

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23AI3104

DEEP LEARNING

Time: 3 hours

CSE (AI)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is the role of weights in a perceptron?	1	1	2M
	b	Describe the linear separability?	2	1	2M
	c	State the objective of gradient descent algorithm.	2	2	2M
	d	Write any two advantages of regularization.	1	2	2M
	e	Define batch normalization.	1	3	2M
	f	What is Regularization?	1	3	2M
	g	What is Long Short-Term Memory.	1	4	2M
	h	Define a Restricted Boltzmann Machine(RBM).	1	4	2M
	i	Define a Variational Autoencoder.	1	5	2M
	j	What is attention mechanism?	1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Discuss the Perceptron Learning Algorithm with a suitable example.	3	1	5M
		ii) Illustrate the Structure of Idea of Computational unit in neural networks?	3	1	5M
	OR				
	b	i) Explain the structure and working of a McCulloch–Pitts neuron with example.	3	1	5M
		ii) Illustrate Architecture of Biological Neuron and Compare Artificial Neuron and Biological Neuron model?	4	1	5M
3	Unit-II				
	a	i) Discuss Empirical Risk Minimization and its importance in neural network training.	3	2	5M
		ii) Analyze the impact of learning rate on convergence speed in backpropagation.	4	2	5M
	OR				
	b	i) Explain the architecture and learning process of a Multilayer Perceptron.	3	2	5M
		ii) Demonstrate how autoencoders can be used for dimensionality reduction.	3	2	5M
4	Unit-III				
	a	i) Compare and explain Adagrad, RMSProp, and Adam optimization algorithms.	4	3	5M
		ii) Describe the saddle point problem and how it affects neural network	3	3	5M

		training.			
	OR				
	b	i) Explain dropout and batch normalization to improve model generalization.	3	3	5M
		ii) Analyze how Nesterov Accelerated Gradient (NAG) overcomes standard gradient descent limitations.	4	3	5M
5	Unit-IV				
	a	i) Analyze how convolution and pooling layers extract spatial features in CNNs.	4	4	5M
		ii) Explain the architecture of LeNet. What was its main contribution to deep learning?	3	4	5M
	OR				
	b	i) Explain a Convolutional Neural Network (CNN)? Why is it useful for image-related tasks?	3	4	5M
		ii) Compare Bidirectional LSTMs and standard RNNs.	3	4	5M
6	Unit-V				
	a	i) Examine how recent generative models like VAEs and GPTs contribute to deep learning innovation.	3	5	5M
		ii) Analyze the role of latent space representation in VAEs.	4	5	5M
	OR				
	b	i) Explain the Transformer architecture in deep learning?	3	5	5M
		ii) Explain the concept of Variational Autoencoders for image reconstruction.	3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23AM3101 INFORMATION RETRIEVAL SYSTEMS

Time: 3 hours

CSE (AIML)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define the term Information Retrieval and its main objective.	K2	1	2M
	b	List any two important evaluation parameters used in IR systems.	K2	1	2M
	c	What is the difference between term frequency and document frequency?	K3	2	2M
	d	Explain the role of hashing in signature file generation.	K3	2	2M
	e	What is a PAT array and how does it differ from a PAT tree?	K4	3	2M
	f	Define lexical analysis in the context of information retrieval.	K2	3	2M
	g	What are the advantages of stemming in IR systems?	K3	4	2M
	h	Differentiate between automatic and manual thesaurus construction.	K4	4	2M
	i	Explain the basic working principle of the Boyer–Moore algorithm.	K3	5	2M
	j	What is the purpose of preprocessing in string searching algorithms?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	Compare Information Retrieval systems with Database Management Systems. Discuss their similarities and differences with examples.	K3	1	10M
	OR				
	b	Explain the structure and components of a modern IR system with a neat block diagram.	K4	1	10M
3	Unit-II				
	a	Describe the process of constructing an inverted index using a sorted array with a suitable example.	K3	2	10M
	OR				
	b	Discuss compression techniques used in signature files and explain vertical and horizontal partitioning.	K4	2	10M

4	Unit-III				
	a	Explain the construction of PAT Trees and discuss how they improve search performance in large text databases.	K3	3	10M
	OR				
	b	Discuss the importance of lexical analysis, tokenization, and stop-word removal in the IR pipeline.	K3	3	10M
5	Unit-IV				
	a	Explain in detail different types of stemming algorithms and discuss how over-stemming and under-stemming affect retrieval results.	K4	4	10M
	OR				
	b	Describe the process of constructing a thesaurus from a text corpus and how it enhances query expansion.	K3	4	10M
6	Unit-V				
	a	Explain the working of the Boyer–Moore and Shift–Or string searching algorithms with examples.	K3	5	10M
	OR				
	b	Compare and analyze the time complexities of Naive, KMP, and Boyer–Moore algorithms for large datasets.	K4	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23AM3102

DEEP LEARNING

Time: 3 hours

(AIML)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is the perceptron learning rule?	1	1	2M
	b	Compare biological neuron and artificial neuron?	2	1	2M
	c	What is a deep neural network?	1	2	2M
	d	Define autoencoder.	1	2	2M
	e	What is drop connect?	1	3	2M
	f	Define Adam optimizer.	1	3	2M
	g	What is a Bidirectional RNN?	1	4	2M
	h	Define Restricted Boltzmann Machine(RBM).	1	4	2M
	i	What is Natural Language Processing(NLP)?	1	5	2M
	j	write any two applications of deep learning in vision.	2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the structure and function of a biological neuron with a neat diagram.	2	1	5M
		ii) Illustrate the Perceptron Learning Algorithm?	3	1	5M
	OR				
	b	i) Compare linear separable and non-linear separable problems with examples	4	1	5M
		ii) State and prove the convergence theorem of the Perceptron?	3	1	5M
3	Unit-II				
	a	i) Apply backpropagation to a small MLP example and calculate the weight updates for one iteration.	4	2	5M
		ii) Explain the concept of Empirical Risk Minimization (ERM) in neural network training.	3	2	5M
	OR				
	b	i) What is regularization? How does regularization help in reducing overfitting?	3	2	5M
		ii) Explain how autoencoders can be used for layer-wise pretraining to improve deep network training.	3	2	5M

4	Unit-III				
	a	i) Describe the concept of the saddle point problem in training neural networks.	3	3	5M
		ii) Explain second-order methods for training neural networks?	2	3	5M
	OR				
	b	i) Analyze the role of regularization techniques in reducing overfitting in neural networks.	4	3	5M
		ii) Explain the working of batch normalization?	2	3	5M
5	Unit-IV				
	a	i) Explain the process of Backpropagation Through Time (BPTT) in RNNs.	3	4	5M
		ii) Illustrate CNN architectures LeNet and AlexNet?	3	4	5M
	OR				
	b	i) Illustrate the architecture and functioning of Long Short-Term Memory (LSTM) networks in detail.	4	4	5M
		ii) Explain Gibbs Sampling with an example?	3	4	5M
6	Unit-V				
	a	i) Explain the architecture of Generative Pretrained Transformers(GPT)?	3	5	5M
		ii) Demonstrate the Variational Autoencoders(VAE) and how they differ from traditional autoencoders.	4	5	5M
	OR				
	b	i) Briefly discuss the self-attention mechanism in Transformers with an example.	3	5	5M
		ii) Explain applications of deep learning in vision tasks?	2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23AM3103

NATURAL LANGUAGE PROCESSING

Time: 3 hours

(AIML)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define Natural Language Processing and list any two of its major applications.	K1	1	2M
	b	What are the challenges in building NLP systems for Indian languages?	K1	1	2M
	c	Define a Regular Expression. Give a simple example.	K2	1	2M
	d	What is the role of Finite State Transducers (FSTs) in morphological analysis?	K2	2	2M
	e	Define smoothing in N-gram models and mention any one smoothing technique.	K2	2	2M
	f	What is a Context-Free Grammar (CFG)?	K2	3	2M
	g	Differentiate between Dependency Grammar and Constituency Grammar.	K3	3	2M
	h	Define Word Sense Disambiguation (WSD).	K2	4	2M
	i	What is anaphora in discourse analysis? Give an example.	K2	5	2M
	j	What is the difference between WordNet and PropBank?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	Explain in detail the architecture and key components of a typical NLP system.	K2	1	10M
	OR				
	b	Discuss Language Modeling in NLP. Explain Grammar-based and Statistical Language Models with examples.	K3	1	10M
3	Unit-II				
	a	Explain the process of Part-of-Speech (PoS) tagging using Hidden Markov Models. Illustrate with a suitable example.	K3	2	10M
	OR				
	b	Compare and contrast Add-One, Good-Turing, and Kneser-Ney smoothing techniques for N-gram models.	K4	2	10M
4	Unit-III				
	a	Explain syntactic parsing using the CYK algorithm. Provide an example of parsing a simple sentence.	K3	3	10M

	OR				
	b	Describe different types of syntactic ambiguities and explain how probabilistic CFGs help in resolving them.	K4	3	10M
5	Unit-IV				
	a	Explain Word Sense Disambiguation (WSD) using supervised and unsupervised approaches. Compare their advantages and limitations.	K3	4	10M
	OR				
	b	Discuss various types of semantic relations like synonymy, antonymy, hypernymy, and meronymy with examples.	K2	4	10M
6	Unit-V				
	a	Describe Anaphora Resolution using Hobbs' algorithm. Provide an example for illustration.	K2	5	10M
	OR				
	b	Explain important NLP resources such as WordNet, FrameNet, and British National Corpus (BNC). Discuss their uses in machine learning models.	K3	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3101

COMPUTER NETWORKS

Time: 3 hours

CSE, IT, CSE (AI)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	List out and explain the functionalities of Network Layer.	K1	1	2M
	b	Explain why low-frequency radio waves are suitable for indoor communication.	K2	1	2M
	c	What is the role of a checksum in data link layer communication?	K1	2	2M
	d	Briefly state the purpose of the Point-to-Point Protocol (PPP) in data communication.	K2	2	2M
	e	At low network load, which has less delay: pure ALOHA or slotted ALOHA? Explain why.	K3	3	2M
	f	What is baud rate? What is the baud rate of classic 10-Mbps Ethernet?	K1	3	2M
	g	Explain store-and-forward packet switching with a neat diagram.	K2	4	2M
	h	A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle?	K3	4	2M
	i	List the differences between TCP and UDP.	K1	5	2M
	j	What is a cookie in web communication, and what is its primary use?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Compare twisted-pair cable, coaxial cable, and fiber optic cable.	K2	1	5M
		ii) Explain the main differences between the OSI and TCP/IP reference models and give one example of a protocol at each layer.	K2	1	5M
	OR				
	b	i) Compare LAN, MAN, and WAN with a neat diagram.	K2	1	5M
		ii) Explain the differences between radio waves, microwaves, and infrared as unguided media, and suggest a suitable application for each.	K2	1	5M
3	Unit-II				
	a	i) Explain the working of Cyclic Redundancy Check (CRC). How does it help in detecting errors during transmission?	K2	2	5M
		ii) Describe the concept of flow control in data communication. How does the Stop-and-Wait protocol ensure flow control between sender and receiver?	K3	2	5M

	OR				
	b	i) Compare Go-Back-N and Selective Repeat sliding window protocols.	K3	2	5M
		ii) Briefly explain the main features and working of the Point-to-Point Protocol (PPP). Mention its advantages over HDLC.	K2	2	5M
4	Unit-III				
	a	i) Explain the working principle of Pure ALOHA and Slotted ALOHA. Compare their efficiencies and state why Slotted ALOHA performs better.	K2	3	5M
		ii) Describe the operation of Carrier Sense Multiple Access with Collision Detection (CSMA/CD). How does it handle collisions on a shared medium like Ethernet?	K3	3	5M
	OR				
	b	i) Compare Polling and Token Passing methods. How does each control access to the channel, and what happens if the central station or token is lost?	K4	3	5M
		ii) Compare Standard Ethernet, Fast Ethernet, Gigabit Ethernet, and 10 Gigabit Ethernet.	K2	3	5M
5	Unit-IV				
	a	i) Explain the concept of Store and Forward Packet Switching. How does it differ from circuit switching?	K2	4	5M
		ii) Describe how the Distance Vector Routing algorithm works. What information is exchanged between routers and how does it help in finding the best path?	K3	4	5M
	OR				
	b	i) Draw and explain the IPv4 header format. Describe the purpose of any four important fields.	K3	4	5M
		ii) Differentiate between the Leaky Bucket and <i>Token</i> Bucket algorithms. How do they help in controlling network congestion?	K2	4	5M
6	Unit-V				
	a	i) Explain the TCP three-way handshake and how it ensures reliable data transmission.	K2	5	5M
		ii) Analyze the differences between HTTP/1.1 and HTTP/2 and their impact on web performance.	K4	5	5M
	OR				
	b	i) Evaluate the differences between HTTP and Email (SMTP/IMAP/POP3). In what scenarios is one preferred over the other?	K5	5	5M
		ii) Describe the architecture of the Domain Name System (DNS). How does DNS translate a domain name into an IP address?	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3102

OBJECT ORIENTED ANALYSIS & DESIGN

Time: 3 hours

(CSE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What are the principles of modelling?	K1	1	2M
	b	List out few applications that UML can be used.	K2	1	2M
	c	Define Association and Aggregation.	K1	2	2M
	d	What is a class in UML?	K1	2	2M
	e	Define interface in UML.	K1	3	2M
	f	Define packages and their purpose.	K1	3	2M
	g	What is the need of use case diagram?	K2	4	2M
	h	What is a sequence diagram?	K1	4	2M
	i	Compare action state and activity state.	K2	5	2M
	j	What is a deployment diagram?	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	Summarize the principles, importance, and need for modelling in software design.	K2	1	10M
	OR				
	b	i) Illustrate the conceptual model of UML in detail ii) Explain the architecture of UML with neat sketch.	K2	1	5M
3	Unit-II				
	a	Construct a detailed class diagram for Traffic Management Control System and explain its components.	K3	2	10M
	OR				
	b	Explain different types of relationships in UML with examples.	K2	2	10M
4	Unit-III				
	a	Analyze and List the common properties and uses of class diagrams?	K4	3	10M
	OR				
	b	Draw and explain an object diagram for a simple banking system.	K3	3	10M
5	Unit-IV				
	a	i) Outline the elements of a sequence diagram.	K2	4	5M
		ii) Design a Use case diagram for a web application "Vacation Tracking System"	K3	4	5M

	OR				
	b	Draw an activity diagram for an online booking system and explain each element of it.	K6	4	10M
6	Unit-V				
	a	Construct a diagram for the Weather Forecasting which includes events, signals, state machines and processes.	K3	5	10M
	OR				
	b	Explain the elements that can be used in deployment diagram with suitable examples	K2	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3103 AUTOMATA THEORY & COMPILER DESIGN

Time: 3 hours

IT, CSE (AI)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

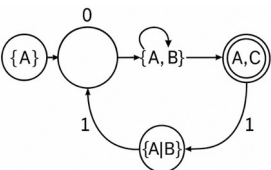
PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define a Regular Expression. Give one example.	K1	1	2M
	b	Draw a state diagram for a DFA that accepts all strings over {0, 1} ending with 00	K1	1	2M
	c	Define a Context-Free Grammar (CFG) with an example.	K1	2	2M
	d	Differentiate between deterministic and non-deterministic PDA.	K2	2	2M
	e	What is the role of a Lexical Analyzer?	K2	3	2M
	f	Define <i>FIRST</i> and <i>FOLLOW</i> in parsing.	K1	3	2M
	g	What is the difference between top-down and bottom-up parsing?	K2	4	2M
	h	Define Syntax Directed Definition (SDD).	K1	4	2M
	i	Discuss three-address code?	K2	5	2M
	j	List different code optimization techniques.	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Construct a DFA for the language over {0, 1} that contains an even number of 0's and odd number of 1's. Draw the transition table and diagram.	K4	1	5M
		ii) Convert the following NFA into equivalent DFA and draw the transition table and diagram. 	K3	1	5M
	OR				
	b	i) Show the steps to convert the regular expression $(0+1)^*11$ into an NFA and then into a DFA.	K3	1	5M
		ii) Explain with diagram the working of a Moore and Mealy machine.	K2	1	5M
3	Unit-II				
	a	Draw a Parse Tree for the grammar $E \rightarrow E + E \mid E * E \mid id$ for the input $id + id * id$. Identify whether the grammar is ambiguous.	K4	2	10M

	OR				
	b	Design a Push Down Automaton (PDA) for the language $L = \{wcw^R \mid w \in (0+1)^*\}$. Show its transition diagram and explain step-by-step for the input string "0110c0110".	K4	2	10M
4	Unit-III				
	a	i) Draw the block diagram of a compiler showing all phases and intermediate representations.	K3	3	5M
		ii) Using a suitable example, illustrate Lexical Analysis using Transition Diagram for token recognition.	K4	3	5M
	OR				
	b	i) Compute FIRST and FOLLOW for the grammar: $S \rightarrow S S + \mid S S * \mid a$	K3	3	5M
		ii) Construct the Predictive Parsing Table for the grammar: $E \rightarrow E + T \mid T, T \rightarrow T * F \mid F, F \rightarrow (E) \mid id$	K3	3	5M
5	Unit-IV				
	a	i) Construct the LR(0) Items and Canonical Collection for the grammar: $S \rightarrow L = R \mid R, L \rightarrow *R \mid id, R \rightarrow L$	K3	4	5M
		ii) Draw the SLR(1) Parsing Table and explain the parsing action for the input "id = id".	K2	4	5M
	OR				
	b	i) Draw a Syntax Directed Translation Tree for $E \rightarrow E + T \mid T, T \rightarrow T * F \mid F, F \rightarrow id$	K3	4	5M
		ii) Differentiate between S-Attributed and L-Attributed definitions using diagrams.	K3	4	5M
6	Unit-V				
	a	i) Explain Basic Blocks and construct a Flow Graph for the code: if ($x < y$) $z = x + y$; else $z = x - y$;	K2	5	5M
		ii) Illustrate the DAG construction for the expression $a = b * c + b * d$.	K3	5	5M
	OR				
	b	i) Draw the Runtime Memory Organization diagram showing code, stack, and heap areas. Explain storage allocation strategies.	K2	5	5M
		ii) Explain the Peephole Optimization process using a code segment and diagrammatic representation of instruction transformation.	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3107

DATA WAREHOUSING & DATA MINING

Time: 3 hours

(CSE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define Data Warehouse. List its key characteristics.	K1	1	2M
	b	Differentiate between Operational Database and Data Warehouse.	K4	1	2M
	c	What is Data Preprocessing? Why is it required in Data Mining?	K2	2	2M
	d	Define Data Cleaning. List any two methods used for it.	K1	2	2M
	e	What is a Decision Tree? Mention two advantages of using it for classification.	K3	3	2M
	f	State Bayes Theorem and its importance in classification.	K1	3	2M
	g	Define Support and Confidence in Association Rule Mining.	K1	4	2M
	h	What is the Frequent Itemset? Give a short example.	K3	4	2M
	i	What is Clustering? Mention two of its applications.	K1	5	2M
	j	Compare K-Means and Hierarchical Clustering.	K4	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the architecture of a Data Warehouse with a neat diagram.	K1	1	5M
		ii) Analyze different Data Warehouse Models like Enterprise, Data Mart, Virtual Warehouse.	K4	1	5M
	OR				
	b	i) Explain Data Cube and Multidimensional Data Model.	K1	1	5M
		ii) Analyze the typical OLAP operations with suitable examples.	K4	1	5M
3	Unit-II				
	a	i) Explain different steps in the Data Preprocessing. process	K2	2	5M
		ii) Explain about Data Reduction and its various strategies.	K2	2	5M
	OR				
	b	i) Explain techniques for handling missing and noisy data in Data Cleaning.	K2	2	5M
		ii) Explain about Data Transformation and Discretization methods.	K2	2	5M
4	Unit-III				
	a	i) Apply the Decision Tree Induction algorithm to construct a Decision Tree with an example.	K3	3	5M
		ii) Analyze the various methods for evaluating the performance of a classifier.	K4	3	5M

	OR				
	b	i) Apply Naïve Bayes Classification with a suitable example.	K3	3	5M
		ii) Analyze overfitting in classification and how it can be avoided.	K4	3	5M
5	Unit-IV				
	a	i) Apply the Apriori principles to generate the frequent itemset with an example.	K3	4	5M
		ii) Explain about rule generation and pruning process in Apriori.	K2	4	5M
	OR				
	b	i) Apply the FP-Growth Algorithm to build FP-Tree with an example	K3	4	5M
		ii) Explain about compact representation of frequent itemsets.	K2	4	5M
6	Unit-V				
	a	i) Explain the K-Means clustering algorithm with a suitable example.	K2	5	5M
		ii) Analyze the strengths and weaknesses of the DBSCAN algorithm	K4	5	5M
	OR				
	b	i) Explain about Agglomerative Hierarchical Clustering process	K2	5	5M
		ii) Compare partition-based, hierarchical, and density-based clustering techniques.	K4	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3111

COMPUTER NETWORKS

Time: 3 hours

CSE (AIML), DS, AIML

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	List the types of computer networks?	K1	1	2M
	b	Define protocol stack?	K1	1	2M
	c	What is the main idea behind sliding window protocols?	K1	2	2M
	d	Differentiate between error detection and error correction with an example.	K2	2	2M
	e	Why is IPv6 superior in addressing and security?	K2	3	2M
	f	Define packet switching?	K1	3	2M
	g	Illustrate the difference between connection-oriented and connectionless service at the Transport Layer?	K2	4	2M
	h	Define congestion control?	K1	4	2M
	i	What is the significance of HTTP status codes?	K1	5	2M
	j	Why is Telnet considered insecure?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the OSI Reference Model with neat diagram?	K2	1	5M
		ii) Define the protocols and design principles of the TCP/IP reference model?	K4	1	5M
	OR				
	b	i) Describe different types of computer networks?	K2	1	5M
		ii) Write a short note on the history and evolution of the Internet?	K1	1	5M
3	Unit-II				
	a	i) Discuss the design issues of the Data Link Layer?	K2	2	5M
		ii) Describe various data link layer protocols – HDLC, PPP, and sliding window?	K2	2	5M
	OR				
	b	i) Explain in detail the different types of transmission media with examples?	K2	2	5M
		ii) Discuss multiple access protocols and compare ALOHA, CSMA, and CSMA/CD?	K4	2	5M
4	Unit-III				
	a	Describe various routing algorithms used in computer networks?	K2	3	10 M
	OR				
	b	i) Explain IPv4 header format and its fields?	K2	3	5M
		ii) Discuss the role and working of the network layer in the Internet?	K2	3	5M

5	Unit-IV				
	a	i) List out the services provided by the transport layer?	K2	4	5M
		ii) Explain how congestion and flow control are handled in TCP?	K2	4	5M
	OR				
	b	i) Explain the features and working of SCTP?	K2	4	5M
		ii) Compare and contrast TCP, UDP, and SCTP protocols?	K4	4	5M
6	Unit-V				
	a	i) Explain the architecture of Electronic Mail (E-Mail) system?	K2	5	5M
		ii) Describe the HTTP protocol and its operations?	K2	5	5M
	OR				
	b	i) Explain in detail various Internet applications – FTP, SMTP, and Remote Login?	K2	5	5M
		ii) Describe the Domain Name System (DNS) and its hierarchy with a neat diagram?	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3112

SOFTWARE ENGINEERING

Time: 3 hours

CS, DS, CSE (AIML)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define Software Engineering. What led to its evolution?	K1	1	2M
	b	List any two limitations of the Waterfall Model.	K1	1	2M
	c	What are the responsibilities of a Software Project Manager?	K2	2	2M
	d	Define SRS. What are its main components?	K2	2	2M
	e	What is Cohesion and Coupling in software design?	K2	3	2M
	f	Define Agile Process. Mention two characteristics of Extreme Programming	K1	3	2M
	g	Differentiate between Black-box and White-box testing.	K2	4	2M
	h	What is the significance of the Capability Maturity Model (CMM)?	K2	4	2M
	i	What is CASE? Mention its role in software development.	K2	5	2M
	j	Define Software Reuse. Give two benefits of reuse in software engineering.	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the Evolution of Software Engineering and discuss how it changed software development practices.	K2	1	5M
		ii) Describe different Software Life Cycle Models with emphasis on the Spiral Model.	K3	1	5M
	OR				
	b	i) Compare Waterfall, Rapid Application Development, and Agile Models with examples.	K4	1	5M
		ii) Explain Computer System Engineering and its role in software systems.	K2	1	5M
3	Unit-II				
	a	i) Discuss Software Project Estimation Techniques including COCOMO and Halstead's Software Science.	K2	2	5M
		ii) Explain the steps involved in Requirements Gathering and Analysis.	K2	2	5M
	OR				
	b	i) What are the major risks in software projects, and how can they be managed?	K1	2	5M
		ii) Compare Formal, Axiomatic, and Algebraic Specifications with examples.	K4	2	5M

4	Unit-III				
	a	i) Discuss Characteristics of a Good Software Design.	K2	3	5M
		ii) Explain the Agile Process and list the tools used in Agile development.	K2	3	5M
	OR				
	b	i) Describe the Structured Analysis and Design (SA/SD) methodology with suitable DFD diagrams.	K3	3	5M
		ii) Explain the Principles of User Interface Design and its importance in software quality.	K2	3	5M
5	Unit-IV				
	a	i) Explain Black-box and White-box testing techniques with examples.	K2	4	5M
		ii) Describe Software Reliability and Six Sigma Quality Standards.	K3	4	5M
	OR				
	b	i) Discuss Software Documentation and its importance in maintenance and testing.	K2	4	5M
		ii) Explain the ISO 9000 Quality Standard in detail	K3	4	5M
6	Unit-V				
	a	i) Explain the Architecture of a CASE Environment and its components.	K2	5	5M
		ii) Discuss the Software Maintenance Process Models	K3	5	5M
	OR				
	b	i) Explain the types and scope of CASE tools in software life cycle support.	K2	5	5M
		ii) Discuss the Challenges and Benefits of Software Reuse at Organization Level.	K3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3113 AUTOMATA THEORY & COMPILER DESIGN

Time: 3 hours

(CS, DS)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is the main difference between <i>DFA</i> and <i>NFA</i> ?	1	1	2M
	b	Summarize the relationship between <i>alphabets</i> , <i>strings</i> , and <i>languages</i> .	2	1	2M
	c	List the steps in converting a finite automaton into a regular expression.	1	2	2M
	d	Interpret the regular expression $(a + b)^*$ and What language does it represent?	2	2	2M
	e	Write the formal definition of a Turing Machine and its components.	1	3	2M
	f	Summarize how a PDA can be converted to an equivalent CFG.	2	3	2M
	g	Define <i>pattern</i> and <i>lexeme</i> with an example.	1	4	2M
	h	Compare <i>SLR</i> , <i>LALR</i> , and <i>Canonical LR</i> parsers	2	4	2M
	i	Define quadruple and triple representations in three-address code.	1	5	2M
	j	Differentiate between synthesized and inherited attributes with suitable examples	1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Construct a DFA that accepts all binary strings ending with '0'. Show its state transition diagram.	1	1	5M
		ii) Explain the relationship between automata theory and computational complexity.	2	1	5M
	OR				
	b	i) Design an NFA with ϵ -transitions that accepts the language $L = \{w \mid w \text{ contains "01" as a substring}\}$. Explain how ϵ -transitions help connect states.	2	1	5M
		ii) Illustrate the process of converting an NFA into an equivalent DFA using the subset construction method for the given NFA $\Sigma = \{0,1\}$, $Q = \{q_0, q_1\}$, $\delta(q_0, 0) = \{q_0, q_1\}$, $\delta(q_0, 1) = \{q_0\}$, $\delta(q_1, 1) = \{q_1\}$, $q_0 = \text{start}$, $F = \{q_1\}$.	2	1	5M
3	Unit-II				
	a	i) Simplify $(a + aa)^*$ to an equivalent regular expression using algebraic identities.	2	2	5M
		ii) Explain the procedure for constructing a finite automaton from a give regular expression $(a + b)^*ab$.	2	2	5M
	OR				
	b	i) Use the Pumping Lemma to prove that $L = \{a^n b^n \mid n \geq 0\}$ is not a regular language.	4	2	5M
		ii) Compare $L_1 = \{a^n b \mid n \geq 0\}$ and $L_2 = \{a^n b^n \mid n \geq 0\}$ and justify which is	4	2	5M

		regular.			
4	Unit-III				
	a	i) Explain the structure of a Pushdown Automaton (PDA) and describe how each component contributes to its functioning.	2	3	5M
		ii) For input “101”, show one possible instantaneous description during computation.	2	3	5M
	OR				
	b	i) Construct a PDA for the language $L = \{a^n b^n \mid n \geq 1\}$ and explain how it accepts the input string “aaabbb”.	3	3	5M
		ii) Construct a Turing Machine to check whether a binary string contains an equal number of 0's and 1's.	3	3	5M
5	Unit-IV				
	a	i) Explain the structure of a compiler with a neat block diagram and describe the function of each phase.	2	4	5M
		ii) Examine how ambiguity in a context-free grammar can affect parsing and show how it can be resolved using examples.	4	4	5M
	OR				
	b	i) Compare top-down parsing and bottom-up parsing with suitable examples.	2	4	5M
		ii) For the given grammar $E \rightarrow E + T \mid T, T \rightarrow T * F \mid F, F \rightarrow (E) \mid \text{id}$. Construct the LR(0) items and explain the parsing table construction process.	4	4	5M
6	Unit-V				
	a	i) Construct a syntax-directed definition (SDD) for evaluating arithmetic expressions involving operators + and *.	3	5	5M
		ii) Apply a translation scheme to generate intermediate code for array assignment $A[i] = B[j] + 5$.	3	5	5M
	OR				
	b	i) Construct the DAG and three-address code for $x = y * z + y * z + w$.	3	5	5M
		ii) Demonstrate the difference between static and dynamic memory allocation using suitable examples.	3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3115

OPERATING SYSTEMS

Time: 3 hours

CSE (AIML), CSE (AI), AIML

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is system call?	1	1	2M
	b	What is the difference between system software and application software?	2	1	2M
	c	Differentiate between preemptive and non-preemptive scheduling.	2	2	2M
	d	What is a process control block (PCB)?	1	2	2M
	e	List four necessary conditions for deadlock.	3	3	2M
	f	What is the difference between wait() and signal() operations?	3	3	2M
	g	What is the purpose of memory management unit (MMU)?	2	4	2M
	h	What is a page fault?	1	4	2M
	i	What is the purpose of caching in file system implementation?	4	5	2M
	j	What are the two common methods for directory implementation?	2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M											
2	Unit-I															
	a	i)Explain how system calls provide an interface between user and operating system.	2	1	5M											
		ii)Explain the concept of Multitasking Operating System. How is it different from Multiprogramming?	1	1	5M											
	OR															
	b	i)Describe the key principles involved in designing an operating system.	1	1	5M											
		ii)Explain how protection and security mechanisms are incorporated during OS design.	2	1	5M											
3	Unit-II															
	a	i)Explain in detail the different types of multithreading models.	2	2	5M											
		ii)Discuss synchronization problems in Interprocess Communication.	3	2	5M											
	OR															
	b	A printer queue receives 5 jobs at different times with priorities based on urgency as below	4	2	10 M											
		<table><tr><th>Process</th><th>Arrival Time</th><th>Burst Time</th><th>Priority</th></tr><tr><td>P1</td><td>0</td><td>7</td><td>2</td></tr><tr><td>P2</td><td>2</td><td>4</td><td>1</td></tr></table>	Process	Arrival Time		Burst Time	Priority	P1	0	7	2	P2	2	4	1	
Process		Arrival Time	Burst Time	Priority												
P1	0	7	2													
P2	2	4	1													

		P3413 P4542 Calculate average waiting and average turnaround times using I. Priority preemptive scheduling algorithm. II. Priority non-preemptive scheduling algorithm.																																																																									
4	Unit-III																																																																										
	a	A system has 5 processes (P0–P4) and 4 resource types (A, B, C, D).Total instances of each resource is given as A=10, B=5, C = 7, D = 8 . The below table representing the Allocation Matrix (current allocation). <table><tr><th>Process</th><th colspan="4">Allocation</th><th></th><th colspan="4">Max</th></tr><tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th><th></th><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><td>P0</td><td>0</td><td>1</td><td>0</td><td>3</td><td></td><td>7</td><td>5</td><td>3</td><td>5</td></tr><tr><td>P1</td><td>2</td><td>0</td><td>0</td><td>0</td><td></td><td>3</td><td>2</td><td>2</td><td>2</td></tr><tr><td>P2</td><td>3</td><td>0</td><td>2</td><td>1</td><td></td><td>9</td><td>0</td><td>2</td><td>2</td></tr><tr><td>P3</td><td>2</td><td>1</td><td>1</td><td>1</td><td></td><td>2</td><td>2</td><td>2</td><td>3</td></tr><tr><td>P4</td><td>0</td><td>0</td><td>2</td><td>2</td><td></td><td>4</td><td>3</td><td>3</td><td>4</td></tr></table> A) Calculate the Need Matrix. B) Find the Available resources. C) Is the system in a Safe State? Provide the Safe Sequence using Banker’s Algorithm. D) Suppose process P1 makes a request (1,2,0,1). Use Banker’s Algorithm to check if the request can be granted immediately.	Process	Allocation					Max					A	B	C	D		A	B	C	D	P0	0	1	0	3		7	5	3	5	P1	2	0	0	0		3	2	2	2	P2	3	0	2	1		9	0	2	2	P3	2	1	1	1		2	2	2	3	P4	0	0	2	2		4	3	3	4	5	3	10 M
	Process	Allocation					Max																																																																				
		A	B	C	D		A	B	C	D																																																																	
P0	0	1	0	3		7	5	3	5																																																																		
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P2	3	0	2	1		9	0	2	2																																																																		
P3	2	1	1	1		2	2	2	3																																																																		
P4	0	0	2	2		4	3	3	4																																																																		
OR																																																																											
b	i)Discuss the Readers-Writers problem. Explain how starvation can be prevented for both readers and writers.		3	3	5M																																																																						
	ii)Explain the Producer-Consumer problem using semaphores.		3	3	5M																																																																						
5	Unit-IV																																																																										
	a	A set of processes with memory requirements (150 KB, 300 KB, 600 KB, 350 KB, 200 KB) arrives to be allocated into memory partitions of sizes (100 KB, 500 KB, 200 KB, 300 KB, 600 KB). i. Perform allocation using Best Fit, First Fit, and Worst Fit. ii. For each strategy, state how many processes are successfully allocated iii. Compare the resulting memory utilization and external fragmentation.	3	4	10 M																																																																						
	OR																																																																										
	b	i)Discuss the role of TLB (Translation Lookaside Buffer) in paging.		2		4	5M																																																																				
	ii)Explain address translation(Logical to Physical) in segmentation with an example.		2	4		5M																																																																					
6	Unit-V																																																																										
	a	i)Explain the concept of a file system and its role in an operating system.		1	5	5M																																																																					
		ii)Discuss the concept of automatic mounting and its implementation.		2	5	5M																																																																					
	OR																																																																										
b	i)Describe the different file allocation methods in detail.		1	5	5M																																																																						
	ii)Explain the concept of dynamic and static partitions in memory management.		2	5	5M																																																																						

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CC3116

CLOUD COMPUTING

Time: 3 hours

CSE (CY)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define cloud computing.	K1	1	2M
	b	List the types of cloud deployment models.	K1	1	2M
	c	What is ubiquitous Internet and its role in cloud computing?	K2	2	2M
	d	Define virtualization and its importance in cloud environments.	K1	2	2M
	e	What is the difference between hypervisor and container?	K2	3	2M
	f	List two container orchestration platforms.	K1	3	2M
	g	Explain cloud scalability and fault tolerance.	K2	4	2M
	h	What is the shared responsibility model in cloud security?	K2	4	2M
	i	Define serverless computing.	K1	5	2M
	j	What is edge computing and how does it differ from fog computing?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the cloud computing reference model and types of cloud services.	K2	1	5M
		ii) Analyse the characteristics, benefits, and major cloud service providers like AWS, Azure and Google AppEngine.	K4	1	5M
	OR				
	b	i) Explain how cloud computing is transforming IT infrastructure.	K2	1	5M
		ii) Analyze the cloud deployment models public, private, and hybrid.	K4	1	5M
3	Unit-II				
	a	i) Explain parallel and distributed computing and their elements.	K2	2	5M
		ii) Explain about inter-process communication and technologies for distributed computing.	K2	2	5M
	OR				
	b	i) Compare SISD and MIMD architecture	K4	2	5M
		ii) Explain virtualization as an enabling technology for cloud computing.	K2	2	5M
4	Unit-III				
	a	i) Explain about VMware virtualization techniques with an examples.	K2	3	5M
		ii) Explain about container building blocks.	K2	3	5M

	OR				
	b	i) Explain a about taxonomy of virtualization techniques.	K2	3	5M
		ii) Analyze about AmazonEC2 how it is useful to recent days applications.	K4	3	5M
5	Unit-IV				
	a	i) Explain about economics of cloud computing, interoperability and standards.	K2	4	5M
		ii) explain about cloud security architecture and security in deployment models	K2	4	5M
	OR				
	b	i) Explain about cloud scalability and energy efficiency	K2	4	5M
		ii) Analyze the fundamentals of computer security in cloud environments	K4	4	5M
6	Unit-V				
	a	i) Explain about Function-as-a-Service architecture with examples AWS Lambda or OpenFaaS.	K2	5	5M
		ii) explain about cloud-centric IoT, edge and fog computing with respect to cloud-centric IoT.	K2	5	5M
	OR				
	b	i) Explain infrastructure-as-code and quantum cloud computing.	K2	5	5M
		ii) explain about applications and layers of cloud-centric IoT systems.	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23CE3102

ENGINEERING HYDROLOGY

Time: 3 hours

(CE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define the hydrologic cycle and list its major components	1	1	2M
	b	What is Probable Maximum Precipitation (PMP)? Mention one method used for its estimation.	2	1	2M
	c	What is evaporation? State any two factors affecting evaporation.	1	2	2M
	d	Define evapotranspiration and mention its significance in hydrology.	2	2	2M
	e	Define runoff and list any two factors affecting it.	1	3	2M
	f	What is baseflow separation in hydrograph analysis?	2	3	2M
	g	What is the Standard Project Flood (SPF)?	1	4	2M
	h	What is hydrologic routing?	2	4	2M
	i	Define an aquifer and list any two types of aquifers.	2	5	2M
	j	State Darcy's law and mention any one assumption associated with it.	3	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the major sources of hydrological data and their importance in engineering hydrology.	2	1	5M
		ii) Describe the steps involved in constructing Intensity–Duration–Frequency (IDF) curves and their applications.	3	1	5M
	OR				
	b	i) Explain the development and significance of Depth–Area–Duration (DAD) curves in hydrologic design.	3	1	5M
		ii) Discuss radar-based rainfall measurement along with its advantages and limitations.	2	1	5M
3	Unit-II				
	a	i) Describe the methods used for measuring evaporation and discuss their applications.	2	2	5M
		ii) Describe the measurement techniques used to determine infiltration in the field.	3	2	5M
	OR				
	b	i) Discuss the factors influencing infiltration and explain their effect on surface runoff.	2	2	5M
		ii) Explain different approaches for estimating evapotranspiration and identify their limitations.	3	2	5M

4	Unit-III				
	a	i) Explain the various empirical formulas used for runoff estimation and their applications.	2	3	5M
		ii) Explain the assumptions and derivation of a unit hydrograph.	3	3	5M
	OR				
	b	i) Explain the major components of runoff and discuss the factors influencing each component.	2	3	5M
		ii) Discuss the principle of superposition and the S-hydrograph method used for deriving unit hydrographs of different durations.	3	3	5M
5	Unit-IV				
	a	i) Explain the major causes and effects of floods in a river basin.	2	4	5M
		ii) Explain reservoir routing using the Puls method and illustrate the steps involved.	3	4	5M
	OR				
	b	i) Compare hydrologic routing with hydraulic routing and discuss their relative advantages.	2	4	5M
		ii) Describe Gumbel's method of flood frequency analysis and outline the steps involved.	3	4	5M
6	Unit-V				
	a	i) Explain the occurrence of groundwater and describe different geological formations that store groundwater.	2	5	5M
		ii) Explain steady radial flow to a well in an unconfined aquifer and derive the relevant governing equation.	3	5	5M
	OR				
	b	i) Explain porosity, specific yield, permeability, and storage coefficient, and discuss their hydrological relevance.	2	5	5M
		ii) Explain Darcy's law and discuss its applications and limitations in groundwater flow analysis.	3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

Sub Code: R23CS3104

FORMAL LANGUAGES & AUTOMATA THEORY

Time: 3 hours

(CSE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

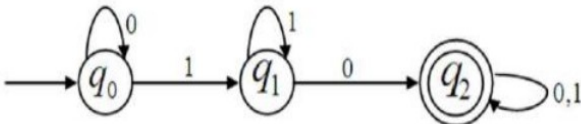
PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define DFA and NFA.	K1	1	2M
	b	Define Regular Expression and list its applications	K1	1	2M
	c	Draw finite automata for $(0+1)^* 100$.	K1	2	2M
	d	Define context free grammar	K1	2	2M
	e	How do we show the acceptance of a string by DFA.	K1	3	2M
	f	What is a Computable function?	K1	3	2M
	g	How do we show the acceptance of a string by PDA.	K1	4	2M
	h	List out the features of Universal Turing Machine	K1	4	2M
	i	Define NP –complete problem	K1	5	2M
	j	Define undecidability. Give an example of undecidable problems.	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Differentiate between NFA and DFA	K2	1	5M
		ii) Design DFA, which accepts the set of all strings with residue modulo 3 over $\Sigma = \{0,1\}$.	K3	1	5M
	OR				
	b	i) Define NFA, design NFA for accepting all the strings in $L = \{a^m b^n \mid m, n \geq 1\}$	K3	1	5M
		ii) Define Mealy Machine; design a Mealy machine to generate output Y for all the strings ending with 00 or 11 and for all the remaining strings output will be N.	K3	1	5M
3	Unit-II				
	a	i) Construct the regular expression corresponding to the language accepted by following DFA. 	K3	2	5M

		ii) Convert the following regular expression to an equivalent DFA: (a+b)*a(a+b)	K3	2	5M
	OR				
	b	Explain about closure properties of regular expressions.	K2	2	5M
		Explain about RMD and LMD with examples	K2	2	5M
4	Unit-III				
	a	i) Find the GNF equivalent to the following $S \rightarrow AA \mid 0$ $A \rightarrow SS \mid 1$	K3	3	5M
		ii) Define Right linear grammar and left linear grammar, write RLG for $00(0+1)^*$	K3	3	5M
	OR				
	b	Show that for every PDA there exists a CFG such that $L(G) = N(P)$	K3	3	5M
		Define CNF and Convert the following CFG to CNF $S \rightarrow aSa \mid bSb \mid a \mid b$	K3	3	5M
5	Unit-IV				
	a	Determine the language given by $L = \{a^n \mid n \geq 1\}$ is context free or not	K3	4	5M
		ii) Define Ambiguous Grammar. Check whether the grammar is Ambiguous or not? $S \rightarrow aAB$ $A \rightarrow bC/cd$ $C \rightarrow cd$ $B \rightarrow c/d$	K3	4	5M
	OR				
	b	Explain about PDA in detail	K2	4	5M
		ii) Define Instantaneous Description for PDA with suitable example	K2	4	5M
6	Unit-V				
	a	Design a Turing Machine to accept the language $L = \{wcw^R \mid w(a+b)^*\}$	K3	5	5M
		Explain in detail about Chomsky classification of languages.	K3	5	5M
	OR				
	b	Discuss in brief about NP Hard problems	K2	5	5M
		Explain different types of Turing machines	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23DS3101

MACHINE LEARNING

Time: 3 hours

CSE (DS)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define Reinforcement Learning	1	1	2M
	b	Outline data Acquisition with an example	1	1	2M
	c	Define manhattan distance and its use in KNN	1	2	2M
	d	Highlight Minkowski distance?	1	2	2M
	e	Tabulate Overfitting and Under fitting?	1	3	2M
	f	Memorize the functions used in Decision Tree?	1	3	2M
	g	Define sigmoid function and its use in Logistic Regression	1	4	2M
	h	List the applications of Neural Networks in Machine Learning.	1	4	2M
	i	List Disadvantages in K-Means Clustering	1	5	2M
	j	Tabulate Divisive clustering and Agglomerative clustering	1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M	
2		Unit-I				
	a	i) Comment on Instance Based and Model Based Learning	2	1	5M	
		ii) Summarize about Feature Construction and Transformation	2	1	5M	
		OR				
	b	i) Exemplify paradigms of machine learning?	2	1	5M	
ii) Determine the key evaluation parameters (or metrics) for classification and regression in machine learning		3	1	5M		
3		Unit-II				
	a	i) Illustrate Different Classification Algorithms Based on the Distance Measures	4	2	5M	
		ii)Implement K nearest neighbor classifier to predict the diabetic patient with the given features BMI, Age. If the training examples are,	3	2	5M	

			35.3	23	1					
			35.9	67	1					
			36.7	45	1					
			25.7	46	O					
			23.3	29	O					
			31	56	1					
Assume K=3, use Euclidean distance metric and predict whether the person has diabetics or not on the Test Example with BMI=43.6, Age=40, Sugar=?										
OR										
b	i) Explain Proximity measures in detail?						4	2	5M	
	ii) Exemplify the task of binary classification. Discuss different quantities and evaluation measures for classifiers.						2	2	5M	
4	Unit-III									
	a	i) Correlate Bias –Variance –Trade-off?						4	3	5M
		ii) How do the features to be considered as nodes for splitting the decision tree						2	3	5M
	OR									
	b	i) Explain in detail about Decision Tree with an example.						4	3	5M
		ii)Comment on Naïve bayes Classifier in detail						2	3	5M
5	Unit-IV									
	a	i)Illustrate Linear Regression to fit a straight line $y = a+ bx$ using method of least squares for the following data						4	4	5M
		x	0	1	3	6	8			
		y	1	3	2	5	4			
	ii) Summarize Linear Discriminates for Classification?						2	4	5M	
	OR									
	b	i) For a given dataset, a neural network outputs a probability of 0.85 for the positive class and 0.15 for the negative class. Estimate the cross-entropy loss for the true label $y =1$.						2	4	5M
ii) determine about multilayer neural networks and back propagation algorithm.						3	4	5M		
6	Unit-V									
	a	i)For the given data, compute two clusters using K-means algorithm for clustering where initial cluster centers are (1.0, 1.0) and (5.0, 7.0). Estimate for two iterations						4	5	5M
		Record Number		A		B				
		R1		1		1				
		R2		1.5		2				
		R3		3		4				
		R4		5		7				
		R5		3.5		5				
		R6		4.5		5				
		R7		3		4.5				

		ii) Interpret about Expectation-Maximization Algorithm for Clustering Multidimensional Numerical Data.	2	5	5M
	OR				
	b	i) Express about Hierarchical clustering With an example?	2	5	5M
		ii) Explain about Fuzzy C-Means Clustering in detail	4	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23EC3101 ANALOG & DIGITAL IC APPLICATIONS

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is the main function of a voltage regulator?	K2	1	2M
	b	List any two important DC characteristics of an op-amp.	K1	1	2M
	c	Difference between monostable and astable multivibrators.	K1	2	2M
	d	What is an active filter?	K1	2	2M
	e	Which is the fastest ADC? State reason.	K2	3	2M
	f	Define resolution and accuracy of a DAC.	K1	3	2M
	g	Define a multiplexer.	K1	4	2M
	h	Mention two applications of decoders.	K2	4	2M
	i	Explain about Flip-Flop	K1	5	2M
	j	Write the differences between shift register and counter.	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Derive the voltage gain expressions for integrator and differentiator circuits using operational amplifiers.	K3	1	5M
		ii) With neat circuit diagrams, explain the working of a comparator and a Schmitt trigger.	K2	1	5M
	OR				
	b	i) Describe the features and working of the 723-voltage regulator IC.	K2	1	5M
		ii) Derive the expression for the voltage gain of an instrumentation amplifier, explaining the role of each stage in its configuration.	K2	1	5M
3	Unit-II				
	a	i) Describe the operation of a monostable multivibrator configured using the IC 555 timer, with an appropriate circuit diagram.	K2	2	5M
		ii) Explain the principle of operation of the PLL (IC-565).	K2	2	5M
	OR				
	b	i) Derive the expression for the output voltage of a 1st order Butterworth high-pass filter and sketch its frequency response curve.	K2	2	7M
		ii) Design a first order butterworth low pass filter having upper cut-off frequency of 1KHz, and pass band gain of 2.	K3	2	5M

4	Unit-III				
	a	i) Derive the output voltage expression for a Weighted Resistor DAC and explain the limitations of this type of DAC.	K3	3	5M
		ii) Discuss the advantages and typical applications of Dual Slope ADCs over other ADC types.	K2	3	5M
	OR				
	b	i) Compare the Parallel Comparator ADC and Counter Type ADC in terms of speed, complexity, and accuracy.	K3	3	5M
		ii) Explain the working of an R-2R ladder DAC with suitable circuit diagram and derive its output voltage formula.	K3	3	5M
5	Unit-IV				
	a	i) Design an XOR gate using CMOS logic along with its truth table.	K6	4	7M
		ii) Compare CMOS, TTL, and ECL logic families.	K1	4	3M
	OR				
	b	i) Design inverter circuit using emitter coupled logic.	K3	4	5M
		ii) Draw and explain the circuit of a parallel binary adder/subtractor and how the control input modifies its operation.	K4	4	5M
6	Unit-V				
	a	i) Discuss the Ring counter and Johnson counter with appropriate circuit diagrams and their corresponding waveforms.	K2	4	5M
		ii) Discuss the architecture and operation of a static RAM cell and how it differs from dynamic RAM.	K3	4	5M
	OR				
	b	i) Explain different types of ROMs and their applications.	K2	4	5M
		ii) Draw and explain the block diagram of a decade counter IC from the 74XX series and its counting sequence.	K2	4	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23EC3102

DIGITAL COMMUNICATIONS

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is quantization error?	K1	1	2M
	b	Mention two advantages of digital communication systems over analog systems.	K1	1	2M
	c	Define Phase Shift Keying (PSK).	K1	2	2M
	d	Differentiate between coherent and non-coherent detection.	K2	2	2M
	e	What is probability of error in digital communication?	K1	3	2M
	f	What is integrator and Dump circuit?	K1	3	2M
	g	Define Linear Codes and Systematic Linear codes	K1	4	2M
	h	Define Hamming distance.	K1	4	2M
	i	Define the code rate of convolutional encoder.	K1	5	2M
	j	What is the function of the Viterbi algorithm?	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Derive the expression for signal-to-quantization noise ratio (SQNR) in a uniform quantizer.	K2	1	5M
		ii) Explain the working of Delta Modulation and list its drawbacks.	K1	1	5M
	OR				
	b	i) Compare PCM, DPCM, and DM systems in terms of bandwidth, noise, and complexity.	K2	1	5M
		ii) A voice signal is sampled at 8 kHz and quantized using 256 levels in a PCM system. (a) Find the number of bits per sample. (b) Determine the bit rate. (c) Find the bandwidth required if the transmission is done using NRZ signaling.	K3	1	5M
3	Unit-II				
	a	i) Derive the bandwidth requirement and probability of error for Binary PSK.	K2	2	5M
		ii) A digital system uses 8-PSK modulation to transmit data at 4800 bps. Find the symbol rate and the minimum transmission bandwidth.	K3	2	5M

	OR				
	b	i) Discuss M-ary modulation schemes and their advantages over binary schemes.	K2	2	5M
		ii) Explain Quadrature Phase Shift Keying (QPSK) with waveforms.	K1	2	5M
4	Unit-III				
	a	i) i) Derive the expression for probability of error using a matched filter.	K3	3	5M
		ii) Derive the error probability of BFSK modulation system	K3	3	5M
	OR				
	b	i) Compare the error performance of ASK, PSK, and FSK systems.	K2	3	5M
		ii) A binary signal is transmitted with pulse amplitude +1 for bit '1' and -1 for bit '0'. If the pulse duration is $T = 1 \text{ m}$ sand white noise with $N_0/2 = 10^{-9} \text{ W/Hz}$ is present, find the output SNR of the matched filter.	K4	3	5M
5	Unit-IV				
	a	i) Explain the encoding and decoding process of linear block codes.	K1	4	5M
		ii) Derive the error detection and correction capability of linear block codes.	K3	4	5M
	OR				
	b	i)) Explain binary cyclic codes and their algebraic structure.	K1	4	5M
		ii) Given data bits: 1 0 1 1. Construct a (7,4) Hamming code and show parity bit calculation. And detect and correct the error, if any	K4	4	5M
6	Unit-V				
	a	i) Explain the working of the Viterbi decoding algorithm with an example.	K2	5	5M
		ii) A rate 1/2 convolutional encoder has generator sequences $g_1 = (1,1,1), g_2 = (1,0,1)$. Find the encoded output for input sequence 1 0 1 1.	K4	5	5M
		OR			
	b	i) What are the different methods of decoding of convolutional codes? Explain	K1	5	5M
		ii) Draw and explain the trellis diagram for a rate 1/2, constraint length 3 encoder.	K3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23EC3103 ANTENNAS & WAVE PROPAGATION

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define radiation resistance and explain its significance in antenna design.	1	1	2M
	b	State and explain the principle of polarization.	1	1	2M
	c	Differentiate between small dipole and half-wave dipole antennas.	2	2	2M
	d	Write short notes on radiation pattern lobes.	2	2	2M
	e	Define principle of pattern multiplication in antenna arrays.	1	3	2M
	f	Mention the applications of Yagi-Uda antenna.	2	3	2M
	g	What is the function of a log-periodic antenna?	2	4	2M
	h	Compare axial mode and normal mode operation of helical antennas.	1	4	2M
	i	Define MUF and skip distance in ionospheric propagation.	1	5	2M
	j	What is the significance of FRIIS transmission equation?	2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the radiation mechanism of a thin linear wire antenna with neat diagram.	2	1	5M
		ii) Derive the expression for antenna directivity and beam efficiency.	2	1	5M
	OR				
	b	i) Calculate the beamwidth between first nulls for a uniform linear aperture antenna of 1 m length operating at 3 GHz.	3	1	5M
		ii) Discuss the concept of antenna efficiency and bandwidth.	3	1	5M
3	Unit-II				
	a	i) Derive the field components for a small electric dipole.	3	2	5M
		ii) Determine the radiation resistance of a $\lambda/2$ dipole antenna.	3	2	5M
	OR				
	b	i) Derive the expressions for radiation fields of small loop antenna.	3	2	5M
		ii) Compare short magnetic dipole and short electric dipole.	3	2	5M
4	Unit-III				
	a	i) Derive the array factor for a uniform linear array of N isotropic elements.	4	3	5M
		ii) Calculate the directivity of an 8-element broadside array with $\lambda/2$ spacing.	4	3	5M
	OR				
	b	i) Explain binomial array design and compare with uniform array.	4	3	5M
		ii) Discuss the function of parasitic elements in Yagi-Uda antenna.	4	3	5M

5	Unit-IV				
	a	i) Explain the working principle and design equations of log-periodic antenna.	3	4	5M
		ii) Describe the different types of horn antennas with neat sketches.	3	4	5M
	OR				
	b	i) Write short notes on offset-fed paraboloidal reflectors.	2	4	5M
6		ii) Determine the gain of a pyramidal horn antenna with an aperture of $0.3 \text{ m} \times 0.25 \text{ m}$ operating at 10 GHz.	3	4	5M
	Unit-V				
	a	i) Write short notes on radio horizon and line-of-sight propagation.	2	5	5M
		ii) Determine the maximum usable frequency (MUF) when the critical frequency is 5 MHz and angle of incidence is 30° .	2	5	5M
	OR				
	b	i) Explain the mechanism of ionospheric reflection and refraction.	2	5	5M
		ii) Derive the expression for field strength in space wave propagation.	2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23EC3106 ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is the function of a PMMC instrument?	K1	1	2M
	b	Define accuracy and precision in measurements with one example each.	K1	1	2M
	c	What is the importance of the delay line in CRO.	K1	2	2M
	d	Mention any two applications of CRO in electrical measurements.	K3	2	2M
	e	Which bridge is suitable for measuring very low resistances and why?	K2	3	2M
	f	What is the function of a Schering bridge?	K2	3	2M
	g	What is the difference between a fixed and a variable AF oscillator?	K1	4	2M
	h	Define signal generator.	K1	4	2M
	i	Define Transducer and classify them.	K1	5	2M
	j	What is the function of a photoelectric transducer?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Explain the construction and working principle of a PMMC meter with a neat sketch.	K2	1	5M
		ii) Discuss various types of errors in measurement and methods to minimize them.	K2	1	5M
	OR				
	b	i) Explain the construction and working of a Digital Voltmeter (DVM) based on the Voltage-to-Time (V-T) conversion principle.	K2	1	5M
		ii) Explain the operation of a digital frequency meter with a block diagram.	K2	1	5M
3	Unit-II				
	a	i) Analyze the function and working of delay line and sync selector circuits in CRO.	K4	2	5M
		ii) Discuss the function and significance of a delay line in a CRO.	K3	2	5M
	OR				
	b	i) Distinguish between dual-beam and dual-trace CROs with suitable diagrams and applications.	K4	2	5M

		ii) Draw and explain the construction and working of a Cathode Ray Tube (CRT) used in CROs.	K2	2	5M
4	Unit-III				
	a	i) What resistance range must resistor R3 have in order to measure unknown resistor in the range 1-100K Ω using a Wheatstone bridge. Given R1=1K Ω and R2=10K Ω	K1	3	5M
		ii) Compare and contrast DC bridges and AC bridges in terms of their applications and measurement characteristics.	K3	3	5M
	OR				
	b	i) Explain the construction and working principle of the Wheatstone bridge with a neat diagram.	K2	3	5M
		ii) Discuss precautions required and sources of errors that affect accuracy when measuring small resistances using Kelvin's bridge.	K3	3	5M
5	Unit-IV				
	a	i) Describe the block diagram and working of a laboratory type signal generator.	K2	4	5M
		ii) Explain how a function generator can produce sine, square, and triangular waveforms.	K2	4	5M
	OR				
	b	i) Explain the working principle of a pulse generator and its use in digital circuit testing.	K2	4	5M
		ii) Discuss the role of duty cycle and frequency in the design of a pulse generator.	K3	4	5M
6	Unit-V				
	a	i) Describe the construction and operating principle of an LVDT and its applications.	K2	5	5M
		ii) Analyze self-adaptive and self-validating sensors with examples.	K5	5	5M
	OR				
	b	i) Explain the construction and working of a strain gauge as a resistive transducer.	K2	5	5M
		ii) Discuss the concept of soft sensors and self-adaptive sensors in intelligent instrumentation.	K3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23EE3101

POWER ELECTRONICS

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is meant by the triggering of an SCR?	1	1	2M
	b	Write the features of IGBT?	1	1	2M
	c	What is the role of freewheeling diode in the rectifier operation?	1	2	2M
	d	Write the applications of half wave controlled rectifiers?	1	2	2M
	e	Write the features of single phase step down cyclo converter?	1	3	2M
	f	Write the function of 3 phase AC-DC converter?	1	3	2M
	g	Write the function of buck converter?	1	4	2M
	h	Write the function of boost converter?	1	4	2M
	i	What is meant by the phase displacement control of inverters?	1	5	2M
	j	What is meant by the single phase half bridge inverter?	1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Draw the circuit and explain the snubber circuit operation?	2	1	5M
		ii) For an SCR, the gate cathode characteristic has a straight line slope of 132. For trigger source voltage of 14.8V and allowable gate power dissipation of 0.6 watts. Find the gate source resistance?	3	1	5M
	OR				
	b	i) Analyze the static characteristics of power MOSFET?	4	1	5M
		ii) The trigger circuit of a Thyristor has a source voltage of 16.5V and the load line has a slope of -110V per ampere. The minimum gate current to turn-on the SCR is 23.6mA. Find the source resistance required in the gate circuit and the trigger voltage and trigger current for an average gate power dissipation of 0.6 watts?	3	1	5M
3	Unit-II				
	a	Draw the circuit diagram and analyze the single phase fully controlled bridge rectifier with RLE load? Also draw the output waveforms?	4	2	10M

	OR					
	b	i)	Compare the continuous and discontinuous conduction modes of converter operation with relevant waveforms?	2	2	5M
		ii)	SCRs with peak forward voltage rating of 1012V and average on state current rating of 38.7A are used in single phase midpoint converter and single phase bridge converter. Calculate the power that these two converters can handle? The factor of safety is 2.4.	3	2	5M
4	Unit-III					
	a	i)	Explain in detail about the operation of three phase half wave rectifier with RL load by drawing the output waveforms?	2	3	10M
	OR					
	b	i)	Justify the single phase AC-AC power control by using phase control with resistive load? Also draw relevant waveforms?	5	3	10M
5	Unit-IV					
	a	i)	Write and explain the principle of operation of chopper?	2	4	5M
		ii)	A step up chopper has input voltage of 210V and output voltage of 650V. If the non-conducting time of Thyristor chopper is 104 micro seconds, find the pulse width of the output voltage? If the pulse width is halved for the constant frequency operation, calculate the new output voltage?	3	4	5M
	OR					
	b	i)	Explain the control techniques of chopper circuits with wave forms?	2	4	5M
		ii)	For type-A chopper, feeding on RLE load, obtain the maximum value of average current rating for the Thyristor in case the load current remains unchanged?	3	4	5M
6	Unit-V					
	a	i)	Explain the operation of current source inverter with necessary waveforms?	2	5	5M
		ii)	A single phase bridge inverter delivers power to a series connected RLC load with R=2.2 ohms and inductive reactance of 9.6 ohms. The periodic time T=0.2 msec. Find the value of C should the load have in order to obtain load commutation for the SCRs? The Thyristor turn off time is 11.2 micro seconds. The circuit turn off time is 1.3t _q . Assume that the load current contains only fundamental component?	3	5	5M
	OR					
	b	i)	Describe the process of sinusoidal pulse width modulation with relevant waveforms?	2	5	5M
		ii)	Explain in detail about the operation of three phase square wave inverter?	2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

Sub Code: R23EE3102

DIGITAL CIRCUITS

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Write the types of number systems?	K1	1	2M
	b	What is BCD code?	K1	1	2M
	c	What are the basic gates?	K1	2	2M
	d	What is K-map?	K1	2	2M
	e	What is an encoder?	K1	3	2M
	f	Draw the block diagram of a four input multiplexer?	K1	3	2M
	g	What is a sequential circuit?	K2	4	2M
	h	What is a flip-flop?	K2	4	2M
	i	What are the two models of sequential circuits?	K1	5	2M
	j	Write the difference between combinational logic circuits and sequential logic circuits?	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2		Unit-I			
	a	i) Convert the following decimal numbers to excess 3 code i) 14 ii) 460	K3	1	5M
		ii) Convert the gray code word 11011 to binary?	K3	1	5M
		OR			
	b	i) Explain Basic theorems and properties of Boolean algebra?	K2	1	5M
		ii) Obtain the truth table of the following function $(xy + z)(y + xz)$	K2	1	5M
3		Unit-II			
	a	Minimize the logic function $F(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 8, 11, 14)$	K3	2	10M
		OR			
	b	i) What are Minterms and Maxterms. Show truth tables in each case?	K4	2	5M

		ii) Show the following expression on Karnaugh map $F = ABC + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C}$	K4	2	5M
4	Unit-III				
	a	i) Implement the given function using 8 to 1 multiplexer? $F(A, B, C, D) = \sum m(1, 3, 4, 11, 12, 13, 14, 15)$	K4	3	5M
		ii) Write short notes on BCD decoders?	K4	3	5M
	OR				
	b	Explain the following i) Programmable ROM ii) PAL	K4	3	10M
5	Unit-IV				
	a	i) Explain the function of basic flip flop?	K2	4	5M
		ii) Discuss the Master-Slave flip flop?	K2	4	5M
	OR				
	b	i) Explain the procedure to convert one flip flop to another flip flop?	K3	4	5M
		ii) Explain the term “shift register”?	K3	4	5M
6	Unit-V				
	a	A sequential circuit has three D flip flops. A, B and C and one input X. It is described by the following flip flop input functions $DA = (BC^1 + B^1C)X + (BC + B^1C^1)X^1$ $DB = A, DC = B$ i) Derive the state table for the circuit ii) Draw two state diagrams are for $X = 0$ and other for $X = 1$	K3	5	10M
	OR				
	b	Disucss about Mealy and Moore models with example	K2	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23EE3103

POWER SYSTEMS-II

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

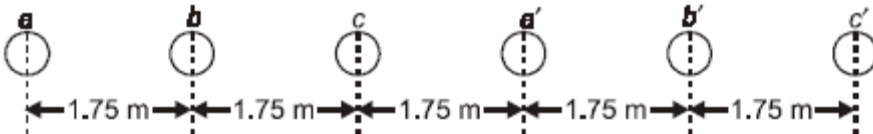
PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What are the advantages of Bundled conductors	K1	1	2M
	b	Define Skin effect and Proximity effect.	K1	1	2M
	c	Draw the nominal T model of a transmission line	K1	2	2M
	d	What is Ferranti effect	K1	2	2M
	e	Write the difference between reflection and refraction.	K1	3	2M
	f	List the causes for propagation of surges in transmission line.	K1	3	2M
	g	What are the advantages of corona	K1	4	2M
	h	Write about Visual critical voltage with reference to corona	K1	4	2M
	i	Can string efficiency in an AC system be 100%?	K1	5	2M
	j	Define stringing chart	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Derive an expression for the loop inductance of a single phase line	K2	1	5M
		ii) Determine the inductance per km/ phase of a double circuit three phase transmission line as shown in fig. The radius of each conductor is 1.5cm	K3	1	5M
					
	OR				
	b	i) Derive expressions for capacitance for a 1- ϕ two conductor transmission line	K2	1	5M
		ii) The conductors of a 50 Hz fully transposed line are horizontally arranged with an inter conductor spacing of 5m. If the capacitance to neutral per km when conductors are arranged at the corners of an equilateral triangle of side 5m? What is the ratio of charging currents per phase in the two cases?	K3	1	5M
3	Unit-II				
	a	i) Derive expression for the ABCD constants for nominal- π method	K2	2	5M
		ii) A short transmission line has impedance of (0.3+j0.4) ohm/ph. The sending end voltage being 3.3kV (L-L) and the load at the receiving end	K3	2	5M

		being 300kW per phase at 0.8 p.f. lagging. Calculate (a) the receiving end voltage (b) the line current			
	OR				
	b	i) Derive the A, B, C and D constants of long transmission lines using Rigorous solution.	K2	2	7M
		ii) Explain about surge impedance loading.	K2	2	3M
4	Unit-III				
	a	i) Show that surges behave as travelling waves. Derive expressions for surge impedance and wave velocity	K2	3	7M
		ii) A 210 kV, $2.5\mu\text{s}$ rectangular surge travels on a line of surge impedance of 400Ω . The line is terminated in a capacitance of 2500pf . Find the voltage across the capacitance	K2	3	3M
	OR				
	b	i) Explain about termination of line with open circuit for travelling wave	K2	3	5M
		ii) Two stations are connected together by an underground cable having a surge impedance of 50Ω joined to an overhead line with a surge impedance of 400Ω . If a surge having a maximum value of 110 kV travels along the cable towards the junction with overhead line. Determine the value of the reflected and the transmitted wave of voltage and current at the junctions	K3	3	5M
5	Unit-IV				
	a	i) Explain the phenomena of corona and derive an expression for disruptive critical voltage.	K2	4	5M
		ii) A three phase, 110 kV, 50Hz transmission line has equilateral triangular spacing of side 2.5 m. The conductor diameter is 1.8 cm. The air density factor and irregularity factor is 0.95 and 0.89 respectively. Find the disruptive critical voltage.	K3	4	5M
	OR				
	b	i) Explain about corona loss and discuss the methods for the reduction of corona loss	K2	4	5M
		ii) A three phase, 220 kV, 50Hz transmission line has equilateral triangular spacing of side 3m. The conductor diameter is 2.5 cm. Determine the corona loss per kilometer of the line at 20°C and atmospheric pressure 75 cm Hg. Take irregularity factor as 0.8	K3	4	5M
6	Unit-V				
	a	i) Deduce expressions for sag and conductor length of an overhead line when the supports are at unequal levels.	K2	5	5M
		ii) The line supports of an overhead line are 180 m apart and are at the same level. Diameter of the conductor is 1.27 cm. Calculate the maximum sag (a) in still air and (b) in a wind pressure of 33.7 kg/m^2 of the projected area of the ice covered line. The radial thickness of the ice is 1.25 cm. Maximum stress in the line is 844 kg/m^2 . The weight of the conductor is 1.13 kg. Density of ice is 915 kg/m^3 .	K3	5	5M
	OR				
	b	i) Define string efficiency. Why is it necessary to have high string efficiency? How can it be achieved?	K2	5	5M
		ii) string of 3 units, the capacitance between each link to pin to earth is 11% of the capacitance of one unit. Calculate the voltage across each unit and string efficiency when the voltage across the string is 33kV.	K3	5	5M

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23EE3107

SPECIAL ELECTRICAL MACHINES

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Why steel is preferred for making permanent magnet?	II	1	2M
	b	Define reversible losses in permanent magnets.	II	1	2M
	c	List the disadvantages of permanent magnets over electromagnets.	II	2	2M
	d	List any two merits of PMDC motors.	I	2	2M
	e	Why rotor position sensor is essential for the operation of switched reluctance motor?	II	3	2M
	f	State the principle of operation of SRM.	II	3	2M
	g	Is BLDC motor a DC motor or an AC motor? Justify your answer.	II	4	2M
	h	Write the torque equation for a BLDC motor.	I	4	2M
	i	Compare between linear DC motor and linear induction motors.	II	5	2M
	j	List the major parts of a linear induction motor.	I	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	Discuss the mechanical, magnetic, and thermal properties of permanent magnets and their influence on electrical machine performance.	II	1	10M
	OR				
	b	i) Compare the conventional DC motor and the electronically commutated DC motor. ii) What is B-H curve? List out the basic comparisons between soft and hard magnetic materials.	II IV	1 1	5M 5M
3	Unit-II				
	a	i) Draw and explain the control circuit for a two-phase stepper motor. ii) Discuss the merits and demerits of PMDC motors.	III II	2 2	5M 5M
	OR				
	b	With a neat diagram, explain the constructional details of a variable reluctance stepper motor. Also list the merits and demerits of VR stepper Motor.	II	2	10M
4	Unit-III				
	a	i) With the help of a neat schematic diagram, explain the closed loop control of an SRM. ii) Derive the expression for torque produced by the switched reluctance motor.	II II	3 3	5M 5M

	OR				
	b	Explain various converter configurations used for SRM drives with suitable circuit diagrams.	V	3	10M
5	Unit-IV				
	a	i) Explain the working principle of a BLDC motor with a neat sketch.	III	4	5M
		ii) Derive the EMF equation for a square-wave BLDC motor.	III	4	5M
	OR				
	b	With the help of model waveforms for back emf, gate pulses of converter, stator currents and voltages, explain the operation of a BLDC motor	II	4	10M
6	Unit-V				
	a	i) Draw and explain the equivalent circuit of a linear induction motor.	IV	5	5M
		ii) Explain the advantages and disadvantages of of Linear Induction Motors.	II	5	5M
	OR				
	b	Explain in detail the construction and working principle of Linear Induction Motors.	II	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23IT3108

ADVANCED JAVA

Time: 3 hours

(IT)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	List out the main components of JDBC architecture?	K1	1	2M
	b	Describe the use of the Class.forName() method in JDBC?	K2	1	2M
	c	Define a Web Container	K1	2	2M
	d	Name any two HTTP methods and their functions.	K1	2	2M
	e	List any two advantages of Servlets over CGI	K2	3	2M
	f	Differentiate between GenericServlet and HttpServlet?	K2	3	2M
	g	How does JSP differ from Servlets?	K2	4	2M
	h	List any four implicit objects.	K1	4	2M
	i	Mention any two advantages of using Spring Framework	K2	5	2M
	j	Which annotation is used to define a controller in Spring MVC?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Describe the steps involved in building a simple JDBC application with code snippets.	K2	1	5M
		ii) Explain the architecture of JDBC with a neat diagram.	K3	1	5M
	OR				
	b	i) Explain how to perform CRUD operations using JDBC with suitable examples.	K3	1	5M
		ii) Explain the four types of JDBC drivers with advantages and disadvantages	K2	1	5M
3	Unit-II				
	a	i) Explain the multi-tier architecture of J2EE with a neat diagram.	K2	2	5M
		ii) Write short notes on WEB-INF directory and deployment descriptor.	K2	2	5M
	OR				
	b	i) Explain Model-View-Controller (MVC) architecture in web applications with a neat diagram	K3	2	5M
		ii) Write a short note on J2EE Containers	K2	2	5M
4	Unit-III				
	a	i) Describe the lifecycle of a Servlet with a neat diagram.	K2	3	5M
		ii) Write a simple program demonstrating the life cycle of a Servlet.	K3	3	5M

	OR				
	b	i) Discuss HttpSessionListener and ServletContextListener with examples.	K3	3	5M
		ii) Compare cookies, hidden form fields, and URL rewriting for session tracking.	K2	3	5M
5	Unit-IV				
	a	i) Explain the life cycle of a JSP page with a neat diagram.	K3	4	5M
		ii) Write a JSP code snippet using all three scripting elements.	K3	4	5M
	OR				
	b	i) Explain different session management techniques in JSP with examples.	K2	4	5M
		ii) Explain the steps to build a CRUD application using JSP, JDBC, and MySQL.	K2	4	5M
6	Unit-V				
	a	i) Explain how Spring manages bean creation and dependency injection through XML configuration.	K2	5	5M
		ii) Explain how Spring integrates with Hibernate through DAO pattern.	K3	5	5M
	OR				
	b	i) Explain how @Configuration and @Bean annotations are used in Spring applications.	K2	5	5M
		ii) Write short notes on Spring transaction propagation and isolation levels.	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23ME3101

MACHINE TOOLS & METROLOGY

Time: 3 hours

(ME)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Defined the term “rake angle” and “clearance angle” with reference to the single point cutting tool.	K2	1	2M
	b	What are the different types of Chips?	K1	1	2M
	c	List any four operations that can be performed on a lathe.	K2	2	2M
	d	Mention two differences between a shaper and a planner.	K1	2	2M
	e	What are the applications of broaching machines?	K2	3	2M
	f	What are the basic functions of milling?	K3	3	2M
	g	What are types of fits?	K1	4	2M
	h	State three major applications of slip gauges.	K2	4	2M
	i	State the principle of a sine bar.	K1	5	2M
	j	Differentiate between roughness and waviness.	K1	5	2M

PART-B

Answer either ‘a’ or ‘b’ from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Differentiate between orthogonal and oblique cutting in metal cutting process.	K3	1	5M
		ii) Explain the geometry of chip formation with proper sketches and equations.	K3	1	5M
	OR				
	b	Draw merchant circle diagram for metal cutting process and derive relations for various forces in metal cutting.	K3	1	10M
3	Unit-II				
	a	i) Differentiate between Capstan and Turret lathe.	K2	2	5M
		ii) Describe the turning process in lathes with suitable sketch.	K2	2	5M
	OR				
	b	i) Explain the different parts of planner machine with neat sketch.	K3	2	5M
		ii) Explain the different parts of shaper machine with suitable schematic sketch.	K3	2	5M
4	Unit-III				
	a	i) Explain the working of radial drilling machine with a suitable schematic sketch.	K3	3	5M
		ii) Explain the methods of indexing applicable in milling machine and its limitation.	K4	3	5M

	OR				
	b	Compare grinding, lapping, honing, and broaching processes based on accuracy and finish.	K4	3	10M
5	Unit-IV				
	a	i) Compare and contrast unilateral and bilateral tolerance system	K3	4	5M
		ii) Explain the Taylor's principle applied in limits	K3	4	5M
	OR				
	b	Compare the accuracy and use cases of a vernier caliper, micrometer, and dial gauge.	K4	4	10M
6	Unit-V				
	a	Describe the various components of Bevel protractor with a neat sketch	K3	5	10M
	OR				
	b	Explain the working principle and construction of a tool maker's microscope.	K4	5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

Sub Code: R23ME3102

THERMAL ENGINEERING

Time: 3 hours

(ME)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Differentiate between gas power cycles and air standard cycles	K1	1	2M
	b	Distinguish between Otto & Diesel Cycles	K2	1	2M
	c	What is supercharging and turbocharging.	K1	2	2M
	d	Define boiler draught and write the types	K2	2	2M
	e	Write the classification of steam turbines	K1	3	2M
	f	Explain the functions of a convergent nozzle.	K2	3	2M
	g	Write the principle of multi stage compression	K1	4	2M
	h	Explain the working principle of centrifugal compression	K2	4	2M
	i	Illustrate the components of gas turbine cycle	K1	5	2M
	j	Differentiate between solid and liquid propellant rockets.	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Why the actual cycle efficiency is much lower than the air standard cycle efficiency? List the major losses in the actual engine.	K2	1	5M
		ii) Write a note in Exhaust blow-down losses.	K2	1	5M
	OR				
	b	i) What is heat loss factor? What is its contribution compared to other losses?	K3	1	5M
		ii) Explain the phenomenon of loss due to rubbing friction in actual cycle	K3	1	5M
3	Unit-II				
	a	i) Explain the typical port timing diagram and the significance of each angle in the port timing diagram in 2-stroke engine	K3	2	5M
		ii) Describe the evaporative cooling system with a neat sketch	K3	2	5M
	OR				
	b	i) Write the detailed classification of the boilers	K2	2	5M
		ii) List different boiler mountings and accessories	K2	2	5M
4	Unit-III				
	a	i) Describe the changes which occur in pressure and velocity distribution along the length of a) convergent nozzle b) convergent-divergent nozzle	K3	3	5M
		ii) Explain the working of a single-stage reaction turbine.	K3	3	5M

	OR				
	b	i) A steam nozzle is supplied steam at 6 bar and 250°C and it discharges steam at 1 bar. If the divergent portion of the nozzle is 64 mm long and the throat diameter is 5.6 mm, determine the cone angle of the divergent portion. Assume 12% of the total available enthalpy drop lost in friction in the divergent portion.	K3	3	5M
		ii) A single row impulse turbine develops 132.4 kW at a blade speed of 175 m/sec, using 2 kg of steam per sec. Steam leaves the nozzle at 400 m/sec. Velocity coefficient of the blades is 0.9. Steam leaves the turbine blades axially. Determine nozzle angle, blade angles at entry and exit. Assume no shock.	K3	3	5M
5	Unit-IV				
	a	i) Derive the work done for a single stage air compressor with and without clearance volume.	K2	4	5M
		ii) A single stage single acting reciprocating air compressor takes in 17 m ³ /min at suction conditions of 100 KPa and 25°C. The delivery pressure is 700 KPa. The clearance volume is 6% of swept volume. The compression and expansion follows the law $PV^{1.3} = C$. The speed of the compressor is 600 rpm. Stroke to bore ratio is 1. Find the power required to drive the compressor and cylinder dimensions.	K3	4	5M
	OR				
	b	i) With help of a neat sketch explain the construction and working of an axial flow compressor.	K3	4	5M
		ii) Draw the velocity triangles for the centrifugal compressor and derive the equation for the estimation of power required to compress the air.	K3	4	5M
6	Unit-V				
	a	i) Explain working principle of turbo jet engine with neat sketch.	K3	5	5M
		ii) Explain the classification of the propellants	K3	5	5M
	OR				
	b	i) Discuss the effect of Regeneration on Brayton cycle efficiency with help of neat sketch and T-s plot.	K3	5	5M
		ii) Discuss about types of gas turbine combustion chambers.	K3	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23ME3103

DESIGN OF MACHINE ELEMENTS

Time: 3 hours

(ME)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

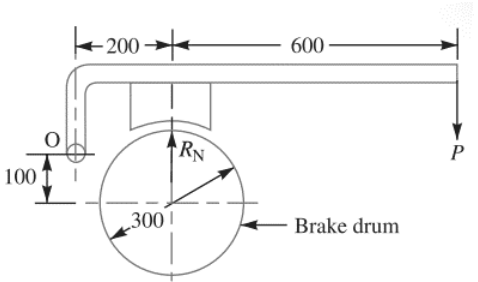
Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	How do you classify materials for engineering use?	K2	1	2M
	b	Define notch sensitivity.	K2	1	2M
	c	Define pitch and lead in a screw thread.	K1	2	2M
	d	State the differences between lap and butt welds joints.	K2	2	2M
	e	What is the relation between power transmitted and torque in a rotating shaft?	K3	3	2M
	f	State the application of universal coupling.	K1	3	2M
	g	What is a clutch, and also state a few advantages of a clutch.	K2	4	2M
	h	What is the difference between compression and tension springs?	K2	4	2M
	i	What is meant by hydrodynamic lubrication?	K1	5	2M
	j	Classify the gears.	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2		Unit-I			
	a	At a critical section in a shaft, the following stresses are induced. Bending stress = 60 MPa and torsional shear stress = 40 MPa. Determine the factor of safety, according to i) Maximum normal stress theory ii) Maximum shear stress theory, and iii) Maximum principal strain theory. The proportional limit in a simple tension test is found to be 300 MPa. Take Poisson's ratio as 0.3	K3	CO1	10M
		OR			
	b	A steel rod is subjected to a reversed axial load of 180 kN. Find the diameter of the rod for a factor of safety of 2. Neglect column action. The material has an ultimate tensile strength of 1070 MPa and yield strength of 910 MPa. The endurance limit in reversed bending may be assumed to be one-half of the ultimate tensile strength. Other correction factors may be taken as follows: For axial loading = 0.7; For machined surface = 0.8; For size = 0.85; For stress concentration = 1.0.	K3	CO1	10M
3		Unit-II			
	a	A steam engine of effective diameter 300 mm is subjected to a steam pressure of 1.5 N/mm ² . The cylinder head is connected by 8 bolts having yield point 330 MPa and endurance limit at 240 MPa. The bolts are tightened with an initial preload of 1.5 times the steam load. A soft copper gasket is used to make the joint leak-proof. Assuming a factor of safety 2, find the size of bolt required.	K3	CO2	10M

		The stiffness factor for copper gasket may be taken as 0.5.			
		OR			
	b	A low carbon steel plate of 0.7 m width welded to a structure of similar material by means of two parallel fillet welds of 0.112 m length (each) is subjected to an eccentric load of 4000 N, the line of action of which has a distance of 1.5 m from the centre of gravity of the weld group. Design the required thickness of the plate when the allowable stress of the weld metal is 60 MPa and that of the plate is 40 MPa.	K3	CO2	10M
4		Unit-III			
	a	A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm. The distances between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the allowable shear stress is 45 MPa, determine the diameter of the shaft. Show in a sketch how the gear will be mounted on the shaft; also indicate the ends where the bearings will be mounted? The pressure angle of the gear may be taken as 20°.	K3	CO3	10M
		OR			
	b	Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14 MPa.	K3	CO3	10M
5		Unit-IV			
	a	The block brake, as shown in Fig. 1. provides a braking torque of 360 N-m. The diameter of the brake drum is 300 mm. The coefficient of friction is 0.3. Find : i) The force (P) to be applied at the end of the lever for the clockwise and counter clockwise rotation of the brake drum; and ii) The location of the pivot or fulcrum to make the brake self locking for the clockwise rotation of the brake drum.  Fig.1. (All Dimensions are in mm)	K3	CO4	10M
		OR			
	b	Design a helical spring for a spring loaded safety valve (Rams bottom safety valve) for the following conditions: Diameter of valve seat = 65 mm; Operating pressure = 0.7 N/mm ² ; Maximum pressure when the valve blows off freely = 0.75 N/mm ² ; Maximum lift of the valve when the pressure rises from 0.7 to 0.75 N/mm ² = 3.5 mm; Maximum allowable stress = 550 MPa; Modulus of rigidity = 84 kN/mm ² ; Spring index = 6. Draw a neat sketch of the free spring showing the main dimensions.	K3	CO4	10M
6		Unit-V			
	a	Design a journal bearing for a centrifugal pump from the following data :	K3	CO5	10M

		Load on the journal = 20 000 N; Speed of the journal = 900 r.p.m.; Type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg / m-s; Ambient temperature of oil = 15.5°C; Maximum bearing pressure for the pump = 1.5 N / mm ² . Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 W/m ² /°C.			
	OR				
	b	A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength.	K3	CO5	10M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23OE3103

CLIMATE CHANGE IMPACT ON ECO SYSTEM

Time: 3 hours

CSE (AIML, DS, CS), AIML

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What are the main components of the Earth's climate system?	K1	1	2M
	b	What is meant by the Earth's energy balance?	K1	1	2M
	c	Define the hydrologic cycle and list its main components.	K1	2	2M
	d	Write the general equation for a simple water balance model.	K1	2	2M
	e	What is relative humidity and how is it related to vapor pressure?	K1	3	2M
	f	What causes the Indian monsoon, and how is it related to the seasonal reversal of wind patterns?	K1	3	2M
	g	Define a flood and mention one major climatic cause of flooding.	K1	4	2M
	h	Name any two common drought indicators used to assess drought severity.	K1	4	2M
	i	What is the main purpose of climate change modeling?	K1	5	2M
	j	What is downscaling in climate modeling, and why is it important for regional climate studies?	K1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	(i) Describe the vertical structure of the Earth's atmosphere in detail.	K2	1	[5 M]
		(ii) Describe the different mechanisms of heat transfer in the atmosphere	K2	1	[5 M]
	OR				
	b	Explain the interrelationship between weather, climate, and climate change. Discuss how long-term variations in climatic elements lead to climate change.	K2	1	[10 M]
3	Unit-II				
	a	(i) Explain the concept of global water balance	K2	2	[5 M]
		(ii) Discuss the cycling of water on land.	K2	2	[5 M]
	OR				
	b	(i) Develop and explain a simple water balance model for a defined land area	K2	2	[5 M]
		(ii) Explain the hydrologic cycle	K2	2	[5 M]
4	Unit-III				
	a	(i) Differentiate between stable, unstable, and conditionally unstable atmospheric conditions, providing examples of how each affects weather phenomena.	K3	3	[5 M]
		(ii) Briefly describe the difference between convective and orographic precipitation.	K2	3	[5 M]

	OR				
	b	Explain the "processes of the vadose zone" and its critical role in regulating water movement from the surface to groundwater.	K3	3	[10M]
5	Unit-IV				
	a	(i) Discuss the various types of floods and their primary causes.	K2	4	[5 M]
		(ii) Explain how changes in precipitation and temperature contribute to drought formation.	K2	4	[5 M]
	OR				
	b	(i) Elaborate on the concept of "climate extremes".	K2	4	[5 M]
		(ii) Explain any two commonly used indicators and their importance in drought monitoring and management.	K2	4	[5 M]
6	Unit-V				
	a	Discuss the importance of IPCC Scenarios	K3	5	[10M]
	OR				
	b	(i) Explain the fundamental principles behind Global Climate Models (GCMs) and General Circulation Models (GCMs).	K3	5	[5 M]
		(ii) Briefly explain the concept of radiative forcing.	K2	5	[5 M]

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23OE3117

MOBILE COMPUTING

Time: 3 hours

CSE, IT, CSE (AI)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What are the main components of Mobile Computing architecture?	K1	1	2M
	b	List any two services provided by GSM.	K2	1	2M
	c	Define hidden and exposed terminal problem.	K2	2	2M
	d	State the motivation for specialized MAC protocols.	K1	2	2M
	e	Mention the purpose of DHCP.	K2	3	2M
	f	Define home agent and foreign agent.	K1	3	2M
	g	Mention one limitation of traditional TCP in mobile networks.	K2	4	2M
	h	Differentiate between Indirect TCP and Mobile TCP.	K3	4	2M
	i	List any two characteristics of MANETs.	K1	5	2M
	j	What is the function of the OLSR protocol?	K2	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Discuss the various limitations of Mobile Computing.	K4	1	5M
		ii) Explain the architecture of Mobile Computing with a neat diagram.	K2	1	5M
	OR				
	b	i) Discuss the working of GPRS and its advantages over GSM.	K4	1	5M
ii) Explain handover and localization in GSM networks.		K2	1	5M	
3	Unit-II				
	a	i) Compare FDMA, TDMA, and CDMA.	K3	2	5M
		ii) Describe the need for specialized MAC protocols in wireless communication.	K2	2	5M
	OR				
	b	i) Explain the concept of SDMA and its advantages.	K2	2	5M
ii) Discuss various multiple access techniques in wireless communication systems.		K4	2	5M	
4	Unit-III				
	a	i) Describe encapsulation and optimization techniques in Mobile IP.	K2	3	5M
		ii) Explain the process of agent advertisement and discovery.	K2	3	5M

	OR				
	b	i) Describe the process of IP packet delivery in Mobile IP.	K2	3	5M
		ii) Discuss registration and tunnelling mechanisms in Mobile IP.	K4	3	5M
5	Unit-IV				
	a	i) Explain the problems faced by traditional TCP in mobile environments.	K2	4	5M
		ii) Discuss the mechanisms of fast retransmit and fast recovery.	K4	4	5M
	OR				
	b	i) Compare different TCP variants used in mobile communication.	K3	4	5M
		ii) Explain selective retransmission and transaction-oriented TCP.	K2	4	5M
6	Unit-V				
	a	i) Compare proactive, reactive, and hybrid routing protocols.	K3	5	5M
		ii) Describe DSDV and OLSR routing algorithms in detail.	K2	5	5M
	OR				
	b	i) Explain the hybrid routing approach with reference to ZRP.	K2	5	5M
		ii) Explain the working of DSR and AODV routing protocols.	K2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23OE3118 PRINCIPLES OF DATABASE MANAGEMENT SYSTEMS

Time: 3 hours

(ECE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	What is data redundancy	1	1	2M
	b	Define schema and instance.	1	1	2M
	c	Define specialization and generalization	1	2	2M
	d	Why are null values important in a database?	1	2	2M
	e	What are aggregate functions? Give two examples.	1	3	2M
	f	Define a constraint.	1	3	2M
	g	What are the problems caused by redundancy?	1	4	2M
	h	What is a candidate key?	1	4	2M
	i	What does atomicity mean in transactions	1	5	2M
	j	Define shared lock.	1	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Compare database systems and file systems in detail.	3	1	5M
		ii) Describe the three-tier architecture of a database system.	3	1	5M
	OR				
	b	i) Explain the different types of database users.	2	1	5M
		ii) Distinguish between centralized and client-server database architectures.	2	1	5M
3	Unit-II				
	a	i) Explain different types of attributes in ER model with examples.	2	2	5M
		ii) Explain the basic concepts of relational model — domain, attribute, tuple, and relation.	2	2	5M
	OR				
	b	i) Explain key constraints and participation constraints in an ER model.	2	2	5M
		ii) Explain different types of keys used in a relational model.	2	2	5M

4	Unit-III				
	a	i) Explain arithmetic and logical operations in SQL.	2	3	5M
		ii) Explain relational set operations with examples.	2	3	5M
	OR				
	b	i) Explain the form of a basic SQL query with examples.	2	3	5M
		ii) Discuss the advantages of using views in SQL	2	3	5M
5	Unit-IV				
	a	i) What is decomposition? Explain lossless join and dependency preservation properties.	2	4	5M
		ii) Write short notes on partial and transitive dependencies.	3	4	5M
	OR				
	b	i) Define and explain functional dependency with examples.	2	4	5M
		ii) Discuss how redundancy affects update, insert, and delete anomalies	2	4	5M
6	Unit-V				
	a	i) Explain the two-phase locking (2PL) protocol.	2	5	5M
		ii) Differentiate between primary index and clustering index.	2	5	5M
	OR				
	b	i) Define serializability and explain its importance in concurrency control.	2	5	5M
		ii) Write short notes on primary index and its characteristics.	2	5	5M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks

III B.Tech I Semester Supple. Examinations, May-2026

R23

Sub Code: R23OE3121

ENTREPRENEURSHIP DEVELOPMENT & VENTURE CREATION

Time: 3 hours

(EEE)

Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

Q.No		Questions	KL	CO	M
1	a	Define Entrepreneurship?	KL1	1	2M
	b	What is Entrepreneurial Skillset	KL 1	1	2M
	c	Define Identifying passion	KL2	2	2M
	d	Iterating problem-customer fit.	KL3	2	2M
	e	Expand MVP	KL2	3	2M
	f	Potential scale of the opportunity	KL2	3	2M
	g	What is Opportunity Cost	KL2	4	2M
	h	Define Sales Plan	KL1	4	2M
	i	Write about Venture Idea	KL2	5	2M
	j	What is Persuasive storytelling	KL3	5	2M

PART-B

Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

Q.No		Questions	KL	CO	M
2	Unit-I				
	a	i) Discuss the meaning and importance of Entrepreneurship?	KL1	1	5M
		ii) Discuss the attributes of entrepreneurial and intrapreneurial leadership?	KL2	1	5M
	OR				
	b	i) Explain the role of entrepreneurs in economic development?	KL2	1	5M
		ii) What do you mean by Entrepreneurial Mindset? How to build it?	KL3	1	5M
3	Unit-II				
	a	i) Discuss the steps in understanding and analyzing the macro-problem and Industry perspective?	KL3	2	5M
		ii) Discuss the urbanization trends and their implication on new opportunities?	KL3	2	5M
	OR				
	b	i) Explain the process of analyzing problem and validating with the potential customer?	KL3	2	5M
		ii) Discuss about Customer Segmentation and the basis for it?	KL2	2	5M

4	Unit-III				
	a	Explain how to understand customer jobs-to-be-done and crafting innovative solution?	KL3	3	10 M
	OR				
	b	Discuss the initial testing for proof-of-concept and iterate on the prototype?	KL3	3	10 M
5	Unit-IV				
	a	i) What is 9 block lean canvas model?	KL1	4	5M
		ii) Discuss about the importance of build-measure-lean approach?	KL2	4	5M
	OR				
	b	i)What are the various types of costs?	KL1	4	5M
		ii)Explain how to prepare a financial plan for profitability using financial template?	KL2	4	5M
6	Unit-V				
	a	Explain how to understand and identify potential and aspiration for scale?	KL2	5	10 M
	OR				
	b	Discuss how to build an investor ready pitch desk?	KL2	5	10 M

KL: Blooms Taxonomy Knowledge Level

CO: Course Outcome

M: Marks
