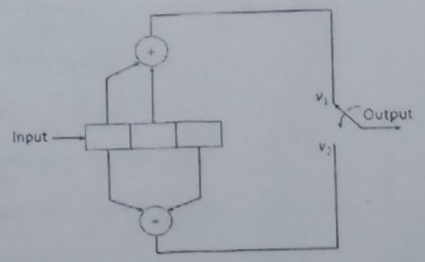

Fig. 1

15. (a) Explain the operation of FH-SS. Compare slow and fast FH-SS.

Or

(b) Discuss the FDMA and TDMA techniques used in wireless communication with their merits and demerits.

PART C — (1 × 15 = 15 marks)

16. (a) A compact disk (CD) recording system samples each of two stereo signals with a 16-bit analog-to-digital converter (ADC) at 44.1 Kb/s.

(i) Determine the output signal-to-quantization-noise ratio for a full-scale sinusoid.

(ii) The bit stream of digitized data is augmented by the addition of error-correcting bits, clock extraction bits, and display and control bit fields. These additional bits represent 100 percent overhead. Determine the output bit rate of the CD recording system.

(iii) The CD can record an hour's worth of music. Determine the number of bits recorded on a CD.

(iv) For a comparison, a high-grade collegiate dictionary may contain 1500 pages, 2 columns per page, 100 lines per column, 8 words per line, 6 letters per word, and 7 b per letter on average. Determine the number of bits required to describe the dictionary and estimate the number of comparable books that can be stored on a CD.

Or

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Question Paper Code : 80095

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY, 2019.

Third Semester

Computer Science and Engineering

CS 8391 — DATA STRUCTURES

(Common to Computer and Communication Engineering/Information Technology)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the advantages of Linked List over arrays?

2. Illustrate the differences between linear linked list and Circular linked list.

3. Convert the following infix expression to postfix expression using Stack
$a + b * c + (d + e + f) / g$.

4. A priority queue is implemented as a Max- Heap. Initially it has 5 elements. The level order traversal of the heap is : 10, 8, 5, 3, 2. Two new elements 11 and 7 are inserted into the heap in that order. Give the level order traversal of the heap after the insertion of elements.

5. How to resolve null links in a binary tree?

6. The depth of complete binary tree is 8 and compute the number of nodes in leaf.

7. What is Bi-connectivity?

8. Given a weighted, undirected graph with $|V|$ nodes, Assume all weights are non-negative. If each edge has weight $\leq w$, What can you say about the cost of Minimum spanning tree?

9. Brief about Extendible hashing.

10. Compare linear search and Binary search.

om

(b) (i) Write a routine for AVL tree insertion. Insert the following elements in the empty tree and how do you balance the tree after each element insertion?

Elements : 2, 5, 4, 6, 7, 9, 8, 3, 1, 10. (8)

(ii) Brief about B+ Tree. And discuss the applications of heap. (5)

14. (a) Apply an appropriate algorithm to find the shortest path from 'A' to every other node of A. For the given graph Fig. 14(a) (13)

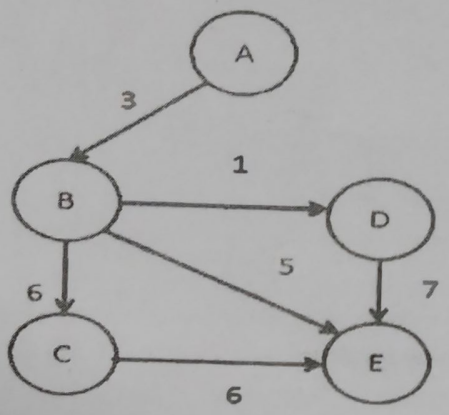

Fig. 14(a)

Or

(b) (i) Explain in detail about strongly connected components and illustrate with an example. (7)

(ii) Find an Euler path or an Euler circuit using DFS for the following graph Fig. 14(b). (6)

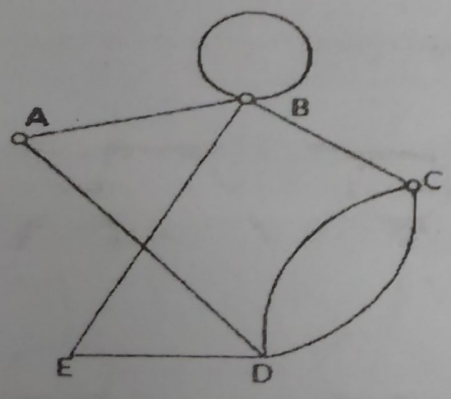

Fig. 14(b)

15. (a) Consider a hash table with 9 slots. The hash function is $h(k) = k \bmod 9$. The following keys are inserted in the order 5, 28, 19, 15, 20, 33, 12, 17, 10. Draw the contents of the hash table when the collisions are resolved by

(i) Chaining

(ii) Linear probing

(iii) Double hashing. The second hash function $h2(x)=7-(x \bmod 7)$ (13)

Or

(b) (i) Write a function to perform merge sort. Give example (6)

(ii) Write a routine for Insertion sort. Sort the following sequence using Insertion sort.

3, 10, 4, 2, 8, 6, 5, 1. (7)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Indicate whether you use an Array, Linked List or Hash Table to store data in each of the following cases. Justify your answer. (6)

(1) A list of employee records needs to be stored in a manner that it is easy to find max or min in the list.

(2) A library needs to maintain books by their ISBN number. Only thing important is finding them as soon as possible.

(3) A data set needs to be maintained in order to find the median of the set quickly.

(ii) Define data abstraction. Write the ADT for the data structure in which the same condition can used appropriately, for checking over flow and underflow. Define all basic function of this ADT. (9)

Or

(b) (i) When do you perform rehashing? Illustrate with example. (8)

(ii) From the Figure 16. (b), in what order are the vertices visited using DFS and BFS starting from vertex A? Where a choice exists, use alphabetical order. (7)

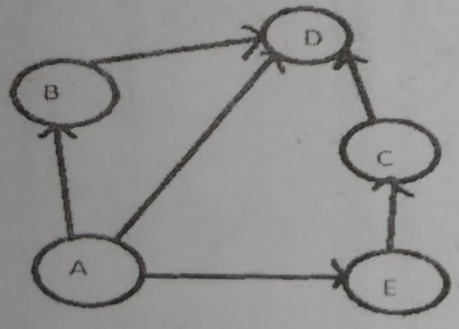

Figure 16. (b)