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21CS61

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Software Engineering and Project Management

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is Software Engineering? Explain the software engineering practice in detail. **(06 Marks)**

b. Define software Myth. Demonstrate customer myth and practitioners myth in detail. **(07 Marks)**

c. Elaborate on incremental model along with its advantages and disadvantages. **(07 Marks)**

OR

2 a. Identify the model which is well suited for the below scenario and explain in detail. The SBI Bank Manager gives requirements to develop SBI banking application. The manager states that the requirements are stable and changes are not required in future. **(08 Marks)**

b. Show the process flow in spiral model along with neat diagram. **(06 Marks)**

c. Discuss the common attributes or characteristics for Web App. **(06 Marks)**

Module-2

3 a. Draw a use case diagram which demonstrates the usage of library management system. **(08 Marks)**

b. Identify the differences between user and system requirements. **(06 Marks)**

c. Discuss on activity diagram in detail. **(06 Marks)**

OR

4 a. Construct a use case diagram for online shopping system. **(08 Marks)**

b. Explain each and every step in requirements elicitation. **(06 Marks)**

c. Elaborate on state transition diagram briefly. **(06 Marks)**

Module-3

5 a. Write short notes on tool set of agile process. **(07 Marks)**

b. Brief the scrum concept along with scrum roles and events. **(07 Marks)**

c. Identify the core principles in software engineering and explain them in detail. **(06 Marks)**

OR

6 a. Discuss on extreme programming along with the Xp rules. **(07 Marks)**

b. What is Agility? Explain the cost of curve in agile. **(07 Marks)**

c. Explain Agile principles in detail **(06 Marks)**

Module-4

7 a. Explain the characteristics of the project. **(06 Marks)**
b. Discuss the different ways of categorizing software project. **(07 Marks)**
c. Elaborate on software project v/s other engineering projects. **(07 Marks)**

OR

8 a. Discuss criteria's and factors of a project success and project failure. **(07 Marks)**
b. Differentiate between traditional v's modern project management practices. **(06 Marks)**
c. Explain different phases of project management life cycle. **(07 Marks)**

Module-5

9 a. Explain software quality dimensions/parameters and factors affecting software quality. **(07 Marks)**
b. With a neat diagram, explain place of software quality in project management. **(07 Marks)**
c. Discuss on techniques that enhances software quality. **(06 Marks)**

OR

10 a. Demonstrate the usage of Mecall Software quality model. **(06 Marks)**
b. Elaborate on Capability Maturity Model (CMM) in detail. **(07 Marks)**
c. Explain levels of testing and testing activities. **(07 Marks)**

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BCS654B

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Fundamentals of Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Operating System. Explain modern computer system with suitable block diagram.	10	L2	CO1
	b.	Discuss various services provided by operating system.	10	L2	CO1
		OR			
Q.2	a.	Explain multiprogramming, multiprocessing and multitasking.	10	L2	CO1
	b.	What is a System Call? Explain different types of system calls.	10	L2	CO1
		Module – 2			
Q.3	a.	Define a Process. Explain various states of a process with its diagram.	10	L2	CO2
	b.	Discuss different types of CPU schedulers.	10	L2	CO2
		OR			
Q.4	a.	Define Thread. Explain the benefits of multithreaded programming.	10	L2	CO2
	b.	Discuss different multithreading models.	10	L2	CO2
		Module – 3			
Q.5	a.	List CPU scheduling criteria. Explain with an example.	10	L2	CO3
	b.	Apply FCFS and scheduling algorithm for the given problem and calculate Average Waiting Time and Average Turnaround time.	10	L3	CO3

Process ID	Arrival Time	Burst Time
P1	2	2
P2	5	6
P3	0	4
P4	0	7
P5	7	4

		OR			
Q.6	a.	Define critical section problem. Explain with a suitable diagram.	5	L2	CO3
	b.	Write and explain Peterson's solution by taking an example.	10	L2	CO3
	c.	Explain how semaphores can be used to solve dining Philosopher's problem.	5	L2	CO3

			Marks	Level	CO
		Module – 4			
Q.7	**a.**	What is a Deadlock? List and explain necessary conditions for deadlock situation.	**10**	**L2**	**CO4**
	b.	Consider the following snapshot of the system – Apply Bankers safety algorithm. (see tables below) i. Calculate need matrix ii. Is the system in safe state? If so mention safe sequence.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	What are First-Fit, Best-Fit and Worst-Fit in memory allocation? Explain with suitable example.	**10**	**L2**	**CO4**
	b.	Why Paging? Explain paging hardware with its block diagram.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	What is a page fault? Explain steps involved in handling page fault.	**10**	**L2**	**CO5**
	b.	Consider the page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3 for a memory with frame size 3. Determine the page faults using FIFO algorithm. i. Calculate Hit ratio ii. Calculate Miss ratio.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Define File. List and explain file attributes.	**5**	**L2**	**CO5**
	b.	Explain various operations on File.	**10**	**L2**	**CO5**
	c.	Write a note on file access methods.	**5**	**L2**	**CO5**

Tables for Q.7 b.:

	Allocation Matrix				Max Matrix		
	A	B	C		A	B	C
P0	1	0	1	P0	2	1	1
P1	2	1	2	P1	5	4	4
P2	3	0	0	P2	3	1	1
P3	1	0	1	P3	1	1	1

Available Matrix

A	B	C
2	1	1

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BCS601

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Cloud Computing

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Distributed Systems. Explain any three system models used in distributed and cloud computing with examples.	10	L2	CO1
	b.	What is Scalable Computing? Explain how cloud computing enables scalable computing over the Internet.	10	L2	CO1
		OR			
Q.2	a.	Compare and contrast cluster computing grid computing and cloud computing in terms of Architecture and Usage.	10	L3	CO1
	b.	Analyze the challenges in distributed systems related to performance, security and energy efficiency.	10	L3	CO1
		Module – 2			
Q.3	a.	Define Virtualization. Explain the different implementation levels of virtualization with examples.	10	L2	CO2
	b.	Define Virtual Clusters. Explain how virtual clusters are built and used in Distributed Systems.	10	L2	CO2
		OR			
Q.4	a.	Explain with examples how Resource Management is handled in Virtual Clusters.	10	L3	CO2
	b.	How does virtualization support data center automation and dynamic resource management?	10	L3	CO2
		Module – 3			
Q.5	a.	Define Cloud Computing. Explain the different service models (IaaS, PaaS, SaaS) with examples.	10	L2	CO3
	b.	Explain the basic components and design considerations of a modern data center.	10	L2	CO3
		OR			
Q.6	a.	Describe the Architecture design of compute clouds with the help of a diagram.	10	L2	CO3
	b.	Compare the public cloud platforms: Google App Engine (GAE), Amazon Web Services (AWS) and Microsoft Azure.	10	L3	CO3

		Module – 4			
Q.7	**a.**	Define Cloud Security. What are the top 5 security concerns faced by cloud users?	**10**	**L1**	**CO4**
	b.	What is a Privacy Impact Assessment (PIA)? List its key components and purpose in a cloud environment.	**10**	**L1**	**CO4**
		OR			
Q.8	**a.**	Analyze the security risks posed by shared virtual machine images and management operating systems in public cloud environments.	**10**	**L4**	**CO4**
	b.	Explain how XOAR architecture and trusted hypervisors enhance cloud security analyze their impact on virtualized data center environments.	**10**	**L4**	**CO4**
		Module – 5			
Q.9	**a.**	Apply the concept of MapReduce by writing a simple program to count the number of occurrences of each word in a text file.	**10**	**L3**	**CO5**
	b.	Develop a simple Python or Java application for Google App Engine to serve dynamic content using a basic web handler.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Analyze the differences between Parallel Computing Paradigms (MPI/openMP) and Cloud Programming Paradigms (MapReduce, GAE) in terms of scalability and fault tolerance.	**10**	**L4**	**CO5**
	b.	Examine how emerging cloud software environments like Microsoft Azure integrate PaaS, IaaS and SaaS. Analyze the flexibility offered to developers.	**10**	**L4**	**CO5**

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BCS602

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Machine Learning

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	**a.**	Explain the machine learning process and its applications with a suitable diagram.	**6**	**L2**	**CO1**
	b.	Explain the purpose of dimensionality reduction and its importance in the domain of machine learning.	**8**	**L2**	**CO1**
	c.	Write short notes on the following : i) Min-Max Scaling ii) Z-score iii) Mean iv) Standard Deviation v) Median vi) Dispersion.	**6**	**L2**	**CO1**
		OR			
Q.2	**a.**	Explain the elements of Big Data, data types, and Big Data analytics in relation to Machine Learning.	**6**	**L2**	**CO1**
	b.	Explain data collection and data pre-processing.	**8**	**L2**	**CO1**
	c.	Explain the removal of noise or outlier data with a suitable example.	**6**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Explain the Gaussian Elimination Algorithm and Solve the following problem $x + y + z = 2$ $x + 2y + 3z = 5$ $2x + 3y + 4z = 11$	**10**	**L3**	**CO2**
	b.	Explain the Types of Machine Learning (ML)	**4**	**L2**	**CO2**
	c.	Illustrate PCA, why it is important, and write the PCA Algorithm.	**6**	**L3**	**CO2**
		OR			
Q.4	**a.**	Solve the problem using the Find – S Algorithm :	**10**	**L3**	**CO2**

S. No	Horns	Tail	Tusks	Paws	Fur	Color	Hooves	Size	Elephant
1	No	Short	Yes	No	No	Black	No	Big	Yes
2	Yes	Short	No	No	No	Brown	Yes	Medium	No
3	No	Short	Yes	No	No	Black	No	Medium	Yes
4	No	Long	No	Yes	Yes	White	No	Medium	No
5	No	Short	Yes	Yes	Yes	Black	No	Big	Yes

			Marks	Level	CO
	b.	Write a short note on Binomial Distribution, Poisson Distribution and Bernoulli Distribution.	4	L2	CO2
	c.	Explain LU Decomposition and solve the following problem $A = \begin{bmatrix} 2 & 3 & 1 \\ 4 & 7 & 3 \\ 6 & 18 & 5 \end{bmatrix}$	6	L3	CO2

Module – 3

Q.5 a. Explain the KNN algorithm and solve the following problem :
In the KPSC exam, candidates secured the following marks. Based on those obtained marks, categorize whether the candidate is eligible for the exam or not using K-Nearest Neighbors. Given instance as follows :

- General Studies X(O1) = 07
- Computer Science Y(O2) = 6
- Language = 4
- K = 3 nearest neighbors

Note : Training data is provided, where O represents observable values.

General Studies	Computer Science	Languages	Eligible
4	3	5	Fail
6	7	8	Pass
6	8	6	Pass
5	5	4	Fail
8	8	9	Pass

10 L3 CO3

b. Explain the Local Weighted KNN, Logistic Regression, and Nearest centroid classifier algorithms. **10 L3 CO3**

OR

Q.6 a. Explain Linear Regression and Polynomial Regression and solve a Linear Regression problem :
Apply linear regression technique to predict the 7th week sales

Table : Sample data

X (week)	Y (Sales in Thousands)
1	1.2
2	1.8
3	2.6
4	3.2
5	3.8

10 L3 CO3

b. Explain ID3 algorithm and solve the following problem :

Age	Competition	Type	Profit
Old	Yes	S/W	Down
Old	No	S/W	Down
Old	No	H/W	Down
Mid	Yes	S/W	Down
Mid	Yes	H/W	Down
Mid	No	H/W	Up
Mid	No	S/W	Up
New	Yes	S/W	Up
New	No	H/W	Up
New	No	S/W	Up

10 L3 CO3

		Module – 4			
Q.7	**a.**	Explain Baye's Theorem and Bayes' optimal classifier.	**8**	**L2**	**CO4**
	b.	Explain the Naïve Bayes algorithm and solve the problem using the Naïve Bayes classifier. Classify using Naïve Bayes' for the new sample : (fruit = {yellow, sweet, long}) Data : <table><tr><td>Fruit</td><td>Yellow</td><td>Sweet</td><td>Long</td></tr><tr><td>Orange</td><td>350</td><td>450</td><td>0</td></tr><tr><td>Banana</td><td>400</td><td>300</td><td>350</td></tr><tr><td>Others</td><td>50</td><td>100</td><td>50</td></tr></table>	**12**	**L3**	**CO4**
		OR			
Q.8	**a.**	Write a note on : i) Perceptron ii) Different types of Artificial Neural Network with a suitable diagram.	**8**	**L2**	**CO4**
	b.	Explain the ANN Node structure and all its associated activation function with suitable mathematical notations.	**12**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Write a short note on Clustering and classification along with advantages and disadvantages of the clustering algorithm.	**6**	**L2**	**CO5**
	b.	Explain the proximity measures.	**6**	**L2**	**CO5**
	c.	Explain the Mean Shift Clustering Algorithm and solve the following problem. Start with point P1(1, 1) P1 = (1, 1) P2 = (2, 1) P3 = (2, 2) P4 = (8, 8) P5 = (9, 8) P6 = (8, 9) Mean shift clustering using a bandwidth (radius) of 4 units. Stopping threshold : Stop when the new center moves less than 0.01	**8**	**L3**	**CO5**
		OR			
Q.10	**a.**	Explain the K-Mean clustering algorithm and solve the following problem. <table><tr><td>Point</td><td>X</td><td>Y</td></tr><tr><td>A</td><td>1</td><td>1</td></tr><tr><td>B</td><td>1.5</td><td>2</td></tr><tr><td>C</td><td>3</td><td>4</td></tr><tr><td>D</td><td>5</td><td>7</td></tr><tr><td>E</td><td>3.5</td><td>5</td></tr><tr><td>F</td><td>4.5</td><td>5</td></tr><tr><td>G</td><td>3.5</td><td>4.5</td></tr></table>Lets apply K-Means with K = 2	**12**	**L3**	**CO5**
	b.	Short note on : Monte Carlo method, temporal difference learning, Q-learning and SARSA learning.	**8**	**L2**	**CO5**

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BCS613D

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Advanced Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Summarize the main advantages of using the Java collections Framwork.	5	L2	CO1
	b.	Explain the difference between a List and Set in the Java.	5	L2	CO1
	c.	Create a student class with fields name and roll number. Develop a Java code snippet to store multiple student objects in an ArrayList, use iterator to display details of each student.	10	L3	CO1
		OR			
Q.2	a.	Explain how does a comparator interface differ from a comparable interface.	5	L3	CO2
	b.	Explain the difference between an array and an ArrayList in Java.	5	L2	CO2
	c.	Develop a Java program that stores a list of integers in a LinkedList and applies reverse-order Comparator to sort it in descending order. Then, use appropriate methods from the collections class to reverse, shuffle and find the minimum and maximum values in the list.	10	L3	CO2
		Module – 2			
Q.3	a.	Explain why string is immutable in Java? What are the benefits of this behavior?	5	L2	CO2
	b.	Compare between the = = operator and equals( ) method when comparing string objects in Java. Support your explanation with a code example.	5	L2	CO2
	c.	Develop a Java program that applies the Bubble sort algorithm to sort an array of string objects in ascending order alphabetically using the compareTo( ) method.	10	L3	CO2
		OR			
Q.4	a.	Explain how the append( ) method in StringBuffer works and how it is different from using + with string?	5	L2	CO3
	b.	Explain the purpose of the insert( ) delete( ), replace( ), reverse( ) and substring( ) method in the StringBuffer class with suitable examples.	5	L2	CO3
	c.	Develop a Java program using suitable StringBuffer methods to transform the string "StringBuffer is powerful" in to "StringBuffer is versatile and widely used". Apply replace( ), insert( ), delete( ) and append( ) methods to achieve the desired output.	10	L3	CO3
		Module – 3			
Q.5	a.	Explain two key features of Java swing.	5	L2	CO2
	b.	What is the MVC architecture is Java swing? Explain the role of each component and identify which parts of the MVC pattern the following swing components represent : JTextfield, ActionListener, and the text content stored in the field.	5	L2	CO2
	c.	Develop a Java swing application using JFrame that displays a simple form with the following components : • A Label and text field for "Name" • A Label and text field for "Age" • A submit button • When the button is clicked, display the entered information using a message dialog.	10	L3	CO2

		OR			
Q.6	**a.**	Create a Java swing application using JApplet to design a simple calculator that adds two numbers entered by the user. Display the result when a button is clicked.	**10**	**L3**	**CO3**
	b.	Develop a Java swing JApplet that contains a menubar with a "color" menu. This menu should have three menu items : "Red". "Green" and "Blue". When a user selects one of the options, the background color of the applet should change according.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	What is a Java Servlet? Explain its role in web development.	**5**	**L2**	**CO4**
	b.	Explain the life cycle of a servlet and how can form data be retrieved in Java Servlet.	**5**	**L2**	**CO4**
	c.	Develop a Java servlet program that accepts a username and passward from an HTML form and displays a welcome message if the credentials match predefined values.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Explain different types of JSP tags with examples.	**5**	**L2**	**CO4**
	b.	Show a JSP code to read a request parameter "name" from an HTML form and display a greeting message.	**5**	**L2**	**CO4**
	c.	Construct a JSP page that accepts a user's name and age, stores them in session attributes and display a personalized message using those attributes.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	What is JDBC? Explain its significance in Java applications.	**5**	**L2**	**CO5**
	b.	Name and explain the four types of JDBC drivers.	**5**	**L2**	**CO5**
	c.	Develop a Java program to connect to a database, insert a new student record into a table, and display a confirmation message.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Explain the steps in the JDBC process to connect to a database.	**5**	**L2**	**CO5**
	b.	Compare statement and ResultSet objects in JDBC.	**5**	**L2**	**CO5**
	c.	Develop a Java program to retrieve and display all records from an employees table using ResultSet.	**10**	**L3**	**CO5**

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BCS654B

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Fundamentals of Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Operating System. Explain modern computer system with suitable block diagram.	10	L2	CO1
	b.	Discuss various services provided by operating system.	10	L2	CO1
		OR			
Q.2	a.	Explain multiprogramming, multiprocessing and multitasking.	10	L2	CO1
	b.	What is a System Call? Explain different types of system calls.	10	L2	CO1
		Module – 2			
Q.3	a.	Define a Process. Explain various states of a process with its diagram.	10	L2	CO2
	b.	Discuss different types of CPU schedulers.	10	L2	CO2
		OR			
Q.4	a.	Define Thread. Explain the benefits of multithreaded programming.	10	L2	CO2
	b.	Discuss different multithreading models.	10	L2	CO2
		Module – 3			
Q.5	a.	List CPU scheduling criteria. Explain with an example.	10	L2	CO3
	b.	Apply FCFS and scheduling algorithm for the given problem and calculate Average Waiting Time and Average Turnaround time. (see table below)	10	L3	CO3

Process ID	Arrival Time	Burst Time
P1	2	2
P2	5	6
P3	0	4
P4	0	7
P5	7	4

		OR	M	L	C
Q.6	a.	Define critical section problem. Explain with a suitable diagram.	5	L2	CO3
	b.	Write and explain Peterson's solution by taking an example.	10	L2	CO3
	c.	Explain how semaphores can be used to solve dining Philosopher's problem.	5	L2	CO3

		Module – 4			
Q.7	**a.**	What is a Deadlock? List and explain necessary conditions for deadlock situation.	**10**	**L2**	**CO4**
	b.	Consider the following snapshot of the system – Apply Bankers safety algorithm. (see tables below) i. Calculate need matrix ii. Is the system in safe state? If so mention safe sequence.	**10**	**L3**	**CO4**

	Allocation Matrix				Max Matrix		
	A	B	C		A	B	C
P0	1	0	1	P0	2	1	1
P1	2	1	2	P1	5	4	4
P2	3	0	0	P2	3	1	1
P3	1	0	1	P3	1	1	1

Available Matrix

A	B	C
2	1	1

i. Calculate need matrix
ii. Is the system in safe state? If so mention safe sequence.

OR

Q.8	**a.**	What are First-Fit, Best-Fit and Worst-Fit in memory allocation? Explain with suitable example.	**10**	**L2**	**CO4**
	b.	Why Paging? Explain paging hardware with its block diagram.	**10**	**L2**	**CO4**

Module – 5

Q.9	**a.**	What is a page fault? Explain steps involved in handling page fault.	**10**	**L2**	**CO5**
	b.	Consider the page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3 for a memory with frame size 3. Determine the page faults using FIFO algorithm. i. Calculate Hit ratio ii. Calculate Miss ratio.	**10**	**L3**	**CO5**

OR

Q.10	**a.**	Define File. List and explain file attributes.	**5**	**L2**	**CO5**
	b.	Explain various operations on File.	**10**	**L2**	**CO5**
	c.	Write a note on file access methods.	**5**	**L2**	**CO5**

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