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C-153

B.Tech. Information Technology III Semester Examinations (June 2026)
Object Oriented Programming (BT-IT-205A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) How object-oriented programming is different from procedure oriented programming?	2
(b) How do we tell Java that the class we are creating implements a particular interface?	2
(c) Suggest various wrapper classes in Java.	2
(d) Users must be above 10 years to open a self-operated bank account. Write this logic using a ternary operator and store the result (the eligibility message) in a String variable named idStatus and print it.	2
(e) Suggests various frequently used API packages used in Java.	2
(f) Discuss various constructors for HashSet class.	2

UNIT-I

Q.2(a)	What is World Wide Web? What is the contribution of Java to the WWW?	6
Q.2(b)	Describe with a flowchart, how various Java tools are used in the application development?	6
Q.3	Write a program to accept a two-dimensional integer array of order 4 x 5 as input from the user. Check if it is a Sparse Matrix or not. A matrix is considered to be a sparse, if the total number of zero elements is greater than total number of non-zero elements. Print appropriate message.	12

UNIT-II

Q.4(a)	What is inheritance and how does it help us to create new classes quickly?	6
Q.4(b)	Discuss different forms of inheritance with suitable syntax of each.	6
Q.5(a)	Explain the concept of constructor overloading with the same number of arguments but different data types.	6
Q.5(b)	Write Java code to showcase the concept of autoboxing and unboxing using different numeric and character wrapper classes.	6

UNIT-III

Q.6(a)	Discuss the various levels of access protection available for packages and their implications.	6
Q.6(b)	What is random access file? How is it different from a sequential file?	6
Q.7	Define an exception called "NoMatchException" that is thrown when a string is not equal to "India". Write a program that uses this exception.	12

UNIT-IV

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|---------------|--|-----------|
| Q.8(a) | Define Stack class. Explain various methods defined in Stack class with the help of suitable example. | 6 |
| Q.8(b) | Discuss TreeSet and TreeMap along with its internal structure. | 6 |
| Q.9 | Explain Queue interface and its implementation along with:
a) FIFO concept.
b) Priority Queue.
c) Methods and examples. | 12 |

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B.Tech. Information Technology IV Semester Examinations (Jun 2026)
Operating System (BT-IT-202A)

Time- 3hrs
Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Explain the role of system call in operating system.	2
(b)	Explain the concept of thread and multithreading.	2
(c)	Define first fit, best fit and next fit partition allocation methods.	2
(d)	What is degree of multiprogramming?	2
(e)	Define Belady's anomaly.	2
(f)	Differentiate preemptive and non-preemptive scheduling algorithms.	2

UNIT-I

Q.2(a)	Describe various stages involve in process life cycle.	6
Q.2(b)	Discuss operating system architecture and various types of operating system.	6
Q.3	Consider the following set of processes with the CPU burst time in ms.	3*4=
		12

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The processes are assumed to have arrived in order P1, P2, P3, P4, P5 all at time 0.

- What is the turnaround time of each process for each of the scheduling algorithms: SJF, Non-pre-emptive priority and round Robine with time quantum =1.
- What is the Waiting time of each process for each of the scheduling algorithms: SJF, Non-pre-emptive priority and round Robine with time quantum =1.
- Which of the above algorithms has minimum average waiting time?

UNIT-II

Q.4(a)	What is the Critical Section Problem in operating systems? Explain the essential requirements that must be satisfied by a correct solution to the Critical Section Problem.	6
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Q.4(b) Define deadlock in operating systems. Explain the four necessary conditions required for the occurrence of deadlock. 6

Q.5 Consider the following system state: 3*4=12

Allocation matrix					Max Need				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P1	0	0	1	2	0	0	1	2	2	1	0	0
P2	2	0	0	0	2	7	5	0				
P3	0	0	3	4	6	6	5	6				
P4	2	3	5	4	4	3	5	6				
P5	0	3	3	2	0	6	5	2				

- Is the system in safe or unsafe state? Why?
- Is the system currently deadlocked justify your answer
- Is the system request from P3 arise for (0 1 0 0) be safely granted immediately?

UNIT-III

Q.6(a) Discuss the role of TLB in performance of Paging. 6

Q.6(b) Consider a main memory with capacity of 4-page frames. The reference string is 5, 0, 1, 0, 2, 3, 0, 2, 4, 3, 3, 2, 0, 2, 1, 2, 7, 0, 1, 1, 0. Find page faults using optimal and least recently used page replacement algorithms. 6

Q.7 Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The FCFS scheduling algorithm is used. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Find total head movement (in number of cylinders) incurred while servicing these requests in following scheduling algo: 12

- FIFO
- SSTF
- SCAN
- LOOK
- C-SCAN
- C-LOOK

UNIT-IV

Q.8 Compare contiguous, linked, and indexed allocation methods. 12

Q.9(a) Discuss the Unix file system. 6

Q.9(b) Explain the purpose of the following system calls: 6

mkdir()
mount()
chown()

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D-152

B.Tech. Information Technology IV Semester Examinations (Jun 2026)

Design & Analysis of Algorithms (BT-IT-204A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory. Each Question carries 12 marks.

Marks

Q.1

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|----|--|---|
| a) | Differentiate between best case and worst-case complexity. | 2 |
| b) | Explain the recursion tree method for solving recurrence relations. | 2 |
| c) | Differentiate between AVL tree and Red-Black tree. | 2 |
| d) | Explain the importance of dividing a problem into subproblems. | 2 |
| e) | Why is greedy approach not suitable for all problems? | 2 |
| f) | Explain why backtracking is considered a depth-first search technique. | 2 |

UNIT-I

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|--------|--|---|
| Q.2 a) | Explain the criteria used for analyzing algorithms. Why is algorithm analysis important prior to implementation? | 6 |
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| Q.2 b) | Consider the recurrence relation: | 6 |
|--------|-----------------------------------|---|

$$T(n) = T\left(\frac{n}{2}\right) + 1$$

Solve the above recurrence using the recursion tree method and determine its asymptotic complexity.

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|---------|--|---|
| Q.3 (a) | Compare the asymptotic notations (O), (Ω), and (Θ) with suitable examples. Discuss their significance in analyzing algorithm efficiency. | 6 |
|---------|--|---|

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|---------|--|---|
| Q.3 (b) | Solve the following recurrence relation using the substitution method and determine its asymptotic complexity:
$T(n)=2T(n-1)+1$ | 6 |
|---------|--|---|

UNIT-II

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|-----|--|----|
| Q.4 | Construct an AVL Tree by inserting the following elements in the given order:
30, 20, 40, 10, 25, 50, 5
Show all balancing steps and rotations performed after each insertion. | 12 |
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|---------|---|---|
| Q.5 (a) | Design an algorithm for Heap Sort and demonstrate the sorting process for the following array: 45, 20, 35, 50, 10, 60. Also, determine its time complexity. | 6 |
|---------|---|---|

- Q.5 (b)** Apply Strassen's Matrix Multiplication algorithm to compute the product of two matrices. 6

UNIT-III

- Q.6 (a)** Explain the concept of Job Scheduling with Deadlines and discuss the steps involved in solving it using the Greedy Approach. 6
- Q.6 (b)** Explain the working of Dijkstra's Algorithm for finding the shortest path in a graph with non-negative edge weights. 6
- Q.7 (a)** Justify why the Traveling Salesman Problem (TSP) is considered an optimization problem. 6
- Q.7 (b)** Explain the Dynamic Programming approach for solving the 0-1 Knapsack Problem. Compare its efficiency with the recursive approach. 6

UNIT-IV

- Q.8 (a)** Explain the concept of State-Space Trees in Backtracking and illustrate the state-space tree for the 4-Queen Problem. 6
- Q.8 (b)** Evaluate the efficiency of the Graph Coloring problem using the Backtracking approach. How does the number of colors influence the computational complexity? 6
- Q.9 (a)** Compare FIFO Branch-and-Bound and LC (Least-Cost) Branch-and-Bound techniques with respect to their node selection strategies, search behavior, and overall efficiency. 6
- Q.9 (b)** What is the Traveling Salesman Problem (TSP)? Justify why the Branch-and-Bound technique is considered suitable for solving TSP. 6

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B.Tech. Information Technology IV Semester Examinations (Jun 2026)
Database Management Systems (BT-IT-206A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Why is DBMS preferred over traditional file processing systems? Mention any two limitations of file-based systems.	2
(b)	Differentiate between Relational algebra and relational calculus.	2
(c)	How is alternate key different from a candidate key? Give suitable examples.	2
(d)	Discuss the purpose of serializability in transaction management.	2
(e)	Why concurrency control required in DBMS?	2
(f)	State any two reasons why NoSQL databases are used for unstructured data.	2

UNIT-I

Q.2	How does ER model help in designing databases? Design an ER model for a hospital management system involving patients, doctors, departments and appointments.	12
Q.3(a)	Describe the role of database administrator and database users in DBMS environment.	6
Q.3(b)	Explain the layered architecture of DBMS with neat diagram.	6

UNIT-II

Q.4(a)	Consider the following STUDENT database schema: STUDENT (roll_no, student_name, gender, course_id, contact_no) COURSE (course_id, course_name, duration) Write SQL queries for the following operations using an appropriate example table: a) Add a new column "fathers_name" to the STUDENT table. b) Update the contact_no of the student having roll_no "101" to a new value. c) Count the number of students enrolled in each course. d) Display the course_name having maximum duration. e) Display the details of students whose contact_no start with '98'. f) Display roll_no, student_name, course_id and course_name from STUDENT and COURSE tables using JOIN operation	6
Q.4(b)	What are integrity constraints? Discuss their types with suitable examples.	6
Q.5	Illustrate various anomalies in relational databases using suitable examples. Explain how normalization helps in achieving efficient database design.	12

UNIT-III

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|---------------|---|-----------|
| Q.6 | Explain transaction processing in DBMS. Discuss transaction states and ACID properties with suitable examples and diagrams. | 12 |
| Q.7(a) | What are deadlocks in DBMS? Discuss various techniques adopted for deadlock handling in DBMS. | 6 |
| Q.7(b) | Analyze the working of Two-Phase Locking (2PL) protocol and explain how it ensures serializability in concurrent execution of transactions. | 6 |

UNIT-IV

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|---------------|---|-----------|
| Q.8 | Explain querying techniques in MongoDB. Discuss querying arrays, comparison operators, and logical operators with examples. | 12 |
| Q.9(a) | How are documents retrieved and ranked in information retrieval systems? Explain with suitable examples. | 6 |
| Q.9(b) | Explain the role of MongoDB features in supporting scalable and flexible application development. | 6 |

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B.Tech. Information Technology IV Semester Examinations (Jun 2026)
Computer Organization & Architecture (BT-IT-208A)

Time- 3hrs

Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	State the stored-program concept	2
(b)	What is Register Transfer Language (RTL)?	2
(c)	Define bus and bus transfer with example.	2
(d)	Write any two differences between RISC and CISC.	2
(e)	What is virtual memory?	2
(f)	Define associative memory.	2
UNIT-I		
Q.2(a)	Explain Flynn's classification of computers with neat diagrams.	6
Q.2(b)	Describe the various phases of the instruction cycle with the help of a flowchart.	6
Q.3(a)	Classify the instructions of a basic computer. Explain memory-reference, register-reference and input-output instructions with their formats.	6
Q.3 (b)	Discuss the timing and control mechanism of a basic computer with the help of a block diagram.	6
UNIT-II		
Q.4	Explain the various arithmetic micro-operations with suitable examples. Also, explain memory read and memory write micro-operations with their notations	12
Q.5(a)	Explain logic micro-operations and shift micro-operations with appropriate truth tables and examples.	6
Q.5(b)	Explain the working of a hardwired control unit with a neat block diagram.	6
UNIT-III		
Q.6	Explain the different types of CPU architectures in detail with suitable diagram	12
Q.7(a)	Discuss instruction-level parallelism in detail with example.	6
Q.7(b)	What is a program interrupt? Explain its types and the steps involved in interrupt.	6
UNIT-IV		
Q.8	Explain virtual memory in detail. Discuss address-mapping using pages with a suitable example and describe the role of the page table and TLB.	12
Q.9(a)	Explain the working of a DMA controller with a neat block diagram.	6
Q.9(b)	Explain hit-ratio and miss-ratio in cache memory with a suitable example.	6

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B.Tech. Information Technology IV Semester Examinations (Jun 2026)
Foundations of Data Analytics, Machine Learning and Statistics (BT-IT-252A)

Time- 3hrs
Max. Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Describe Exploratory Data Analysis and its role in data science.	2
(b)	What do you mean by Data Analytics?	2
(c)	Define the Supervised and Unsupervised Learning.	2
(d)	Differentiate the Population and Sample.	2
(e)	Explain Type-II Error I Decision Analysis.	2
(f)	Describe the Population Variances.	2

UNIT-I

Q.2 (a)	Discuss any four statistical measures with example?	6
Q.2 (b)	Illustrate in detail about ingredients of Machine Learning.	6
Q.3	What are the various Classification of Analytics. Analyze the role of frequentist approach in Statistical Inference.	12

UNIT-II

Q.4	A sample of size 64 and mean 70 were taken from a population whose standard deviation is 10. Construct and evaluate 95% confidence interval for the mean.	12
Q.5(a)	Obtain regression equation of Y on X and estimate Y when X=55 from the following.	6

X	40	50	38	60	65	50	35
Y	38	60	55	70	60	48	30

Q.5(b)	Find the means of X and Y variables and the coefficient of correlation between them from the following two regression equations:	6
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$$2Y - X - 50 = 0$$

$$3Y - 2X - 10 = 0.$$

UNIT-III

Q.6	Write short notes about (i) ANOVA (ii) Type I and Type II errors (iii) Sample and Population.	4+4+4
Q.7(a)	Write and analysis about null hypothesis and testing null hypothesis.	6
Q.7(b)	Write step procedure for difference of means of two independent samples.	6

UNIT-IV

Q.8	How Data Science Can Improve Healthcare Systems. Explain and Analysis with any real time case study in healthcare.	12
Q.9(a)	Explain the appropriate uses of various analytical techniques for identifying, gathering and/or mining healthcare data.	6
Q.9(b)	Why Healthcare needs different types of analytics? Explain and evaluate with any case study in healthcare.	6
