

18. (a) Find by vector method the angle between the diagonals of the cube.

- (b) Prove that the equations  $12x^2 + 7xy - 10y^2 + 13x + 45y - 35 = 0$  represent a pair of straight lines and find the angle between them.

19. Calculate the arithmetic mean and the median of the frequency distribution given below. Hence calculate mode.

Class limits : 130–134 135–139 140–144 145–149

Frequency : 5 15 28 24

Class limits : 150–154 155–159 160–164

Frequency : 17 10 1

5211/A11

MAY 2011

MATHEMATICS

Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Find the derivative of  $x^2 \sin x + \sqrt{x}$ .
2. If  $xy = ae^x + be^{-x}$  prove that  $x \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} - xy = 0$ .
3. Evaluate  $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$ .
4. Evaluate  $\int x \log x dx$ .
5. Determine  $\lambda$  and  $\mu$  by using vectors such that the points  $(-1, 3, 2)$ ,  $(-4, 2, -2)$  and  $(5, \lambda, \mu)$  lie on a straight line.

6. Find the value of

(a)  $2A+B$

(b)  $B-3C$  where  $A = \begin{pmatrix} 1 & 0 \\ -1 & 2 \end{pmatrix}$   $B = \begin{pmatrix} 3 & 1 \\ 0 & -1 \end{pmatrix}$ .

7. Prove that  $x^2+9y^2+6xy+4x+12y-5=0$  represents two parallel straight lines.

8. Solve  $\sqrt{p}+\sqrt{q}=2x$ .

9. Find the G.M. and H.M. of the following distribution.

$$x: \quad 1 \quad 2 \quad 3 \quad 4 \quad 5$$

$$f: \quad 2 \quad 4 \quad 3 \quad 2 \quad 1$$

10. A random variable has the following distribution.

$$x: \quad \quad \quad 4 \quad 5 \quad 6 \quad 8$$

$$\text{probability: } 0.1 \quad 0.3 \quad 0.4 \quad 0.1$$

Find the mean and standard deviation of  $x$ .

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Find the equations of tangent to the curve  $x^2-2xy+2y^2-7x+6y+6=0$  which is perpendicular to  $6x+5y-4=0$ .

12. Evaluate  $\int \frac{x-2}{\sqrt{2x^2-6x+5}} dx$ .

13. Show that the equations  $x+y+z=6$ ,  $x+2y+3z=14$ ,  $x+4y+7z=30$  are consistent and solve them.

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

15. Solve  $x^2(y-z)p+y^2(z-x)=z^2(x-y)$ .

16. Calculate the correlation coefficient from the following data

$$x: \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10$$

$$y: \quad 9 \quad 8 \quad 10 \quad 12 \quad 11 \quad 13 \quad 14 \quad 16 \quad 15 \quad 12$$

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. (a) Find  $y^{(n)}$  when  $y = \frac{x^2}{(x-1)^2(x+2)}$ .

(b) Evaluate  $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$ .



PROGRAMMING IN C

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Time : Three hours

Maximum : 100 marks

SECTION A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Mention some of the control strings used in input statements.
2. Write short notes on keywords.
3. Explain call by reference with an example.
4. Write short notes on macros.
5. Define array? How arrays are initialized?
6. Discuss about operations on pointers?
7. Write short notes on enumeration.
8. Explain in detail about bit fields.
9. Explain fscanf and fprintf functions.
10. Write the usage of getw and fgetc.

SECTION B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Explain the “for” statements with an example program.
12. Write a program to perform matrix multiplication.
13. Explain pointers in detail with an example.
14. Define structures. How can you declare and access structure elements?
15. Explain string handling library functions with an example.
16. Explain fread and fwrite functions with an example.

SECTION C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. What are the different types of “if” statements available in c. Explain with an example.
  18. Explain the categories of functions with an example.
  19. Write a program for storing and retrieving student details using files.
-

**DIGITAL PRINCIPLES AND APPLICATIONS**

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Convert (534) to binary number.
2. Explain the EXCESS code.
3. Explain the AND gate and Truth Table.
4. Prove that  $(A + B) \cdot (A + C) = A + B \cdot C$ .
5. Write a note on product of sums.
6. Explain the Decoder.
7. Explain the full adder circuit and truth table.
8. Draw the circuit JK flipflop and explain its working.



9. Binary addition following number :

(a)  $15 + 18$

(b)  $9 + 16$ .

10. Explain the Distributive law.

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. (a) Explain the Commutative law.

(b) Explain the Associated law.

12. Briefly discuss the Duality theorem.

13. Simplify  $Y = \bar{A} \bar{B} \bar{C} + \bar{A} B \bar{C} + A \bar{B} \bar{C} + A B \bar{C}$  .

14. Explain the astable multivibrator.

15. Describe with a logic diagram parallel in parallel out shift. Register.

16. Explain the Mod 5 counter.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Explain the serial-in and serial-out shift register with wave form.

18. (a)  $AB + \bar{A}\bar{C} + \bar{A}BC(AB + C) = 1$

(b)  $A\bar{B}(A + C) + AC(\bar{A} + \bar{B}) = 1$

19. Simplify the equation using K-map.

$F(A, B, C, D) = (0, 1, 2, 3, 4, 5, 6, 7)$ .

**PC SOFTWARE FOR WINDOWS**

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Time : Three hours

Maximum : 100 marks

**PART A — (6 × 5 = 30 marks)****Answer any SIX questions.**

1. How are tables inserted in Ms-Word?
2. How will you change the background in a page of Ms-word?
3. What is the importance of print layout in Word?
4. What are rows and columns in Ms-Excel?
5. What is a worksheet?
6. What is the use of Labels in Excel?
7. What are the features of Ms-powerpoint?
8. Explain the slide sorter view?



9. What is transition in Ms-powerpoint?
10. Explain the various types of viruses?

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Write short notes on :

- (a) Tables
- (b) Spell check.

12. Describe the formatting of a worksheet in Ms-Excel.
13. Explain the various formatting Numbers of Ms-Excel.
14. Describe the various options in page layout of Ms-word.
15. Explain the various symptoms of viruses with example.
16. Explain the format painter usage with proper examples.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Explain Format menu in Ms – Word.
18. Explain the various types of charts in Ms-Excel.
19. State the various animations used in Ms-powerpoint.
-

SYSTEM SOFTWARE

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Explain addressing modes of SIC/XE machine structure.
2. List out various channel work area.
3. Explain the design of a two pass assembler.
4. Compare system software with application software.
5. What are the differences between absolute loader and relocatable loader?
6. Explain the tables and logic for a linking loader.
7. Explain in detail about the needs for macro.
8. State the use of macros.
9. Compare compiler with interpreter.
10. What are the advantages of compilers?



PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. List out SIC/XE full, instruction set and addressing modes.
12. Write a neat sketch. explain single-pass assembler.
13. Write about Bootstrap loaders.
14. Discuss the design of a macro processor and explain compilation process.
15. Summarize the aspects of compilation with respective examples.
16. Write short notes on:
  - (a) Editors
  - (b) User Interfaces.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Discuss in detail about development tools for language processing.
18. Write notes on:
  - (a) Advanced macro facilities
  - (b) Relocation concepts.

19. (a) Illustrate local optimization.  
(b) Describe compilation of control transfer, conditional and iterative constructs.
-

COBOL PROGRAMMING

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Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Define literal and how is it classified?
2. With examples specify a correct format for MULTIPLY statement in COBOL.
3. What are the significances of level numbers in COBOL?
4. Explain the need for data division in COBOL, with typical examples.
5. What is the purpose of GO TO statement?
6. Write a COBOL program to accept five numbers and calculate the sum and average.
7. What are the advantages of Indexed Organization file?



8. Explain WRITE statement in detail.
9. Write the major activities in materials management system.
10. Write short notes on computer based personal information system.

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Write the syntax of DISPLAY and COMPUTE statements and their usage.
12. Describe in details about any five picture class characters with suitable illustrations.
13. What are the usages of OCCURS clause? Explain with examples.
14. Write a COBOL program to find the sum of 100 odd numbers.
15. Explain in details about relative file organization.
16. Explain Marketing Information System in detail.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. (a) What are the different sections in the environment division? Write the purpose of each statement.  
  
(b) Explain the general form of EXAMINE verb.
  18. Explain the following COBOL verbs with suitable example.  
(a) OPEN  
(b) DIVIDE  
(c) ACCEPT  
(d) CLOSE
  19. (a) State any five rules relating to specifying the SORT verb.  
  
(b) What are the system inputs to financial management systems?
-

DISCRETE MATHEMATICS

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Give an example of a relation which is reflexive, symmetric but not transitive.
2. Show that  $f(x,y) = x^y$  is a primitive recursive function.
3. Distinguish tautology and contradiction.
4. Write the disjunctive normal form of  $P \wedge (P \rightarrow Q)$ .
5. Define recurrence relation with example.
6. Write any two properties of generating functions.
7. Define isomorphism of graphs with example.
8. Explain any types of diagrams.
9. State and prove modular inequality.
10. Write short note on Boolean functions.



PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Write and explain the properties of relation with example.
12. Construct truth table for the formula.  
 $(P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge Q) \vee (\neg P \wedge \neg Q)$
13. Prove that  $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x)P(x) \wedge (\exists x)Q(x)$ .
14. Prove that a tree with  $n$  vertices has  $n-1$  edges.
15. Using generating function solve  
 $y_{n+2} - 6y_{n+1} + 5y_n = 0, y_0 = 2, y_1 = 6$ .
16. Explain the applications of Boolean algebra to switching theory.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. (a) Let  $R$  be the relation in  $N \times N$  defined by  
 $(a, b)R(c, d)$  iff  $ad = bc$ . Show that  $R$  is an equivalence relation.  
 (b) Write the properties of functions.

18. (a) Show that

$$(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R.$$

- (b) Solve  $T(K) - \neg T(K-1) + 10T(K-2) = 6 + 8K, T(0) = 1, T(1) = 2$ .
19. (a) Explain the various types of trees.  
 (b) Explain special lattices with examples.

PROGRAMMING IN C++

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Time : Three hours

Maximum : 100 marks

PART A — (6 × 5 = 30 marks)

Answer any SIX questions.

1. Mention the advantages of OOP languages.
2. What are the differences between while and do-while loop statements?
3. What are the characteristics of arrays?
4. Write a C++ program to find the sum of N given numbers.
5. Write short note on function prototyping.
6. Explain member variable and member function with example.
7. Write a C++ program to illustrate single inheritance.

8. List the rules for overloading operators.
9. How the polymorphism be achieved? Explain.
10. Describe the uses of 'this' pointer in detail.

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Explain typecasting. What are explicit and implicit type conversions?
12. Write short notes on destructors.
13. Discuss the use of function overloading with example.
14. Write the rules for virtual functions.
15. Write a C++ program to show how the unary minus operator can be overloaded.
16. What are the rules for virtual function? Explain with example.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Explain the key concepts of OOP.
18. Explain the copy constructors and dynamic constructors with example.
19. Explain the concept of overloading binary operators with an example.



COMPUTER GRAPHICS

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. What is a line segment? Explain.
2. What is character generation? Explain.
3. Write short notes polygon representation.
4. Explain Random Scan System.
5. What are line attributes? Explain.
6. Explain polygon Flood fill algorithm.
7. Write short notes on scaling transformation.
8. What is inverse transformation? Explain.
9. Explain the concept of line Clipping.
10. Explain window transformation in detail.

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Explain DDA algorithm in details?
12. Write an algorithm for changing pixel values of the frame buffer along a line segment.
13. Explain different display file algorithms.
14. Write short note on polygon filling concepts.
15. Explain display procedure in detail.
16. Obtain the view port transformation matrix.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Explain Bresnham's line algorithm.
  18. Explain polygon interface algorithms.
  19. Explain Cohen — Sutherland algorithm for clipping lines.
-

OPERATING SYSTEMS

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Explain the abstract view of a computer system?
2. What are process states? Explain.
3. Explain IPC?
4. How to recover from Deadlock? Explain.
5. Explain about single contiguous allocation?
6. What is a segment table? Explain.
7. Explain about blocking.
8. Write Short notes on Acyclic graph.
9. Write and explain about DOS file system.
10. Explain the Network Operating System tasks in detail.

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Write Short notes on Buffering and Spooling.
12. Explain about Bankers Algorithm in detail.
13. Write Short Notes on different types of schedulers.
14. What are multilevel queues? Explain.
15. Explain Disk Scheduling in detail.
16. What are the major parts of UNIX? Explain.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Explain about multiple partitioned allocations in detail.
  18. How Dead Locks are handled? How to Prevent and Avoid Dead Locks?
  19. Write Short Notes on
    - (a) Pipelines and Filters
    - (b) Inodes.
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COMPUTER ORGANIZATION

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Explain the use of accumulator.
2. What is meant by Fetch cycle?
3. What is seek time?
4. Explain the use of indexed addressing mode.
5. What is meant by handshaking?
6. What is meant by interrupt?
7. What is meant by Machine language?
8. What is meant by virtual memory?
9. What is I/O bus?
10. Discuss the functional units of a computer.



**PART B — ( $4 \times 10 = 40$  marks)**

Answer any **FOUR** questions.

11. Explain multi processor organization in detail.
12. Describe the role of program counter and other registers in addressing.
13. Explain the working of a one stage arithmetic unit.
14. Describe the use of page table in address mapping.
15. Describe LIFO and LRU page replacement algorithms
16. Explain the process of asynchronous serial data transfer.

**PART C — ( $2 \times 15 = 30$  marks)**

Answer any **TWO** questions.

17. Write the flowchart and algorithm for multiplication and division of two floating point numbers.
18. Explain the various control signals available in a microprocessor.

**19. Write a note on**

- (a) Cache memory
  - (b) Memory protection
  - (c) Micro Program control organization.
-

COMPUTER ALGORITHMS AND DATA  
STRUCTURES

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Write short notes on Divide and Conquer method.
2. Define Space complexity and Time complexity.
3. Explain Job sequencing with deadlines problem in detail.
4. What is Greedy method and explain it.
5. Define Dynamic programming and write its applications.
6. What is 0/1 knapsack problem? Explain.
7. Compare and contrast stack with queue.
8. What is Garbage Collection and Compaction?
9. Write any one binary tree traversal algorithm in detail.

10. Define the following;

- (a) Tree
- (b) Binary tree
- (c) Forest.

18. Explain the linked list representation of stacks and the various operations performed on it.

19. Explain threaded binary tree in detail.

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PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

- 11. Explain selection sort with an algorithm.
- 12. Describe briefly about optimal storage on tapes.
- 13. Write short notes on multi stage graphs.
- 14. Write an algorithm to insert and delete an element from queue.
- 15. What is sparse matrices? Explain how to store sparse Matrices, with example.
- 16. Explain the different ways of representing binary trees in detail.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

- 17. With examples, explain the algorithm of strassen's matrix multiplication.



**SOFTWARE ENGINEERING**

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Time : Three hours

Maximum : 100 marks

**PART A — (6 × 5 = 30 marks)**

Answer any SIX questions.

1. What do you mean by Problem Understanding? Explain.
2. What is the necessity of training in Software Development?
3. What are goals and Requirements? Explain.
4. What are reviews? Explain.
5. Write Short Notes on Product Complexity?
6. What are regular expressions? Explain.
7. Explain about the fundamental Software design concepts?

8. Explain about source code metrics?
9. Write Short Notes on Debugging?
10. How to maintain Software?

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Explain the format of a project plan?
12. Discuss in detail about Prototype life cycle model?
13. Write Short Notes on Software Cost Factors?
14. Explain about state oriented rotation?
15. What are decision tables? Explain.
16. Explain about Integration testing?

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. How to plan an Organization structure? Explain.
18. Explain SADT in detail.

19. Write Short Notes on :

- (a) Cohesion
  - (b) Unit testing
  - (c) Static analysis.
-

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CLIENT/SERVER COMPUTING WITH ORACLE

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. What is a database? What are its uses?
2. Discuss briefly on database security.
3. Explain about mini computer computing model.
4. What are the advantages of Object oriented programming?
5. How is a table structure modified? Give example.
6. What is SQL? What are its advantages?
7. Discuss 'Savepoint' with example.
8. Explain cursors in Oracle.
9. What is a database server?
10. How are triggers executed? Explain with examples.

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Explain PL/SQL block structure with a neat sketch.
12. Explain concurrency control in databases.
13. How are errors trapped in PL/SQL?
14. What are the benefits and pitfalls of Client/Server computing?
15. Discuss on any five of the aggregate functions in SQL with examples.
16. Explain user management in Oracle.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Explain the concept of normalization.
  18. Explain the role of a DBA while installing a database.
  19. Explain in detail about DML commands with examples.
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COMPUTER NETWORKS

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. What are the four classes of service primitives in network software?
2. What is meant by Frame relay?
3. Explain the fiber cables.
4. Explain the space division switching.
5. Comparison of fiber optics and copper wire.
6. What are the functions of MODEM?
7. Explain the Traditional cryptography?
8. Explain the error control and flow control?
9. Explain the digital signature?
10. Explain the Uniform Resource Locator (URL).

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. Describe the Novell Netware.
12. Explain the B-ISDN ATM reference model.
13. Explain the Radio Transmission.
14. Explain the quality of service.
15. Discuss the upward and downward multiplexing.
16. Explain the cryptographic principles.

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. Explain in detail the structure and functions of OSI model.
  18. Explain the Time division switching.
  19. Comparison of virtual circuit and Datagram subnets.
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MULTIMEDIA – TECHNOLOGY AND  
APPLICATIONS

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. What are the uses of multimedia at home entertainment?
2. Write short notes on operating systems and software.
3. Write short notes on Information text.
4. Explain about Images and Color.
5. Write about the process of adding sound to your multimedia project.
6. Discuss about the various recording formats.
7. Write short notes on Alpha and Beta testing.
8. Explain about Simple Interactive authoring tools.
9. Write short notes on HTML and Web Authoring.
10. How can you access content on the internet?

PART B — ( $4 \times 10 = 40$  marks)

Answer any FOUR questions.

11. What are the various hardware elements found in multimedia computer.
12. What are two basic strategies applied when putting pictures in the computer.
13. Explain in detail about the various Broadcast Video standards.
14. Explain in detail about Deployment.
15. Explain in detail about Images for the web.
16. What are the different types of Animation techniques present in multimedia?

PART C — ( $2 \times 15 = 30$  marks)

Answer any TWO questions.

17. What are the resources of multimedia developers?
18. Explain in detail about “Costing a Multimedia Project”.
19. Explain in detail about the process of designing for the web.



JAVA PROGRAMMING

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Write the basic concepts of OOPS.
2. Give a brief description of bitwise operators in java.
3. Write a java program to convert the given temperature in Fahrenheit to Celsius using the following conversion formula  $C = (F - 32) / 1.8$ .
4. Explain the various access modifiers with illustration.
5. Specify five manipulation operations.
6. Distinguish between package and interface with example.
7. Describe Random Access File class.



8. Explain the life cycle of an applet.
9. Write a java program to find the largest number from a given integer array.
10. Explain Border Layout and Card Layout with examples.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. What is the significance of break and continue statement.
12. What are I/O streams? Explain them with illustrations.
13. Explain the life cycle of a thread with a neat diagram.
14. Write a short note on overloading of methods.
15. Explain any five controls in AWT package.
16. Discuss in detail about Panels and Layouts.

PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

17. Explain in detail the control statements in java with example.
  18. Explain the types of inheritance with examples.
  19. Write an applet which draws a human face with few ovals and arcs.
-

OPERATIONS RESEARCH

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Time : Three hours

Maximum : 100 marks

PART A — ( $6 \times 5 = 30$  marks)

Answer any SIX questions.

1. Write a short note on Monte-Carlo method for solving OR models.
2. Discuss the scope of OR.
3. Explain the Mathematical formulation of LPP.
4. Write a note on the following:
  - (a) Slack and surplus variables
  - (b) Standard form of LPP

5. Obtain the dual of the LPP

$$\text{Min } Z = x_1 + x_2 + x_3$$

Subject to constraints  $x_1 - 3x_2 + 4x_3 = 5$

$$x_1 - 2x_2 \leq 3$$

$$2x_2 - x_3 \geq 4 \text{ and}$$

$$x_1, x_2 \geq 0,$$

$x_3$  is unrestricted.

6. Explain Big-M method for solving a LPP.
7. State the general rules for converting any primal LPP into its dual.
8. Explain the Hungarian method to solve an assignment problem.
9. What is degeneracy in a transportation problem and explain how to resolve it.
10. Explain MODI method to find an optimal solution of a TP.

PART B — (4 × 10 = 40 marks)

Answer any FOUR questions.

11. What are the various phases of OR problems?

12. Solve graphically

$$\text{Min } Z = 20x_1 + 10x_2$$

$$\text{Subject to } x_1 + x_2 \leq 40$$

$$3x_1 + x_2 \geq 30$$

$$4x_1 + 3x_2 \geq 60 \text{ and}$$

$$x_1, x_2 \geq 0.$$

13. Solve the following LPP by simplex method:

$$\text{Maximize: } Z = 5x_1 + 3x_2$$

$$\text{Subject to: } x_1 + x_2 \leq 2$$

$$5x_1 + 2x_2 \leq 10$$

$$3x_1 + 8x_2 \leq 12 \text{ and}$$

$$x_1, x_2 \geq 0$$

14. Explain the travelling salesman problem with example.

15. Use

(a) column minima method and

(b) North west corner rule method to obtain an initial basic feasible solution for the following Transportation problem.

Cost of Transport					
Warehouse					
Factory	W1	W2	W3	W4	Availability
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Requirement	5	8	7	14	34

16. Solve the following maximization assignment problem.

A	B	C	D	E
32	38	40	28	40
40	24	28	21	36
41	20	33	30	37
22	38	41	36	36
29	33	40	35	39



PART C — (2 × 15 = 30 marks)

Answer any TWO questions.

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

$$\text{Min } Z = 4x_1 + 3x_2$$

Subject to

$$2x_1 + x_2 \geq 10$$

$$x_1 + x_2 \geq 6$$

$$-3x_1 + 2x_2 \leq 6 \text{ and}$$

$$x_1, x_2 \geq 0$$

18. Determine the basic feasible solution and optimum solution for the following transportation problem:

	Destinations					Supply
	D1	D2	D3	D4	D5	
P1	7	7	10	5	11	45
P2	4	3	8	6	13	90
P3	9	8	6	7	5	95
P4	12	13	10	6	3	75
P5	5	4	5	6	12	105
Demand	20	80	50	75	85	

19. Solve the following assignment problem of minimizing total time for doing all the jobs.

Operators	Jobs				
	1	2	3	4	5
I	6	2	5	2	6
II	2	5	8	7	7
III	7	8	6	9	8
IV	6	2	3	4	5
V	9	3	8	9	7