उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड :	कोर्स शीर्षकः– (Course Title)	अधिकतम अंक : 30
Course Code: **MSC-CS-01**	**Discrete Mathematical Structure**	**Maximum Marks : 30**

खण्ड अ — अधिकतम अंक : 18

Section-A — **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Explain the following terms with example:
   a. Homomorphism and Isomorphism graph
   b. Euler Graph and Hamiltonian graph

2. Rewrite the following arguments using qualifiers, variables and predicate symbols:
   a. All birds can fly
   b. Some men are genius.
   c. Some numbers are not rational
   d. There is a student who likes mathematics but not geography.

3. Explain the following terms with suitable examples –
   a. Conjuction
   b. Disjunction
   c. Contrapositive
4. Construct truth tables for
   (i) [(P => Q) /\ (Q => R)] => (P => R)
   (ii) ~ (P => Q) V [(-P) /\ Q] V Q.
5. Write short notes :
   (i) Regular graph
   (ii) Bipartite graph
   (iii) Hamiltonian graph.

6. Show that the relation (x,y) R (a,b) □ x2 + y2 = a2 + b2 is an equivalence relation on the plane. Also describe the equivalence classes.
7. Show that the dual of distributive lattice is a distributive Lablece is a destrebutive Latlcce
8. Let P (x) be the statement “x can speak Russian” and let Q(x) be the statement “x knows the computer language C++.” Express each of these sentences in terms of P (x), Q(x), quantifiers, and logical connectives. The domain for quantifiers consists of all students at your school.
   a) There is a student at your school who can speak Russian and who knows C++.
   b) There is a student at your school who can speak Russian but who doesn‟t know C++.
   c) Every student at your school either can speak Russian or knows C++.
   d) No student at your school can speak Russian or knows C++.

9. Determine whether the relation R on the set of all Web pages is reflexive, symmetric, antisymmetric, and/or transitive, where (a, b) ∈ R if and only if
   a) everyone who has visited Web page a has also visited Web page b.
   b) There are no common links found on both Web page a and Web page b.
   c) There is at least one common link on Web page a and Web page b.
   d) There is a Web page that includes links to both Web page a and Web page b.

खण्ड ब अधिकतम अंक : 12

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Find using Karnaugh maps a minimal form for the boolean function.
    a. f (x, y, z) = xyz + xyz' + x'yz' + x'y'z'.

11. In any boolean algebra show that
    a. (a + b) (b + c) (c + a) = ab + bc + ca.

12. Define with examples of NAND and NOR gates.

13. Show that the dual of a modular lattice is modular.

14. Define tautologies and contradictions with examples.

15. Construct the truth table for P v (q ^ r) ⇔ q^ (p v r).

16. What is Lattice? Explain the properties of Lattice.

17. What is planar graph? Also explain Euler's formula.

18. Let R and S be two relations on a set A. Then if R and S are reflexive then prove that R∩S is reflexive.

19. Define Cartesian product of two sets and prove that
    a. A x (B∩C) = (AXB) ∩ (AXC).

20. Explain Dijikstra's algorithm for shortest path.

21. Define tree. Show that in a tree of n vertex will have n-I edges.

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अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code: **MSc-CS-02**	कोर्स शीर्षकः– (Course Title) **'C' Programming**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. What is an operator? Explain the arithmetic, relational, logical and assignment operators in C.
2. Write a C program to calculate the factorial of a given number.
3. Write a C program to take a year as input and find out whether it is leap year or not.
4. The two matrix A (NXN) and B (NXN) of following numbers are given. Write the program in C language to find the multiplication of the transpose of A and B i.e. AT X BT.
5. What is a structure? Create a suitable structure for storing the information about the Technical Institutions in India (Assume appropriate attributes to store the information). List all the institutes for a given state.
6. What is the advantage of switch statement over if-else statement? Write a program in C using switch statement to find the value of Y for a given value of N between 1 and 4.

if N =1	Y = (ax+b)2
if N = 2	Y = ax2+b3
if N=3	Y= -ax+b
if N=4	Y=a2+x

7. What do you mean by Pointer? Write the algorithm and programming in C to implement selection sorting.
8. Suppose A is a header circular list in memory. Write a program in C which deletes the last node from A.
9. Convert the following infix expression into postfix expression using stack.
   (i) (a-b*(f+g * h)) * (d/e-f)
   (ii) (ii) (a + b ↑ d) /(e-f) + g

खण्ड ब
Section –B

अधिकतम अंक : 12
Maximum Mark : 12

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.
प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Write any two differences between compilers and interpreters.
11. Explain with example the difference between switch case and do-while loop in C.
12. With the help of an example explain how dynamic memory allocation can be done in C.
13. Define array and its types.
14. Write a short note on call by value and call by reference parameter passing method with example.
15. Write the C programme to find out the length of string without using the string function.
16. Write the step to run the C programme in UNIX.
17. What do you mean by union in C?
18. Define searching. Write a program in C to implement a linear search.
19. Write a program in C to check whether a given string is a palindrome or not? Also give the total number of characters in the string.
20. What is Recursive Function? Explain with suitable Example.
21. Discuss about bit-wise operators in C.

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,इलाहाबाद

Master of Science in Computer Science कार्यक्रम अधिन्यास सत्र **2020-21**

कोर्स कोड : Course Code: **MSC-CS-03**	कोर्स शीर्षकः– (Course Title) **Digital Computer Fundamentals and Assembly Language Programming**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ
Section-A

अधिकतम अंक : 18
Maximum Marks: 18

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Discuss and Differentiate Hardware and Micro-programmed control unit with their advantages and disadvantages.
2. Explain the following addressing modes with an example and suggest a use for those addressing modes:
   i. Register Indirect
   ii. Auto increment
   iii. Indirect address
   iv. Base address
   v. Indexed address
3. Design a Synchronous Modulus-Six Counter Using SR Flip-Flop The modulus six counter will count 0, 2, 3, 6, 5, and 1.
4. What do you mean by Flip-Flop? Discuss the functions and circuits diagram of different type of flip flop?
5. What is Interrupt? Explain the types of Interrupts.
6. Draw the connections between memory module and processor and explain how data transfer takes place between them.
7. What is Register? Draw and explain any one shift register in detail.
8. What is the difference between combinational and sequential circuit? Explain with appropriate example.
9. What is input-output interface? Draw and explain block diagram of input-output interface.

खण्ड ब
Section –B

अधिकतम अंक : 12
Maximum Mark : 12

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Distinguish between horizontal and vertical microprogram control unit.
11. What is instruction cycle? When will be any interrupt processed during the instruction cycle?
12. Briefly describe what are Special purpose registers and General purpose registers in CPU.

13. Write an assembly language program to find factorial of 10 using loop.
14. Explain the differences among microoperation and microprogram?
15. Write down the micro operations involves in fetch cycle.
16. What is DMA? Explain DMA transfer modes in detail.
17. Differentiate between RISC and CISC.
18. Explain the key differences between Compiler and Interpreter.
19. Write an assembly language program to compare values of the three variables and print them in descending order as: Largest = %d, Medium = %d, Smallest = %d.
20. What is the difference between isolated I/O and memory mapped I/O?
21. What do you mean by memory hierarchy? Why registers are present in CPU?

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अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code: **MSC-CS-05**	कोर्स शीर्षकः– (Course Title) **Theory of Computation**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Construct the deterministic finite automata for accepting the set of all strings with three consecutive 0's.
2. Distinguish NFA and DFA with examples.
3. Let G be the grammar
   S -> aB|bA
   A -> a|aS|bAA
   B-> b|bS|aBB
   For the string baaabbabba. Find leftmost derivation, rightmost derivation and parse tree.
4. (i). What are P, NP, NP-complete, and NP-hard?
   (ii). How to prove that a given problem is NP complete?
   (iii). What is polynomial time reduction?
5. Obtain the following grammar in CNF
   S -> aBa|abba
   A -> ab | AA
   B -> aB| a
6. Construct a Mealy machine which is equivalent to the Moore machine given in table:

Present State	Next State		Output
	a=0	a=1	
q0	q3	q1	0
q1	q1	q2	1
q2	q2	q3	0
q3	q3	q0	0

7. Find regular expression for the following languages on {a,b}:
   $L = \{a^2n\ b^2m : n \geq 0, m \geq 0\}$
8. Design a DFA to accept the binary numbers which are divisible by 5.
9. State pumping lemma for regular languages.

खण्ड ब **अधिकतम अंक : 12**

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Give regular set for the following expression: 1(01)*(10)*1
11. For the grammar G defined by S->AB, D->a,A->Aa,A->bB,B->Sb, give derivation tree for the sentential form babab.
12. Give an example of a language accepted by a PDA but not by DPDA.
13. Mention the difference between decidable and undecidable problems with examples of each.
14. What is meant by halting problem and post correspondence problem?
15. Mention any two undecidability properties for recursively enumerable languages.
16. Explain how TM can be simulated by a production system?
17. What do you meant by parse Tree?
18. Construct a DFA for the language 'all strings with 011 as a substring', over alphabet {0, 1}.
19. Obtain CFG for the language L = $\{ww^R \mid w \in \{a, b\}^* \}$, w^R is the reversal of w }.
20. What do you meant by parse Tree?
21. What are P, NP, NP-complete, and NP-hard?

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Master of Science in Computer Science कार्यक्रम अधिन्यास सत्र **2020-21**

कोर्स कोड :	कोर्स शीर्षकः– (Course Title)	अधिकतम अंक : 30
Course Code: **Msc-CS-06**	**System Analysis and Design**	**Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. What is Risk Management and what will risk management do for any business? How does software risk management related to Software process improvement?
2. What is Software Testing? What are the various characteristics of a good testable software?
3. Explain prototype model of software development. Is prototype model a suitable
4. Model for courier company management system? Justify your answer.
5. What is system analysis? Describe the importance of system analysis in software System development. List any five responsibilities of a System Analyst.
6. What is function point analysis? List four features of it.
7. Explain the following:
   a) Project b) Project scheduling c) Critical Path d) Milestones e) Checkpoints f) Project review.
8. What is strategic planning? Relate strategic planning to management control and operational control.
9. With respect to purchasing and inventory control systems explain any three of the following:
   a) Why do retail outlets carry inventory b) Inventory carrying cost. c) Procurement lead time d) Bill of material.

खण्ड ब **अधिकतम अंक : 12**

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. What are the differences between Black Box Testing" and "White Box Testing"?
11. What do you mean by Software Configuration Management?
12. Discuss the role of PERT Chart in software development.
13. What is coupling and Cohesion? What are the different type of Cohesion?
14. Differentiate between decision table and decision tree.
15. What are the attributes of good analyst?
16. Explain the system development life cycle.
17. Distinguish between hierarchical structure and network structure.
18. Define Bench Mark?

19. Define Software Development life cycle (SDLC). List the advantage and disadvantage of waterfall model.
20. When it is beneficial to use spiral model?
21. What is brain storming?

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अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code: **MSC-CS-07**	कोर्स शीर्षकः– (Course Title) **Software Engineering**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**
Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.
प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Define the following:
   (i) Software Product
   (ii) Software Engineering
   (iii) Software Testing.
2. (a) Define software risk. Explain in brief the types of software risk.
   (b) Explain the layered approach used in software Engineering.
3. Explain SDIC in detail. Also explain the framework activities involved in the software development process.
4. What are project metrics? Explain different types of project metrics with an example for each.
5. What is prototyping? Explain the problems and advantages of prototyping in detail.
6. Explain various testing techniques.
7. Describe in detail, debugging strategies.
8. How is software configuration management done in software?
9. What is (SQA)? What are the components of Software Quality Assurance (SQA)?

खण्ड ब **अधिकतम अंक : 12**
Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.
प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Explain four differences between alpha & Beta testing.
11. Explain the task in value at in Requirements Engineering.
12. Define software reliability and software availability.
13. Explain four approaches to handle the software sizing problem.
14. Explain the features of SCM.
15. What are the steps involved in software project estimation?
16. Discuss the Waterfall Model.
17. What is Cohesion? What are the different types of Cohesion?
18. What are the different testing levels? What is the difference between the verification and validation process?
19. What is data dictionary? What do you mean by Coupling?

20. What is Risk Management and what will risk management do for any business?
21. Briefly describe the golden rule for interface design.

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code: **MSC-CS-08**	कोर्स शीर्षकः– (Course Title) **Object Oriented Programming through 'C++'**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ — अधिकतम अंक : 18

Section-A — **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. What is operator overloading? Illustrate Operator overloading concept to concatenate strings.
2. Explain why do we need to use constructors? Explain a copy constructor with an example.
3. What are the different forms of inheritance supported by C++ ? Explain with examples.
4. Highlight the difference between pure virtual functions and virtual function.
5. Write a program using a try block to detect and throw an exception if the condition "divide by zero" occurs.
6. Explain why Object Oriented Programming approach is better than Structured Programming Approach.
7. What is polymorphism? What are different forms of polymorphism? Explain implementation of polymorphism with the help of a C++ program.
8. Explain the usage of the following C++ operators with the help of an example program. (a) sizeof operator (b) Logical Operators (c) Scope resolution operator.
9. Declare an abstract class ***"Shape"*** with methods **'area'** & **'volume'**. Refine this super class to subclasses like ***"cone"***, ***"cylinder"*** & ***"Rectangular Box.*** Then, Calculate area and volume for the subclasses.

खण्ड ब — अधिकतम अंक : 12

Section –B — **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. What do you mean by "this" function? What are the applications of "this" pointer?
11. What are pure virtual functions?
12. What do you mean by container classes?
13. What is a Use case? Also explain with example.
14. What is reusability? Which things can be reused?

15. What is friend function? How it is implemented in C++ ?
16. What is template? Explain with suitable example.
17. What are different types of inheritance?
18. What is operator overloading?
19. Write C++ program to create Matrix class.
20. List the features of Object oriented programming.
21. What are input and output streams. Explain.

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code: **MSC-CS-09**	कोर्स शीर्षकः– (Course Title) **Computer Networks**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ
Section-A

अधिकतम अंक : 18
Maximum Marks: 18

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. What is data communication? Discuss the different made of Data communication. 6
2. What do you mean by addressing? Discuss the different type of addressing.
3. Give the ISO-OSI ref. model for Data Communication and explain the function of each layer in brief. How it is different than TCP/IP model?
4. What is the difference between a frame and a packet? Why framing is required? What is the significance of padding used in some of frame format? Explain.
5. Write the short note on following:
   i) Multiplening ii) TCP Congestion Control Techniques.
6. What is switching? Explain the circuit switching with delay diagram.
7. What is cryptography? Explain the model for network security.
8. Name two well known data transport protocols provided by the Internet Transport Layer. Provide a description of each service and indicate what type of application might use that service.
9. Describe the token bucket mechanism for congestion control. With which other technique is token bucket usually combined to achieve complete flow control. What problems in the simpler approach are addressed by using a token bucket mechanism?

खण्ड ब
Section –B

अधिकतम अंक : 12
Maximum Mark : 12

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. How BGP is different from other distance vector routing protocols?
11. Briefly explain the Asynchronous Transfer Mode (ATM).
12. What do you mean by Baud rate? How is it different from Bit rate?
13. What is Analog data transmission?
14. Why do we need modulation?
15. What is Hamming distance and write about minimum Hamming distance?
16. What is flow and error control?
17. What is topology? Explain basic topology with advantage and disadvantage.
18. Explain the Distance Vector Routing algorithm.

19. Explain the working of simple parity check code for error detection.
20. Explain different notation of IPv4 addressing?
21. Explain classful addressing.

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code: **MSc-CS-11**	कोर्स शीर्षकः– (Course Title) **Introduction to System Software**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ अधिकतम अंक : 18

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. What are necessary conditions to hold a deadlock in a system? Explain the resource allocation Graph algorithm to deal with deadlock problem. What are the limitations of this approach?
2. What do you mean by operating system? What are the major functions of operating system?
3. Define the following terms :
   a. Dispatchers b. Scheduling c. Swapping d. Context switching
4. What do you mean by Compiler? Discuss the step to design a compiler.
5. What do you mean by system software? Explain in details types of software.
6. How is a process different from a program? What information is contained within a Process Control Block (PCB)?
7. Explain the page fault handling routine in a computer system employing virtual memory.
8. Explain the following Unix commands:
   (a) cp (b) chmod (c) sort (d) vi (e) ls (f) tee
9. What is a Semaphore? Explain the wait and signal operations of a semaphore. Why are these operations atomic?

खण्ड ब अधिकतम अंक : 12

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Discuss the paging system for memory management; also give its advantages and disadvantages.
11. Differentiate between :
    (a) System software and application software
    (b) General purpose OS and real time OS
12. What do you understand by page replacement? Name the algorithm available for page replacement.
13. Write the merits and demerits of Assembly language and High level language.
14. What do you mean by two pass assembler?
15. List the functions of System table.

16. Explain the function of Loader.
17. What do you mean by process?
18. Discuss the different state of a process.
19. What do you mean by Multitasking operating system?
20. Explain the difference between compiler and Interpreter. Write the names of two languages used in compiler and interpreter.
21. What is a scheduler? Explain any two types of schedulers.

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड :	कोर्स शीर्षकः– (Course Title)	अधिकतम अंक : 30
Course Code: **MSC-CS-12**	**Object Oriented Analysis and Design**	**Maximum Marks : 30**

खण्ड अ — अधिकतम अंक : 18

Section-A — **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. What is object design? Explain the steps of object design with suitable example.
2. What is multiplie inheritance? Discuss its role in object oriented analysis and design.
3. What is design optimization? Explain with suitable example.
4. Describe in detail the major and minor elements of object model. Give suitable examples.
5. What are the approaches used for identification of classes and attributes? Explain.
6. What is the relationship between cohesion and coupling? Identify the type of coupling in the following. How can it overcome?
7. What do you mean by "Object Oriented". Explain the characteristics of object-oriented approach.
8. Explain Aggregation & Generalization in detail with suitable example.
9. Describe how class diagram, object diagram and generalization are represented with UML Diagram.

खण्ड ब — अधिकतम अंक : 12

Section –B — **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Name the UML diagrams used for the following:
    a) Modelling behaviour of an object.
    b) Interaction between groups of objects.
11. How does object relational database differ from object databases? Explain
12. Explain the design axioms applied to object-oriented design.
13. Give the sequence diagram for making a telephone call.
14. Describe the activities involved in an ATM transaction.
15. What do you mean by the State Diagram and the Event Trace Scenario? Draw the Event Trace Scenario for a Phone Call and the State Diagram for Phone Line.
16. Explain what is cohesion and coupling? What is the relationship between them?
17. How does object relational database differ from object databases?
18. What are the shortcomings in structured approach? Why generally, does an object granted system use a relational DBMS?
19. Explain the steps for converting state diagram to code.

20. Differentiate between Class diagram & Instance diagram
21. Differentiate between Links & association.

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास **2020-21**

Master of Computer Science (M.Sc. CS)

कोर्स कोड :	कोर्स शीर्षकः– (Course Title)	अधिकतम अंक : 30
Course Code: **MSC-CS-13**	**Numerical and Statistical Computing**	**Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Using the Gauss elimination method solve the following linear system of equations:
   X + y + z = 3
   4x + 3y + 4z = 8
   9x + 3y + 4z = 7
2. Explain Regula Falsi method with suitable examples.
3. Find a real root of the equation x Sin x + Cos x = 0 between (2,3) by Bisection method.
4. Using Newton – Raphson method find an iterative scheme to compute the cube root of a positive number.
5. What do you mean by Binomial Distribution? Explain with suitable example.
6. Define lines of Regression. Derive the formula for angle between two lines of regression.
7. Use Lagrange"s interpolation to find the value for x=3 in the following table:
   x: 3.2 2.7 1.0 4.8
   f(x): 22.0 17.8 14.2 38.3
8. The equations of two lines of regression are as follows:
   2x + 3y-8 = 0 and
   x + 2y-5 = 0
   Obtain the value of correlation coefficient and variance of y given that the variance of x is 12.
9. Solve the following system of equation by Gauss Elimination method:
   4x1+ x2+ x3= 4
   x1+4x2— 2x3=4
   3x1+2x2- 4x3= 6

खण्ड ब | अधिकतम अंक : 12

Section –B | **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Explain floating point representations with suitable examples.
11. Evaluate the integral $\int_0^2 \frac{1}{1+x} dx$ by using Simpson's 3/8 rule with h = 1/3.
12. Show that the mean and Variance of the Poisson distribution are each equal to the parameter λ.
13. Explain Runge-Kutta method for fourth order.
14. Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with y = 1 for x = 0. Find y approximately for x = 0.1 by Euler's method.
15. Define the followings :
    a. Coefficients of Kurtosis.
    b. Moments about mean.
    c. Coefficients of Skewness.
    d. Skewness of a distribution.
16. Which of the iterative methods for solving linear system of equations converge faster? Why?
17. A card is drawn from a well shuffled pack of playing cards. Find the probability that it is either a diamond or a king.
18. A student obtained the mean and the standard deviation of 100 observations as 40 and 5.1. It was later found that one observation was wrongly copied as 50, the correct figure being 40. Find the correct mean and the S.D.
19. Solve the following equation using Newton Raphson method:
    e. $x^2 - 4x^2 + 4 = 0$
20. Calculate the value of integral by Trapezoidal rule:
    f. $\int_4^{5.2} logx\, dn$ by using
    Trapezoidal Rule and (b). Rule
21. Calculate the integral given in Q.11 by Weddl's rule.

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code: **MSC-CS-16**	कोर्स शीर्षकः– (Course Title) **DBMS**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):
   The NHL has many teams, each team has a name, a city, a coach, a captain, and a set of players, each player belongs to only one team, each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records, a team captain is also a player, a game is played between two teams (referred to as host_team and guest_team). (i) Draw an E-R diagram.
   (ii) Transform the E-R diagram to a Relational Schema.
2. How distributed database different from client server database? Discuss them with their advantages and disadvantages.
3. Explain different type of locking protocols for concurrency control. How does you ensure both conflict serialzability and freedom from deadlock?
4. What is three-tier client/server architectures? Also differentiate between logical data independence independence. And physical data.
5. What is entity and attribute? Give some examples of entities and attributes in a manufacturing environment. Why are relationships between entities important?
6. What do you mean by data redundancy? What is the difference between controlled and uncontrolled redundancy? What is data independence?
7. Explain the purpose of checkpoints mechanism. How often should checkpoints be performed? How does the frequency of checkpoints affect:
   a) System performance when no failure occurs?
   b) The time it takes to recover from a system crash?
   c) The time it takes to recover from a disk failure?
8. Consider the two sets F and G with their FDs as below :
   F: A→C, AC→D, E→AD, E→H
   G: A→CD, E→AH
   Check whether two sets are equivalent or not.
9. Consider the following requirements of a staff management system of an organization :

a) The basic information that needs to be stored about the staff includes staff-id, name, address, date of birth, date of employment, post held.
b) It keeps dependent information of employees. An employee can have many dependents.
c) Pay details of the employees are also kept.
d) It also keeps track of the various departments and employees of those departments.

Draw the E-R diagram for the organization. Make suitable assumptions, if any.

खण्ड ब अधिकतम अंक : 12

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. How does a deadlock occur in a computer system? How can you prevent deadlock happening in DBMS?
11. R(ABCDEF) F = {A→B, B→C, C→D, E→F} decomposed into D = R1(AB), R2(BCD), R3(DEF). Find whether D is Lossless or Lossy?
12. What is index file? What are the differences between B+ tree and B tree index file?
13. What is data? What do you mean by information? What are the differences between data and information?
14. Who is a DBA? What are the responsibilities of a DBA?
15. What is a transaction? Which are the properties of a transaction and explain each.
16. What is a database trigger? Which are the different kinds of triggers?
17. You are given the following relational schema:

    Person(PersonID, Name, Sex, CityOfBirth)

    Parent(ParentID, ChildID)

    ParentID and ChildID are foreign keys referring to Person.PersonID.

    Write the following queries in SQL:

    Find the names of all people who were born in the same city as their father.
18. When is it preferable to use a dense index rather than a sparse index? Explain your answer.
19. Discuss on the various ways in which we can arrive at a good database design. Discuss the ACID properties of a transaction. Give relevant example.
20. Discuss two phase locking protocol. Give relevant example.
21. Discuss the advantages of DBMS over traditional file processing system.

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास

Master of Computer Science (M.Sc. CS)

कोर्सकोड : Course Code: **MSC-CS-17**	कोर्स शीर्षकः– (Course Title) **Operating System**	अधिकतमअंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Why there is need of process synchronization? Explain how semaphores can be used to deal with n-process critical section problem.
3. What is the need for disk scheduling? Explain the differences between the C-LOOK and C-SCAN disk scheduling algorithms.
4. Define thread. Differentiate user threads and kernel threads.
5. Distinguish between preemptive and non-preemptive scheduling. Explain each type with an example.
6. Consider the following table of arrival time and burst time for three processes P0, P1 and P2.

Process	Arrival time	Burst Time
P0	0 ms	9 ms
P1	1 ms	4 ms
P2	2 ms	9 ms

   The pre-emptive shortest job first scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes. What is the average waiting time for the three processes?
7. How does process different from program? Explain different states of process in process state transition with a neat diagram.
8. Discuss how scheduling algorithms are selected for a system. What are the criteria considered?
9. Consider the following page reference string: 1,2,3,4,2,1,5,6,1,2,3,7,6,3,2,1,2,3,6 How many page faults would occur for the LRU, FIFO, LFU and optimal page replacement algorithms assuming three and five frames?

खण्ड ब अधिकतम अंक : 12

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Mention the circumferences that would a user be better off using a time-sharing system rather than a PC or a single user workstation?
11. How does thrashing occurs? Explain with an example.
12. What is a TLB? How does it improve effective access time of data?
13. How does a deadlock happens in a system?
14. Explain the scenario when the page fault occurs?
15. What is the purpose of swap space?
16. List out the important services of an operating system.
17. What is purpose of Process Control Block?
18. Describe the differences among long-term scheduling, short-term and medium-term.
19. What are the schemes used in operating system to handle deadlocks?
20. What is a critical section? Give examples.
21. What are the minimum requirements that should be satisfied by a solution to critical section problem?

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,इलाहाबाद

Master of Computer Application कार्यक्रम अधिन्यास सत्र

कोर्स कोड : Course Code: **MSc-CS 18**	कोर्स शीर्षकः– (Course Title) **Core Java**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. What is inheritance? Explain two benefits of inheritance, with an example of each.
2. What is a constructor? Write a Java program to explain how super class constructors are called in their subclasses.
3. What is multithreading? Explain this with an example of how interthread communication takes place in Java.
4. How Access Control Mechanism is implemented in Java?. What Method does subclass inherit from superclass.
5. Write down a java program to display number in word format, for Example: 123 will be shown as “One Two Three”.
6. What is an applet? List the methods you must extend to design an applet. What is the purpose of <PARAM …..>tag in Applet?
7. What is Object Oriented Paradigm? Explain features of Object Oriented Paradigm. Why Object Oriented Programming are preferred over structured programming?
8. What is static method? Explain why main method in Java is always static and what are different bitwise operators available in Java? Write a Java program to explain the use of bitwise operators.
9. What is package in Java? Explain how to decide the need of package(s) in a system which is to be developed using Java.

खण्ड ब **अधिकतम अंक : 12**

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Write down C++ features that are not supported by Java.
11. What is multithreading? Explain with example for removing the synchronicity behavior of a thread.
12. What is the difference between Overloading and Overriding? Is it possible to override a inner classes.
13. (a) What is Servelet ? What are the different methods for running the Servelets?
    (b) Why servlet is preferred over CGI script. Write the life cycle of a servlet.

14. What is a global variable?
15. What is encapsulation?
16. What is multithreaded programming? Explain how threads are created in Java.
17. What is JDBC?
18. What is an exception?
19. What is an instance variable? Explain how an instance variable of a class can have different value for each object of that class.
20. What is overloading of methods?
21. Explain with an example how overloading of methods is different from overriding of methods.

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,इलाहाबाद

Master of Science in Computer Science कार्यक्रम अधिन्यास सत्र

कोर्स कोड : Course Code: **MSC-CS-20**	कोर्स शीर्षकः– (Course Title) **Computer Graphics**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. List the hardware and software components essential for professional multimedia development. Also, justify the need of each of the hardware components.
2. What is the method of storing image in vector format? Explain its advantages.
3. Explain the important features of Flash Software.
4. What do you understand by multimedia? What are the commercial tools available for developing multimedia?
5. Explain the benefits and problems in multimedia with multimedia system components?
6. Discuss in detail on multimedia platforms and illustrate cross platform compatibility and standards.
7. Explain DDA line drawing algorithm with Example.
8. Describe the matrix formulation of 2D Translation, Scaling and Rotation.
9. Explain Bresenham's circle generating algorithm.

खण्ड ब **अधिकतम अंक : 12**

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Explain the various digital movie tools.
11. What is meant by Image Compression?
12. List the hardware and software components essential for professional multimedia development.
13. Justify purpose and need of each of the hardware components in Multimedia.
14. How is animation useful in multimedia?
15. How much time is spent scanning across each row of pixels during screen refresh on a raster system with a resolution of 1280 x 1024 and a refresh rate of 60 frames/second?
16. Write short note on:
    (a) MPEG
    (b) MP3

17. What do you understand by the term Multimedia and Hypermedia.
18. Explain any two multimedia features which can be used in business.
19. Define following terms:
    a) Refresh buffer/frame buffer.
    b) Pixel?
    c) Aspect ratio.
20. What are the differences between the GIF and JPEG?
21. Consider two raster systems with the resolutions of 640x480, 1280x1024, and 2560x2048. What size frame buffer (in bytes) is needed for each of these systems to store 12 bits/pixel? How much storage is required for each system if 24 bits per pixel are to be stored?

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,इलाहाबाद

Master of Computer Science कार्यक्रम अधिन्यास सत्र

कोर्स कोड : Course Code:**MSc-CS-21**	कोर्स शीर्षकः– (Course Title) **Design and Analysis Of Algorithms**	अधिकतम अंक : 30 **Maximum Marks : 30**

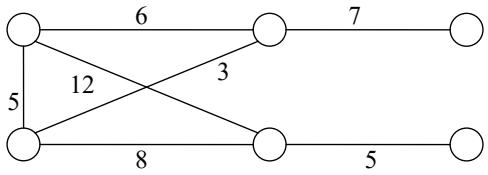
खण्ड अ अधिकतम अंक : 18

Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Prove that the minimum degree of any node in an n node binomial.
2. Show the results of inserting the keys : F, S, Q, K, C, L, H, T, V, W, M, R and N in order to an empty B-Tree with minimum degree 2.
3. Prove that if the weights on the edge of the connected undirected graph are distinct then there is a unique minimum spanning tree. Give an example in this regard.
4. Solve the recurrence relation by iteration
   $T(n) = T(n-1) + n^4$
5. Suppose we are comparing implementations of insertion sort and merge sort on the same machine. For inputs of size n, insertion sort runs in $8n^2$ steps, while merge sort runs in 64 n lg n steps. For which values of n does insertion sort beat merge sort?
6. Find the minimum spanning tree using Prims algorithm for the following graph.



7. Using Dynamic Programming Approach, find the minimum number of scalar multiplications to multiply the chain of matrices given below.

   M1 * M2 * M3

   10*20 20*50 50*1
8. Explain P, NP, NP-Complete and NP-Hard class problems.
9. State the significance of θ, Ω and O notations.

खण्ड ब अधिकतम अंक : 12

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Solve the following recurrence. :
    $T(I) = 1$
    $T(n) = 4T(n/3) + n^2$ for $x <= 2$
11. Show the trace of heapsort algorithm for following input data :
    30, 50, -100, 200, 50, 30, 60, 80, 200 in order.

12. Write an algorithm for inserting a node into Fibonacci Heap.
13. Give an algorithm for Strassens's multiplication. Explain how a divide and conquer strategy is applicable to it? Also analyze your algorithm.
14. Give single source shortest path algorithm. Give the time complexity.
15. Give the non-deterministic algorithm for sorting elements in non-decreasing order.
16. Define Generic Random Access Machine. What assumptions does it have?
17. Explain principle of Optimality.
18. Discuss Kruskal's minimum spanning tree in detail.
19. Explain why the statement, "The running time of algorithm A is at least $O(n^2)$," is meaningless.
20. Explain Satisfiability Problem?
21. Find the optimal solution using greedy criterion for a knapsack having capacity 50 kg. The list of items having values and weight as are shown in the table:

Item	I_1	I_2	I_3	I_4	I_5
Profit	10	20	24	9	8
weight	8	14	34	5	4

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,इलाहाबाद

Master of Computer Science कार्यक्रम अधिन्यास

कोर्स कोड : Course Code:**MSc-CS-23**	कोर्स शीर्षकः– (Course Title) **Artificial Intelligence**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ अधिकतम अंक : 18
Section-A **Maximum Marks: 18**

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.
प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Write a function division which divides a number X by Y such that if Y = O then the function returns the symbol "infinity" else it returns the quotient X/Y.
2. Write a LISP program expo to compute i raise to power j where i and j are natural numbers.
3. Explain water jug problem using state space tree.
4. Explain minmax algorithm with example.
5. Explain unification algorithm used for reasoning under predicate logic with an example.
6. Describe in detail the steps involved in the knowledge Engineering process.
7. Explain the method of handling approximate inference in Bayesian Networks.
8. Explain AO* algorithm with an example
9. What factors determine the selection of forward or backward reasoning approach for an AI problem? Explain

खण्ड ब अधिकतम अंक : 12
Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.
प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Explain the difference between forward chaining system & Backward chaining system?
11. Explain MYCIN and COMPASS.
12. Write down application areas of expert systems. List down the characteristics of intelligent agent.

13. The variable X is bound to 5 and the variable Y is bound to 7. Further the value (5 + 5) * (7 + 7) is evaluated to 140.
14. In order to explain the use cut, we write a program to find the factorial (N) using cut as follows :

    fact (N, 1) : n < = 1, !
    fact (N, F) : - M is N - 1, !

        fact (M, F1),
        F is F1 * N.

15. Draw cons-cell structure for list ((A B) (C D)).
16. What do you mean by local maxima with respect to search technique?
17. List down the characteristics of intelligent agent. Explain the concept of learning from example.
18. What do you mean by local maxima with respect to search technique? What are the differences and similarities between problem solving and planning?
19. What are the limitations in using propositional logic to represent the knowledge base? Explain with the help of example.
20. Explain reinforcement learning with the help of an example.
21. Explain the properties of a good knowledge representation system.

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,इलाहाबाद

Master of Computer Science कार्यक्रम अधिन्यास सत्र

कोर्स कोड : Course Code: **MS-CS-24**	कोर्स शीर्षकः– (Course Title) **Parallel Computing**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ
Section-A

अधिकतम अंक : 18
Maximum Marks: 18

नोट–(Instructions): Section A consists of long answer questions from 1 to 9. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रश्न संख्या 1 से 9 तक दीर्घ उत्तरीय प्रश्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड से किसी भी तीन प्रश्नों का उत्तर दें।

1. Define Array processing. Why an array processors called as SIMD array computers?
2. State and Explain Gustafson‟s Law for measuring speedup performance of paralleled system. Explain with the help of an example.
3. Define the cluster computing. Explain the memory organisation in a cluster computing.
4. Explain the Flynn's Taxonomy in detail.
5. Explain the major issues of concern in the effective utilization of a parallel computer architecture.
6. Consider a program that requires 78% of the total time to perform parallel operation while the remaining time is used for serial operations. The program consists of 25,000 operations each taking 2.5ms to complete, with 2,000operations being done sequentially. Calculate the speedup achieved.
7. Explain the basic concepts of dataflow computing and describe various applications of parallel computing.
8. Explain the Amdahl's law for measuring speed up performance with the help of an example.
9. With the help of a Block diagram explain the architecture of an SIMD array processor.

खण्ड ब
Section –B

अधिकतम अंक : 12
Maximum Mark : 12

नोट–(Instructions): Section B consists of short answer questions from 10 to 21. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघु उत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. What do you mean by Fat Tree?
11. What is systolic array?
12. What is parallel vertual machine (PVM)?
13. What do you mean by Data parallel programming?
14. What is synchronization lalency problem in multithread process?
15. What is permutation Network?
16. List the classification of vector instruction.
17. Explain cube-connected cycles and de Bruijn networks.
18. Explain the RAM and the PRAM models.
19. Define the transformation used in a shuffle network giving an example using eight processors.

20. Explain the concept of permutation Network with an example.
21. Define array processing. Why are array processors called as SIMD Array computers?

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय, इलाहाबाद

सांख्यकी (स्नातक) कार्यक्रम अधिन्यास सत्र

Course Code: MSC. CS- 25 (New)	Course Title : Correlation, Regression & Statistical Inference	Maximum Marks : 30

Section - A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Discuss about the Regression. Find out the angle between two regression lines.
2. Define the Spearman Correlation Coefficient also calculate from the following data.

X	17	23	29	13	13	23
Y	14	22	22	19	14	08

3. State and Prove Rao Blackwell theorem.
4. Discuss about the effect of change of origin and scale on correlation coefficient.
5. Define non parametric tests. Also discuss about the Mann – Whitney U-test.
6. Discuss about the all properties of a good estimator.
7. Prove that: with n number of attributes defined over a group of individuals or units, there are 3^n total numbers of classes or class frequencies.
8. Prove that: If a sufficient estimator exists, then maximum likelihood estimator is a function of the sufficient estimator.
9. Discuss about the Mann-Whitney U-test.
10. Write in short about the wilcoxon signed Rank Test.
11. State and prove Cramer Rao inequality.

Section - B

Short Answer Questions

Maximum Marks: 12

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

1. Write short notes on efficiency and sufficiency.
2. Discuss about Unbiasedness and Consistency
3. Discuss about the effect of change of origin and scale on correlation coefficient.
4. Write down the all properties of regression coefficient.
5. Discuss in detail about
   a) Goodness of fit.
   b) Sign test and Run test.
6. Discuss about
   a) Contingency table
   b) Yates correction.
7. Define
   a) Critical region and Acceptance region.
   b) MP & UMP test.
8. Write detail notes on
   a. Significance test for "equality of means."
   b. Types of error.
9. Discuss about the Effect of change of origin and scale on the correlation coefficient.
10. Write a note on the angle between two regression lines.
11. Distinguish between correlation coefficient and regression coefficient.

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय, इलाहाबाद

सांख्यकी (परास्नातक) कार्यक्रम अधिन्यास सत्र

Course Code: MSc. CS - 26 (New)	Course Title: Mathematical Analysis	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. What do you understand by functions of bounded variation?
2. State and prove Baire's theorem?
3. State and prove the necessary and sufficient conditions for a metric space to be compact?
4. Show that a sequentially compact subset of R is complete?
5. State & Prove Riemann Stieltjes integrals?
6. State and prove Reusz-Fischar theorem?
7. What do you understand by metric space and its completeness?
8. Show that a metric space S is connected iff every two valued function on S constant?
9. State and prove additive property of total variation?
10. State and prove sufficient conditions for convergence of Fourier series at a particular point?
11. Show that in any metric space, every compact subset is complete?
12. Show that a function of bounded variation is necessarily bounded?
13. Show that every real function of bounded variation on [a,b] is bounded, but converse is not necessarily true?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. Write short notes on (a) MP tests (b) UMP tests
2. What is the concept of total variation?
3. Discuss about the CRK bound?
4. Discuss in short (a) BAN estimator (b) CAN estimator
5. Discuss about the Bhattacharya bound?
6. Discuss about Open & closed sets?
7. Write a note on Continuity & Compactness?
8. Write a note on ternary cantor set?
9. Define compact spaces & compact sets?
10. Define completeness and compactness of metric spaces?
11. Define Fourier series?
12. Write a note on Convergence of the sequence?

उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय, इलाहाबाद

सांख्यकी (परास्नातक) कार्यक्रम अधिन्यास सत्र

Course Code: M.Sc. CS - 27 (New)	Course Title: Operation Research	Maximum Marks : 30

Section -A

Long Answer Questions

Note: Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Discuss about the Linear Programming Also Define the different steps for Graphical solution to LPP?
2. Discuss about the principle of simplex method? Also define non basic variable and artificial variables?
3. Discuss about the different methods for the computation of an initial basic feasible solution?
4. Write a detailed not on classification of models used in operations research?
5. What is a game problem? How do we solve these problems using LPP technique? Give example?
6. What is a transportation problem? How could it be considered as LPP? Also, show that number of basic variables in a transportation problem of order m x n, are at the most m+ n -1
7. Explain the following terms?

   (i) Feasible solution (FS)

(ii) Basic solution (BS)

(iii) Basic feasible solution (BFS)

(iv) Optimum BFS

8. What do you mean by LPP? Discuss geometric properties of LPP?
9. State and prove Duality theorem?
10. Discuss about the waiting time distribution for m/m/1 Model?
11. State and prove Kutin Tucker theorem?
12. Show that the numbers of basic variables in a transportation problem are at the most (m+n-1)?
13. State and prove the theorem on the relationship between the feasible on the relationship between the feasible solutions of LPP and its dual?
14. State and prove the dominance property for game problem?
15. State and prove Kruskal's algorithm?
16. State and prove Dijkstra's algorithm?
17. Define Bellman's Principle of Optimality with one example?
18. Discuss about the Travelling Salesman Problem?
19. Write a short note on Project evaluation and review technique?
20. Discuss about the sensitivity analysis of linear programming?
21. State and prove the dominance property for game problems?

Section - B

Short Answer Questions

Note: Attempt any four questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1. What is a spanning tree? Write the steps involved in finding the minimum spanning tree in a network using Prim's Algorithm?

2. Explain the basic steps in CPM/PERT techniques?
3. What is game theory? What are the various types of games? Write the major limitations of game theory?
4. Briefly explain dual simplex method?
5. Discuss in short the n^{th} Job problem?
6. Write short notes on
   (a) CPM (b) PERT (c) MODI method
7. Define machine interference problem?
8. Discuss about the replacement problem?
9. Write a note on staffing problem?
10. Define the problem of cycling in degeneracy?
11. Discuss in brief about the Hungarian method?
12. Discuss about the basic assumption of two person sum- zero game?
13. Write a note on pay off matrix?
14. State and prove little's theorem?
15. Describe the graphical method for $2 \times n$ or $m \times 2$ games?
16. What is a dual problem? How do we get a dual of given primal?
17. State and prove reduction theorem for assignment problems?
18. Write a brief note on phases of OR problem?
19. Give the basic assumptions of Two-Person Sum-Zero Game?
20. Write a brief note a various types of variables used in LPP?
21. Differentiate clearly between primal and its dual problem (with example)?

उत्तर प्रदेष राजर्षि टण्डन मुक्त विष्वविद्यालय,इलाहाबाद

अधिन्यास

Master of Computer Science (M.Sc. CS)

कोर्स कोड : Course Code:**MSC-CS-14**	कोर्स शीर्षकः– (Course Title) **Accountancy and Financial mangement**	अधिकतम अंक : 30 **Maximum Marks : 30**

खण्ड अ **अधिकतम अंक : 18**

Section-A **Maximum Marks : 18**

नोट–(Instructions): Section A consists of long answer questions. Answer should be in 800 to 1000 words. Attempt <u>any three questions</u> from this section.

प्रष्न संख्या 1से 9 तक दीर्घ उत्तरीय प्रष्न है जिनका उत्तर 800 से 1000 शब्दों में लिखना है। इस खंड सेकिसी भी तीन प्रश्नों का उत्तर दें।

1. What do you understand by accounting? Describe the objectives and functions of accounting.

2. Explain the meaning, objectives, nature and scope of Management Accounting?

3. Explain the techniques or methods of management accounting.

4. Akshya Ltd. Is manufacturing a product. The related data of two years are as follows.

	2015	–	2016
Sales	60,000	-	72,000
Fixed Cost	18,000	-	24,000
Variable Cost	30,000	-	40,000

Calculate the contribution, P/v Ratio and BEP from the above data.

5. Write an essay on role of management accounting in decision making process of an organization?

6. How capital account of partnership or prepared?

7. What do you understand by standard costing? Explain the element of standard costing.

8. Explain the meaning and objectives of Inflation Accounting. Give arguments for and against adoption of Inflation Accounting.

9. What is ratio analysis?

खण्ड ब अधिकतम अंक : 12

Section –B **Maximum Mark : 12**

नोट–(Instructions): Section B consists of short answer questions. Answer should be in 200 to 300 words. Attempt <u>any four questions</u> from this section.

प्रश्न संख्या 10 से 21 तक लघुउत्तरीय प्रश्न है जिनका उत्तर 200 से 300 शब्दों में लिखना है। इस खंड से किसी भी चार प्रश्नों के उत्तर दें।

10. Describe the objectives and importance of Human Resource Accounting.

11. Explain any one method of HR accounting

12. What is the role of a Management Accountant in any firm?

13. Analysis the process of budgetary control.

14. Explain any Three Accounting Standards?

15. Present a specimen of Cash Flow Statement in the form of As-3.

16. Write the importance of Financial Ratio's.

17. Explain liquidity Ratio ?

18. Distinguish between Horizontal and Vertical Analysis?

19. Explain the importance and limitations of fund flow statement.

20. What is Cash Flow Statement ?

21. Describe the advantages of Budgetary Control?