

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

B.Tech (CS/IT)  
End Semester Examination  
Even Semester (VI), 2022-23  
ECS-352: COMPILER DESIGN

Time: 2:30 Hours

Note: 1. Attempt all questions. All questions carry marks, as shown against them.

Max. Marks: 50

- Please mention all the Course Outcomes (CO) in statement form
1. Describe the role of each phase of a compiler with its construction tools. (Understand)
  2. Develop a Lexical Analyzer for recognizing tokens of a given language with an understanding of symbol table management and error handling. (Apply)
  3. Construct top-down, bottom-up, operator precedence and SLR parsers with an understanding of Context Free Grammars and syntax analysis. (Apply)
  4. Design and develop semantic analyzers for type-checking and intermediate code generators to translate the source program into an intermediate code. (Apply)
  5. Construct code optimizers to optimize the target code generated. (Apply)

		Related Course Outcome	Marks
<b>Q. No. 1:</b>	Attempt both questions.	(CO)	
(a)	What do you mean by cross compiler? Differentiate between compiler and interpreter.	CO1	(05)
(b)	Explain all the necessary phases and passes in compiler design. Write down the purpose of each pass.	CO1	(05)
<b>Q. No. 2:</b>	Attempt both questions.		
(a)	Write down the differences between Top-down parser and Bottom-up parser.	CO2	(05)
(b)	Check whether the following grammar is SLR(1) or not. Explain your answer with reasons.	CO2	(05)

$$\begin{aligned}S &\rightarrow L = R \\S &\rightarrow R \\L &\rightarrow * R \\L &\rightarrow id \\R &\rightarrow L\end{aligned}$$

(OR)

Design LL(1) parsing table for the following grammar .

$$\begin{aligned}A &\rightarrow AcB \mid cC \mid C \\B &\rightarrow bB \mid id \\C &\rightarrow CaB \mid BbB \mid B\end{aligned}$$

<b>Q. No. 3:</b>	Attempt both questions.		
(a)	What do you mean by syntax directed translation? Differentiate between synthesized translation and inherited translation.	CO3	(05)
(b)	Write the quadruples, triple and indirect triple for the following expression. $(x + y) * (y + z) + (x + y + z)$	CO3	(05)

**Q. No. 4:** Attempt both questions.

- (a) What are the three storage allocation strategies? Explain each in detail. CO4 (05)

Discuss in details the error detection and recovery techniques of the following:  
lexical phase, syntactic phase and semantic phase with help of suitable examples.

- (b) Explain the following: (1). Activation record (2).Symbol table management. CO4 (05)

**Q. No. 5:** Attempt both questions.

- (a) Consider the following program code for computing the dot product of two vectors a and b of length 10 and partition it into basic blocks CO5 (05)

```
prod =0;  
i=1;  
do  
{  
    prod = prod +a[i]*b[i];  
    i=i+1;  
} while (i<=10);
```

- (b) Write short notes on following (1). Global flow data analysis (2). Code Motion (3). Loop Unrolling (4). Loop invariant method (5). Induction variables and reduction in strength. CO5 (05)

HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR

III (CSE+IT)

End Semester Examination

Even Semester, 2022-23

ECS-356: COMPUTER GRAPHICS

Time: 2:30 Hours

Max. Marks: 50

Note: 1. Attempt all questions. All questions carry marks, as shown against them.

Please mention all the Course Outcomes (CO) in statement form

1. Understand and use various mathematical concepts and supporting composite 2-D & 3-D graphics transformations for hidden surface detection/ removal and various graphical algorithms.
2. Design algorithms for various graphics shapes like ellipse, hyperbola, triangle etc.
3. Use of various graphical tools and software in 3D Graphics API.
4. Understand and apply geometrical transformation and computer graphics in multidisciplinary field of engineering.
5. Understand the hardware system architecture for computer graphics - graphics pipeline, frame buffers, and graphic accelerators/co-processors.
6. Analyze and implement interactive graphics applications using programming language and graphics application programming interfaces.

		Related Course Outcome (CO)	Marks
<b>Q. No. 1:</b>	Attempt both questions.		
(a)	Write a short note on working of Random/ Vector Scan Display System. Differentiate between Vector Scan Display and Raster Scan Display.	CO1 (05)	
(b)	List two polygon filling methods and describe them in details. <b>OR</b> Discuss and explain Bresenham's algorithm for circle generation	CO1 (05)	
<b>Q. No.2:</b>	Attempt both questions.		
(a)	Write algorithm to clip line using Cohen Sutherland line clipping algorithm.	CO2 (05)	
(b)	What are homogeneous coordinate systems? Explain the followings: i. 2D Translation ii. 2D Rotation iii. 2D Scaling iv. Reflection v. X Shear & Y Shear	CO2 (05)	

**Q. No. 3:** Attempt both questions.

(a) Derive the window to viewport coordinate transformation and elaborate.

CO3 (05)

(b) Show how shear transformation may be expressed in terms of rotation and scaling?

CO3 (05)

OR

Write short notes on Orthographic projection and oblique projection with matrices representation.

CO3

**Q. No. 4:** Attempt both questions.

(a) Explain the scan line method for visible surface detection?

CO4 (05)

(b) Explain B-Spline Curve. Differentiate between Bezier Curve, Hermite and B-Spline Curve.

CO4 (05)

**Q. No. 5:** Attempt both questions.

(a) What are the various types of animations? Explain the role play in multimedia projects

CO5 (05)

(b) List all multimedia files formats and their purpose.

CO5 (05)

**HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR**  
**B. Tech. (CS/IT) End Semester Examination**  
**Even Semester (VI), 2022-23**  
**ECS-358: SOFT COMPUTING**

**Time: 2:30 Hours****Max. Marks: 50****List of Course Outcomes (CO)**

1. Understand differential behavior of Human and Intelligent Systems. (Understand)
2. Understand and use supervised and un-supervised learning techniques in ANN. (Understand).
3. Understand and apply different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Network and their combination. (Understand, Apply)
4. Correlate human-like processing in problem solving with current technologies in various domains like Bio Informatics, Multimedia Systems, Big Data Analytics, etc.
5. Apply evolutionary computing techniques in real life problems. (Apply)

**Note:- Attempt all questions. All questions carry mark as shown against them.**

Q. No.	Related CO	Marks
<b>1. Attempt ALL Parts of the question.</b>		
(a) What does "soft computing" mean? Explain how soft computing is different from hard computing.	CO1	(05)
(b) Explain Knowledge Based System with the help of suitable architecture.	CO1	(05)
<b>2. Attempt ALL Parts of the question.</b>		
(a) What is an Artificial Neural Network (ANN)? Elaborate various activation functions utilized in ANN.	CO2	(05)
(b) What does the Unsupervised Learning entail? Explain the single class perceptron model for classification.	CO2	(05)
<b>OR</b>		
Explain the architecture of Back-Propagation Network with its working principle in details.		
<b>3. Attempt ALL Parts of the question.</b>		
(a) Explain the training of a neural network by applying the Hebb rule with the help of a flow graph.	CO4	(05)
(b) Describe the Hopfield Network with its architecture in details.	CO4	(05)
<b>4. Attempt ALL Parts of the question.</b>		
(a) Consider the two fuzzy sets defined as: $A=((1,0.2),(2,0.3),(3,0.4),(4,0.5))$ and $B=((1,0.1),(2,0.2),(3,0.2),(4,1))$ . Find the union, algebraic sum, algebraic product, bounded sum, and bounded difference for fuzzy sets.	CO3	(05)
(b) In context to the Fuzzy Logic, write short notes on the following: 1) Fuzzy Relation 2) Membership Functions 3) Bandwidth 4) Crossover Point 5) Fuzzy Singleton	CO3	(05)
<b>5. Attempt ALL Parts of the question.</b>		
(a) Elaborate the working principle of genetic algorithm with help of flow chart.	CO5	(05)
<b>(OR)</b>		
Explain the evolutionary programming strategy using an example.		
(b) Write Notes on Following 1) Information Retrieval 2) Semantic Web.	CO5	(05)

**HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR****B. Tech. (CSE / IT)**

End Semester Examination

Even Semester (IV), 2022-23

**ECS-354: Object Oriented Systems****Time: 2:30 Hours****Max. Marks: 50**Note: 1. Attempt all questions. All questions carry marks, as shown against them.

2. Q.No.6 is from the lab component of the subject.

**Course Outcomes (CO):**

1. Analyse information systems in real-world settings and use an object-oriented method for analysis and design. (Analyse)
2. Understand features of object-oriented design such as encapsulation, polymorphism, inheritance, and UML. (Understand)
3. Understand and prepare different types of UML diagrams like use case diagrams, interaction diagrams, nested state diagrams, state chart diagrams, activity diagram etc. (Understand, Apply)
4. Understand and appreciate the use of Design Patterns in the Software Development. (Understand, Apply)
5. Understand the core and advance Java Programming features and apply them in complex problem solving. (Understand, Apply)

		Related CO	Marks
<b>Q. No. 1</b>	Attempt ALL subparts of this question.		
(a)	Define 'Workflow' in Unified process. How it can be related to the phases of Waterfall Model?	CO1, CO2	4
(b)	<p>Suppose you have Person objects and Location objects and you need to keep track of place of birth of each Person. There are at least three ways to organize this information:</p> <ul style="list-style-type: none"> <li>(i) Each Person object has an instance variable of type Location that stores the place of birth.</li> <li>(ii) Each Location keeps a collection of references to Person objects corresponding to the people born at that location.</li> <li>(iii) A third object keeps a table of Person objects and their place of birth Location objects.</li> </ul> <p>Discuss the advantages and disadvantages of each of these three designs.</p>	CO1, CO2	4
<b>Q. No. 2</b>	Attempt ALL subparts of this question.		
(a)	Differentiate between Aggregation and Generalization relationships in Classes and objects diagrams. Give an example where both relations coexist in a class diagram.	CO1, CO3	4
(b)	Draw a class diagram summarizing the following facts about a library.	CO1, CO3	4

	Discuss your design decisions, and any limitations of your model.  For each book held by the library, the catalogue contains the title, author's name and ISBN number of the book. There may be multiple copies of a book in the library. Each copy of the book has a unique accession number. There are many registered readers belonging to the library, each of whom is issued with a number of tickets. The system records the name and address of each reader and the number of tickets that they have been issued with. Readers can borrow one book for each ticket that they possess and the system keeps a record of which books a reader has borrowed, along with the date by which the book must be returned.		
<b>Q. No. 3</b>	Attempt ALL subparts of this question.		
(a)	What are guarded transitions in States diagrams? How they are represented? Explain their suitability with an example.	CO2, CO3	4
(b)	Explain the concept of state and event generalization/ aggregation using suitable examples.	CO2, CO3	4
<b>Q. No. 4</b>	Attempt ALL subparts of this question.		
(a)	What is Use Case Approach? Explain how Use Case Approach is central to the Object Oriented Software development. Draw Use Case diagram for an online Airline Reservation System.	CO4	4
(b)	Differentiate between activity diagram and flowchart. Prepare an activity diagram for the result management system of a University.	CO3	4
<b>Q. No. 5</b>	Attempt ALL subparts of this question.		
(a)	What are Design patterns in UML? How they are different from Frameworks? Explain the Singleton pattern and Composite Pattern with a suitable example.	CO5	4
(b)	Discuss how modern Web Services makes the use of Object Oriented Computational paradigm?	CO5	4
<b>Q. No. 6</b>	(Laboratory Component): Attempt ALL subparts of this question		
(a)	Write a program in Java to perform addition, subtraction and multiplication of two complex numbers. Use classes and objects.	CO5	5
(b)	Describe the event delegation model of Java. Write a program in Java to show the mouse click event.	CO5	5
	<u>OR</u>		
	Explain the mechanism of introspection during the design process of an application using Java Beans. What is the role of design patterns (Naming Patterns) for properties and events in it?		

**Time: 2:30 Hours****Max. Marks: 50**Note: 1. Attempt all questions. All questions carry marks, as shown against them.**Course Outcomes (CO)**

1. Understand framework and architecture of Internet of Things. (Understand)
2. Understand key technologies in Internet of Things. (Understand)
3. Explain wireless sensor network architecture and its framework along with WSN applications. (Understand)
4. Explain resource management in the Internet of Things. (Understand)
5. Understand Security measures and design applications based on Internet of Things. (Understand, Apply)

Related Course Outco me (CO)	Marks
--	-------

**Q. No. 1:** Attempt all parts

- (a) Explain IOTWF architecture in detail with neat diagram. What are the main characteristics of the Internet of things also write the advantage and disadvantage. 01 05
- (b) Write short notes on the following: 01 05
- a) IoT ecosystem
  - b) IoT technology
  - c) 802.15.4 Zigbee
  - d) HTTP
  - e) TCP

**(OR)**

Discuss the REST based communication API's for IoT.

**Q. No. 2:** Attempt all parts

- (a) What do you mean by sensors? Write the key specification of sensor. Explain in brief four different type of sensor 02 05
- (b) Explain EPC global architectural framework. How can we identify any IoT object? 02 05

**Q. No. 3:** Attempt all parts

- (a) What is the relation between WSN and IoT? Explain with example. 03 05
- (b) Explain RFID technologies with its various components. Discuss principle of RFID and frequency of RFID used for various operations in detail. 03 05

**Q. No. 4:** Attempt all parts

- (a) Define clustering in IoT. Explain various clustering algorithms in detail. 04 05

(b) Explain identity management system model in IoT with its requirements, framework and characteristics. 04 05

Q. No. 5: Attempts all parts

(a) Write short notes on the following: 05 05  
    a) Security Iomograph  
    b) Layer attack model

(b) Explain classification of IoT security attacks in detail. 05 05

**HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR**

B. Tech. (CSE & IT)

End Semester Examination

Even Semester (VI), 2022-23

**ECS-362: NETWORK SECURITY**

**Time: 2.30 Hours**

**Max. Marks: 50**

Note: 1. Attempt all questions. All questions carry marks, as shown against them.

Please mention all the Course Outcomes (CO) in statement form

1. Understand and deploy cryptographic techniques to secure data in networks. (Understand, Apply)
2. Analyze the vulnerabilities in any computing system and design a security solution. (Apply, Analyse)
3. Understand and use standard algorithms for confidentiality, integrity and authenticity. (Understand, Apply)
4. Apply various key distribution and management schemes in network system. (Apply)
5. Apply security protocols in various IT applications. (Apply)

Related Course Outcome (CO)	Marks
-----------------------------	-------

**Q. No. 1:** Attempt all parts of the following:

- (a) Elaborate on the working of Playfair cryptography algorithm. Using the given Playfair matrix 1 (05)

M	F	H	I/J	K
U	N	O	P	Q
Z	V	W	X	Y
E	L	A	R	G
D	S	T	B	C

Encrypt this message:

Must see you over Cadogan West. Coming at once.

- (b) Using S-DES, encrypt the string (11010011) using the key (1010110010). Show intermediate results after each function ( $IP$ ,  $F_{k1}$ ,  $SW$ ,  $F_{k2}$ ,  $IP^{-1}$ ), where S-boxes are 1 (05)

$$S_0 = \begin{matrix} 0 & 1 & 2 & 3 \\ 0 & 1 & 0 & 3 & 2 \\ 1 & 3 & 2 & 1 & 0 \\ 2 & 0 & 2 & 1 & 3 \\ 3 & 3 & 1 & 3 & 2 \end{matrix} \quad S_1 = \begin{matrix} 0 & 1 & 2 & 3 \\ 0 & 0 & 1 & 2 & 3 \\ 1 & 2 & 0 & 1 & 3 \\ 2 & 3 & 0 & 1 & 0 \\ 3 & 2 & 1 & 0 & 3 \end{matrix}$$

**Q. No.2:** Attempt all parts of the following;

- (a) Write down the steps involved in encryption and decryption in RSA algorithm.  
Perform encryption and decryption using RSA algorithm for the following:

$p=11, q=13, e=11$ , message  $M=7$ .

Here p, q, e and M have usual meanings. Show all the steps of calculations.

- (b) Describe Chinese Remainder and Euler's Theorems with their applications.

2 (05)

- (c) Explain the key distribution scheme for symmetric encryption.

2 (2.5)

Or

Explain Diffie-Hellman key exchange algorithm need to exchange secret key between two communicating parties. Show how it is vulnerable to man-in-the-middle attack.

**Q. No. 3:** Attempt all parts of the following;

- (a) Enlist security services provided by digital signature. Write the DSS (digital signature standard) scheme of digital signature generation and verification.
- (b) Describe applications and the working of secure hash algorithm (SHA) using suitable example. Compare and contrast various variants algorithms of shared hash algorithms (SHA).

3 (05)

3 (05)

**Q. No. 4:** Attempt all parts of the following:

- (a) What are major security aspects in the security of electronic mail system?  
Explain the working of PGP (Pretty Good Privacy) and S/MIME.
- (b) What are the uses of Kerberos? Write the sequence of message exchanges that happens when a client attempts to obtain a service granting ticket in Kerberos.

4 (05)

4 (05)

**Q. No. 5:** Attempt all parts of the following:

- (a) Explain the applications and the working of IP Security protocol. How IP Security protocol ensures the security in the network for various applications?
- (b) Enlist the various components of Web Security. What are the various services being offered by secure socket layer (SSL) and transport layer security (TLS)?
- (c) Explain the working of Secure Electronic Transaction (SET).

5 (05)

5 (2.5)

5 (2.5)

Date of showing evaluated answer books: 25 days after exam

No. of Printed Pages: 01

Roll No. 203104052

**HARCOURT BUTLER TECHNICAL UNIVERSITY, KANPUR**

End Semester Examination

Even Semester (B. Tech.), 2022-23

**HHS 352: Entrepreneurship Development**

Time: 2:30 Hours

Max. Marks: 50

Note: 1. Attempt all questions.

2. All questions carry marks, as shown against them.  
Please mention all the Course Outcomes (CO) in statement form

1. Describe what it takes an Entrepreneur; describe multiple ways to become an entrepreneur; including, intrapreneur, and manager, woman entrepreneur rural & urban: highlights motives to become entrepreneur.
2. Apply the beginner concept, ownership and various forms with focus on small scale enterprises.
3. Identify opportunities using identification; project conceptualization, formulation & evaluation.
4. Identify potential contribution of human resources, marketing, financial and strategic management with fund, opportunities
5. Decipher the role of Institution support and policy framework of Government for enterprises in India.

	Related CO	Marks
<b>Q.No. 1:</b> Attempt any two of the following: (a) Describe the Schumpeter's theory of entrepreneurship. (b) Write short notes on women entrepreneurship. (c) What is the Government's policy to motivate entrepreneurship?	CO1	5*2=10
<b>Q.No. 2:</b> Attempt any two of the following: (a) Define MSME. . (b) Explain the role of SMEs in economic development of a country. (c) What are the major sources of fund for a company?	CO2	5*2=10
<b>Q.No. 3:</b> Attempt any two of the following: (a) What is network analysis? Explain its significance in project design. (b) Explain non-discounted cash flow technique of project appraisal. (c) What is a project? Explain various phases of project formulation.	CO3	5*2=10
<b>Q.No. 4:</b> Attempt any two of the following: (a) Discuss the brief marketing strategies of a new venture. (b) What is the strategic business planning? Explain main strategies for business growth. (c) What are the main sources of long term capital? Explain in detail.	CO4	5*2=10
<b>Q.No. 5:</b> Attempt any two of the following: (a) Discuss the Institutional framework to promote MSMEs in India. (b) What are the functions of a TCO? Explain in detail (c) Who is a venture capitalist? What is the need of venture capital in startups?	CO5	5*2=10