19 (a) Find the mean and standard deviation of the following data :

x :	2.0	2.5	3.0	3.5	4.0	4.5	5.0
f :	5	38	65	92	70	40	10

(b) Five coins are tossed 3200 times. Find the expected frequencies of distribution of heads and tails. Calculate the mean number of heads and standard deviation.

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MATHEMATICS

Time : Three hours   Maximum : 100 marks

PART A — $(6 \times 5 = 30 \text{ marks})$

Answer any SIX questions.

1. Find $\dfrac{dy}{dx}$ if $x = a \cos^3 t$, $y = a \sin^3 t$.

2. Find the n th derivative of $\cos x \cos 2x \cos 3x$.

3. Evaluate $\displaystyle\int \dfrac{3x+1}{2x^2 + x + 1} dx$.

4. Evaluate $\displaystyle\int \dfrac{\sin x}{\sin x + \cos x} dx$.

5. Show that the diagonals of a rhombus are at right angles.

6. Find the value of

   (a) $2A + B$

   (b) $B - 3C$ where

   $$A = \begin{pmatrix} 1 & 0 \\ -1 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 3 & 1 \\ 0 & -1 \end{pmatrix}.$$

7. State the condition for a straight line $y = mx + c$ touches the circle $x^2 + y^2 = a^2$.

8. Solve $(x^2 - y^2)\,dx = 2xy\,dy$.

9. Calculate the median for the following data :

CI :	1–10	11–20	21–30	31–40	41–50	51–60	61–70
f :	8	15	25	20	16	10	6

10. A card is drawn from each of two well shuffled packs of cards. Find the probability that at least one of them is an ace.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. If $y = a\cos(\log x) + b\sin(\log x)$ show that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$.

12. Evaluate find $I = \int \dfrac{(2 + 3\cos x)}{(\sin x + 2\cos x + 3)}\,dx$.

13. Solve the following system of equations by matrix method.

$$x + 2y + 3z = 1$$
$$2x + 3y + 2z = 2$$
$$3x + 3y + 4z = 1.$$

14. Find the equation of the circle which touches the straight line $3x + y - 4 = 0$ at the point $\left(\dfrac{1}{2}, \dfrac{5}{2}\right)$ and has its centre on the line $x + y - 5 = 0$.

15. Solve $(mz - ny)p + (nx - lz)q = ly - mx$.

16. Fit a straight line for the following data :

X :	100	200	300	400	500	600
Y :	40.2	92.3	94.2	96.3	98.2	100.3

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) If $y = \sin(m\sin^{-1} x)$, prove that $(1 - x^2)y_2 - xy_1 + m^2 y = 0$.

(b) Show that $\int \log(\tan x + \cot x)\,dx = \pi\log 2$.

18. (a) Find the inverse of the matrix $A = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$.

(b) Solve $x^2(y - z)\,p + y^2(z - x)\,q = z^2(x - y)$.

PROGRAMMING IN C

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   Discuss about the striking features of C.

2.   Explain with example, Nested IF construct in C.

3.   Distinguish between actual and formal arguments.

4.   Discuss the various bitwise operators in C.

5.   How are one-dimensional arrays initialized in a C program?

6.   Describe the operators used for getting the address of a variable and the value of a pointer variable.

7.   Compare a structure and a union.

8.   Explain how you represent nested structures.

9.   Describe the uses of the functions fprintf and fscanf.

10.   List out the file handling functions in C.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Discuss the precedence and associativity of operators in C.

12. Write a program in C to solve a quadratic equation for all possible roots.

13. Write functions to implement the string handling operations strlen and strcat.

14. Write a C program to sort the given 'N' numbers.

15. Define a structure for holding a complex number and write a program to manipulate them.

16. Discuss the various file handling operations in C.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) Describe the usage of bit manipulation operators in C.

(b) What is ternary operator? Explain with an example.

18. (a) Write a C program to find the trace of a matrix.

(b) Write a function in C to search and return the index of an element in an ordered array.

19. What is random file? Explain how they are implemented in C.

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DIGITAL PRINCIPLE AND APPLICATIONS

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   Explain Binary subtraction with example.

2.   Why Binary Numbers are used?

3.   Convert the following hexadecimal numbers into binary and decimal numbers.

   (a)   FAB

   (b)   49.E.

4.   Write the logic symbol of NAND gate with truth table.

5.   Explain Boolean algebra, Positive and Negative logic system.

6.   Explain Demultiplexer with suitable diagram.

7.   Explain Seven segment Indicator.

8. Explain the Parallel Binary adder with suitable diagram.

9. What is meant by switching time?

10. Explain D-flip or D latch.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Find the binary and Octal representation of decimal numbers.

   (a) 235.84

   (b) 750

12. What are the Universal gates?

13. State and prove Distributive laws of Boolean algebra.

14. Explain multiplxer with suitable example.

15. Explain 2's Complement subtraction with example.

16. Design a Mod 10 counter using a Mod 5 counter and a Mod 2 counter.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) Represent the Binary (1101110.0110) into Hexadecimal and Decimal.

   (b) Represent the Octal number (735.64) into Hexadecimal.

18. (a) State and prove Duality theorem.

   (b) Explain the steps involved in simplifying Boolean expression using K-Map.

19. (a) Briefly explain Parity Generators and Parity Checkers.

   (b) Explain JK — Master Slave flip—flop.

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PC SOFTWARE FOR WINDOWS

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   Define Multitasking with an example.

2.   What is the use of Format Painter in MS Word?

3.   How do you set the column width and row height in MS Word

4.   Explain AutoFormat feature in MS Excel.

5.   Describe the applications of Spreadsheet.

6.   How numbers can be formatted in MS Excel? Explain.

7.   Explain Mathematical functions with examples.

8.   What is the use of What-If Analysis in MS Excel?

9. Explain the uses of MS PowerPoint.

10. Explain briefly Computer Viruses.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions

11. Write short notes on

    (a) Choosing Font

    (b) Inserting Special Characters.

12. Explain the use of Find and Replace in MS Word.

13. Discuss the options in Drawing toolbar in MS Word.

14. How charts are created in MS Excel.? Explain.

15. Write short notes on :

    (a) Changing Text Alignment and Orientation

    (b) Format Painter.

16. Explain the features of DTP.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions

17. Explain Templates and Wizards in MS Word.

18. Describe moving, copying, inserting and deleting rows and columns in MS Excel.

19. Explain Macros and Multiple worksheets in MS Excel.

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SYSTEM SOFTWARE

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   Explain Instruction Format of SIC/XE.

2.   Write about Instruction set of SIC.

3.   What are the Assembler Directives?

4.   Explain Assembler Expressions with suitable examples.

5.   What are the functions of loader?

6.   Write about Bootstrap loaders.

7.   Explain how to use Macro Parameters.

8. What are the advantages of line-by-line approach in Macro processing?

9. What are the basic functions of compiler?

10. Write about interpreter.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Explain Addressing Modes of SIC/XE.

12. Explain One Pass Assembler.

13. Explain Addressing Modes of Machine Dependent Assembler.

14. Give the algorithm for Linking Loader and also explain table of logic.

15. Explain the design option of Macro processor.

16. Explain the relationship of Interactive Debuggers with other parts of system.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Explain about overlay structure of Two Pass Assembler.

18. Discuss how overlay process is done in Machine Independent Loader.

19. Describe the Machine Dependent and Independent Code Optimization.

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COBOL PROGRAMMING

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Explain the rules for framing numeric literals.

2. Explain about ADD statement in COBOL with its syntax.

3. Explain about ENVIRONMENT DIVISION with its syntax and examples.

4. What are floating strings? Explain.

5. Write any five rules that are to be observed in using occurs clause.

6. Write the syntax of MOVE statement and explain.

7. Write the syntax of FD entry for a tape or disk file with fixed length records and explain.

8. Explain about OPEN and CLOSE statements of sequential files.

9. What are the components of multimedia system? Explain.

10. What is meant by biochip? What is its future use?

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Explain in detail about decimal point and asterisk picture clauses.

12. Explain the ROUNDED option and ON SIZE ERROR option with arithmetic verbs giving examples.

13. Describe in detail about multi dimensional tables in COBOL.

14. Write a COBOL program to compute the gross pay and net pay. Assume your own deductions and allowances.

15. Explain about merging of files with examples.

16. Discuss the applications of computers in personnel and administration.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) What is meant by figurative constant? Explain with examples.

(b) Explain in detail about COBOL operators.

18. Explain different forms of PERFORM statements with suitable examples.

19. Write an essay on applications of computers in Finance and accounts.

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DISCRETE MATHEMATICS

Time : Three hours　　　　　　Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Write the properties of a relation.

2. Show that $f(x, y) = x^y$ is a primitive recursive function.

3. What is the disjunctive normal form of $pn (P \to Q)$?

4. Symbolise "X is the father of the mother of Y".

5. Write any two applications of recurrence relations.

6. Write the algorithm for solving Non-homogeneous finite order liner relation.

7. Define Rooted binary tree, spanning tree, weighted graph.

8. Write PRIM'S algorithm
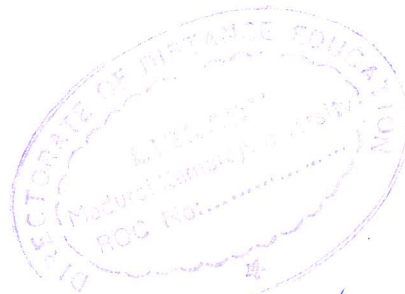
9. Explain duality in lattices with example.

10. Write a short note on boolean functions.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Let $R = \{(1, 2), (3, 4), (2, 2)\}$ and

$S = \{(4, 2), (2, 5), (3, 1), (1, 3)\}$ find

RoS, SoR, RoR, SoS, RoSoR.

12. Show that $P \rightarrow (Q \rightarrow R) \Leftrightarrow P \rightarrow (\neg Q \vee R) \Leftrightarrow (P \wedge Q) \rightarrow R$ without using truth table.

13. Show that $(\exists x) m(x)$ follows logically from the premises $(x)[H(x) \rightarrow M(x)]$ and $(\exists x) H(x)$.

14. Solve the recurrence relation

$a(n) = a(n-1) + 2(n-1), a(1) = 2$.

15. Prove that a graph is a tree iff it is minimally connected.

16. State and prove distributive inequalities of a lattice.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) Explain Warshall's algorithm.

(b) Explain all the four normal forms with examples.

18. (a) Solve $S(k) + 5S(k-1) = 9, S(0) = 6$ in all categories.

(b) Explain travelling salesmen problem.

19. Construct the logic circuit for

$f(x_1, x_2, x_3)0 = [(x_1 \wedge x_2) \vee x_3] \wedge [(x_2 \vee x_3) \vee x_3]$

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PROGRAMMING IN C++

Time : Three hours　　　　　　Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. What are the benefits of CPP?

2. Differentiate break and continue statement with example.

3. What is the use of This pointer? Explain.

4. What are the differences between constructors and destructors?

5. Give explanation for Pass by Value and Pass by Address.

6. Write a program which holds student details using passing an Array of Structure.

7. Explain how to access the base class member function.

8. Explain Hybrid Inheritance.

9. What is binding? Write about this.

10. What are the rules for Virtual Functions?

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Explain the basic concepts of OOPs.

12. Write a note on Dynamic allocation.

13. Explain about Reference Arguments.

14. Define base class student and two derived class internal and external exams and a final derived class result. Write a program for this with your own data.

15. Explain with a program how to access the Constructor and Destructor in Inheritance.

16. Explain Virtual Destructor with an example program.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Explain about various operators C++.

18. Write an essay about Storage Classes.

19. Explain about Runtime Polymorphism.

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COMPUTER GRAPHICS

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Define CG and give its application.

2. Distinguish between line, straight line and points in CG.

3. Explain the normalized device coordinates.

4. Write the line style primitives.

5. Explain the display file structures.

6. Give the polygon representation.

7. Write the 2D transformation matrix.

8. Explain concatenation with examples.

9. Explain mid point sub-division.

10. Define Viewport, Windowing, Window and clipping.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Write the graphics application.

12. Explain the DDA algorithm.

13. Explain the display file interpreter.

14. Explain the concept of filling with pattern.

15. Explain the rotation about arbitrary point.

16. Explain line clipping algorithm.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Explain the vector generation algorithm.

18. Write the transformation routines and explain in detail.

19. Discuss the polygon filling concepts.

OPERATING SYSTEMS

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   Discuss the need for the operating system.

2.   What is a process? How does the OS represent a process in memory?

3.   What do you mean by scheduling?

4.   Explain any two scheduling algorithm.

5.   What do you mean by Deadlock? Explain the problem occur in deadlock.

6.   Explain Banker's Algorithm.

7.   What do you mean by swapping?

8.   Explain Page memory allocation.

9.   Explain the different access methods in the file.

10.   Explain any five DOS commands used to working with directories.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11.   Explain protection requirement for I/O and memory.

12.   Discuss the structure of the Operating System.

13.   Explain the Analytic evaluation method.

14.   Discuss the role of semaphore with an example.

15.   What do you mean by thrashing?

16.   Explain Unix file system.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17.   Explain the method to prevent and avoid Dead lock.

18.   (a) What do you mean by multiprogramming operating system and distributed operating system?

(b)   Explain in detail about Replacement policies.

19.   Briefly explain the Interprocess communication.

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COMPUTER ORGANIZATION

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Write an assembly language program to add two numbers.

2. Discuss the rules of assembly language.

3. Explain all shift operations with example.

4. List out the program control instructions with their usages.

5. Explain Pipeline processing in detail.

6. Explain Auxillary memory.

7. Explain fetch and Indirect cycle.

8. List out the page replacement algorithms and explain them.

9. Write note on Asynchronous data transfer.

10. Explain storage hierarchy in a large computer system.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Explain data transfer and data manipulation Instructions.

12. Explain vertical micro instructions. List out the advantages and areas of application.

13. List out usages of addressing modes and explain its types.

14. What is asynchronous data transfer? Explain.

15. Differentiate between parallel and serial interrupts and explain each with an Example.

16. Explain the techniques used to protect memory.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Explain Multiprocessor System organization.

18. Explain in detail

(a) DMA Data Transfer.

(b) Handshaking.

19. Explain associative and set-associative mapping in cache memory.

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COMPUTER ALGORITHM AND DATA STRUCTURE

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   What is searching? Explain Linear Search Algorithm.

2.   Define Preorder traversal.

3.   How stacks are useful in evaluating expression?

4.   Explain garbage collection.

5.   Explain hash function with examples.

6.   What is a singly linked list? Explain.

7.   Define Knapsack problem.

8.   Explain AND/OR graph.

9.   Define Game trees.

10.   How strings are represented? Explain.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. How to insert and delete an element from a stack? Explain.

12. Explain Quick sort.

13. Write the procedure for assigning program to a tape.

14. Define Mazing problem.

15. Explain Greedy method with suitable example.

16. How Binary trees are represented? Explain.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Formulate the travelling salesman problem and give procedure to solve it.

18. Discuss in detail :

(a) Explain Prim's algorithm.

(b) Insertion and deletion of a DLL.

19. Write short notes on :

(a) Draw Binary search tree with n = 12

(b) Threaded binary tree

(c) Circular queue

(d) Sparse matrix.

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SOFTWARE ENGINEERING

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   How programmers spend their time? Explain.

2.   What is planning? Explain.

3.   What is a Prototype? Explain.

4.   What are the characteristics of various team structures? Explain.

5.   Explain the impact of Technology towards cost estimation.

6.   What is a Data Dictionary? Explain.

7.   What are Decision Table? Explain their type.

8.   What are design concepts? Explain.

9.   What are DFD's? Explain.

10.   What is debugging? Explain.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11.   Explain medium size, large size, very large size projects.

12.   Explain the matrix format of a project structure using example.

13.   What are the influences of programmer ability and product complexity towards software cost?

14.   Explain SRS in detail.

15.   What are Relational Notations? Explain.

16.   Explain Quality Assurance in detail.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17.   Discuss the various factors that influence quality and productivity of software product.

18.   Explain the various design techniques.

19.   Discuss in detail the various testing strategies.

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CLIENT SERVER COMPUTING WITH ORACLE

Time : Three hours　　　　　　Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.　What is a database? Explain with example that stores student marksheet processing system.

2.　What is data independence? Explain its types.

3.　What are the advantages of client server computing?

4.　What is polymorphism? Explain.

5.　Explain any three date functions.

6.　How to update a table? Give suitable example.

7.　Write notes on Cursors.

8.　What is a PL/SQL function? Explain.

9.　List the roles of a DBA.

10.　What do you understand about database backup? Explain.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Explain the ER diagram model with a suitable example.

12. Compare and contrast GUI with CUI.

13. Explain the oracle data types.

14. Explain the various DDL commands.

15. Explain how to handle PL/SQL exceptions.

16. Explain how to configure SQL*net for an oracle client/server system.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. (a) Explain the data integrity constraints.

(b) What do you understand about front end and back end tools? Give examples.

18. Create a table Book (Book id, title, author, publisher, year, price) and write the following queries. (3)

(a) List the details of books published in the year 2007 and 2008.

(b) Get all the details of the books whose price range is Rs. 200 to Rs. 500.

(c) Get all the details of the books whose publisher name starts with 'm'.

(d) Get the title, author names and publisher of all books publisher in 2006 and the price is greater than 600.

(e) Get the number of rows in the table.

(f) Find the average price. (12)

19. What is a trigger? Explain how to create a trigger.

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COMPUTER NETWORKS

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Write the uses of computer networks.

2. Discuss about WAN.

3. Explain Time Division switches.

4. Write the concept of pure ALOHA.

5. Explain the bit stuffing framing method.

6. Write about 802.5, the token ring.

7. Give the internal organization of network layer.

8. Write about transport layer QOS parameters.

9. Explain substitution ciphers.

10. Write about e-mail privacy.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Discuss the critique of the OSI model and protocols.

12. Explain the ATM network in detail.

13. Explain the multiple access protocols in detail.

14. Discuss the network layer design issues.

15. Describe the elements of transport protocols.

16. Explain two fundamental cryptographic principles.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Draw and explain the ISO OSI reference model in detail.

18. Explain :

(a) Collision-free protocols.

(b) Limited contention protocols.

19. Explain the authentication protocols.

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MULTIMEDIA TECHNOLOGY AND APPLICATIONS

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Write brief history of Multimedia.

2. Explain four basic stages in a 'multimedia project.

3. Explain reference organization strategies.

4. Explain communication protocol in Internet.

5. What are the Bandwidth considerations for Internet?

6. Describe Indexed Retrieval System Strategies in Hypertext.

7. What are the disadvantages of MIDI?

8. Write notes on TCP/IP protocol.

9. Write any five advantages of Multimedia.

10. Explain font editing and design tools.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Discuss briefly operating system and software.

12. Explain in detail the digital audio and video.

13. What are the resources for Multimedia developers?

14. What are the various categories of authoring tools for multimedia?

15. Explain how the text is used in multimedia application.

16. Explain briefly about the concept of storyboarding.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Write an essay on the types of Multimedia products.

18. Discuss the uses of graphics in multimedia design.

19. Explain in detail about Digital Video Data sizing.

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JAVA PROGRAMMING

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   List the applications of OPPs technology.

2.   Explain Java's Byte code.

3.   Explain the various access specifiers.

4.   Write a program to convert the given temperature in Fahrenheit to Celsius.

5.   How to create a thread? Give example.

6.   Explain any three string handling methods.

7.   What is a random access file? How is it different from a sequential file?

8. Write a Java program to send a number from the server to client.

9. Write notes on button control.

10. Explain how to pass informations to applets.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. Explain the OOP's concepts.

12. Explain the data types used in Java.

13. Describe the complete life cycle of a thread.

14. Describe the various forms of implementing interfaces. Give examples of Java code for each case.

15. What is a stream class? How are the stream classes classified?

16. Develop an applet that receives three numbers as input from the user and the display the largest number. Write a HTML page and test the applet.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Explain the looping statements available in Java.

18. Discuss in detail about exception handling in Java with examples.

19. Explain the two types of TCP/IP sockets.

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OPERATIONS RESEARCH

Time : Three hours   Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1.   Discuss the various characteristic of Operations Research.

2.   Discuss the scope of OR in various fields.

3.   What is LPP? Explain the various steps involved in the mathematical formulation of LPP?

4.   What are slack and surplus variables? Explain the various forms of a LPP.

5.   Explain the Two-Phase Simplex method.

6.   Obtain the dual of the LPP.

Min $Z = x_1 + x_2 + x_3$

Subject to constraints

$$x_1 - 3x_2 + 4x_3 = 5$$
$$x_1 - 2x_2 \le 3$$
$$2x_2 - x_3 \ge 4$$
$$\text{and } x_1, x_2 \ge 0, x_3 \text{ is unrestricted.}$$

7.   Explain the Hungarian assignment problem.

8.   Explain the Traveling-Salesman problem.

9.   Explain the Vogel's approximation method of solving a TP.

10.   What is degeneracy in a TP? Explain how to resolve it.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11.   What is a model in OR? Discuss various classification schemes of models.

12. Solve graphically

Min $Z = 20x_1 + 10x_2$

Sub to

$$x_1 + x_2 \leq 40$$
$$3x_1 + x_2 \geq 30$$
$$4x_1 + 3x_2 \geq 3$$

and $x_1, x_2 \geq 0$.

13. Using Simplex method solve the following LPP.

Max $Z = x_1 + 2x_2$

Sub to

$$-x_1 + 2x_2 \leq 8$$
$$x_1 + 2x_2 \leq 12$$
$$x_1 - 2x_2 \leq 3$$

and $x_1, x_2 \geq 0$.

14. Use Big-M method to solve the following LPP

Max $Z = 4x_1 + 3x_2$

Sub to

$$2x_1 + x_2 \geq 10$$
$$x_1 + x_2 \geq 6$$
$$-3x_1 + 2x_2 \leq 6$$

and $x_1, x_2 \geq 0$.

15. Use Vogel's Approximation method to obtain an initial basic feasible solution.

Cost of Transport

	D_1	D_2	D_3	D_4	Availability
01	5	8	3	6	30
02	4	5	7	4	50
03	6	2	4	6	20
Requirement	30	40	20	10	100

16. Four computer programming jobs have to be assigned to four programmers. Time taken by each programmer on each job is shown in the table below. Find an optimum assignment.

Programmers

		P_1	P_2	P_3	P_4
	A	9	3	7	2
Job	B	4	4	10	5
	C	4	6	9	6
	D	7	4	8	5

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Old hens can be bought for Rs. 2 each but young hens cost Rs. 5 each. The old hens lay 3 eggs per week each worth 30 paise. A hen cost Rs. 1 per week to feed. If I have only Rs. 80 to spend for hens, how many of each kind should buy to give a profit of more than Rs. 6 per week, assuming that I can't house more than 20 hens. Write a mathematical of the given problem and solve.

18. Use principle of duality to solve the following LPP.

Max $Z = 3x_1 + 2x_2$

Sub to

$$2x_1 + x_2 \leq 5$$
$$x_1 + x_2 \leq 3$$
and $x_1, x_2 \geq 0$.

19. (a) Using North West Corner rule and MODI solve the transportation problem with unit transportation costs, availability and demand as given below :

Destinations	D_1	D_2	D_3	D_4	Availability (in units)
O_1	6	2	8	9	80
Origin O_2	12	6	16	12	80
O_3	4	6	18	4	120
Demand (in units)	40	50	130	60	280

(b) Find the optimum assignment for the following problem.

			M/C		
		A	B	C	D
	1	12	30	21	15
Jobs	2	18	33	9	31
	3	44	25	24	21
	4	23	30	28	14

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