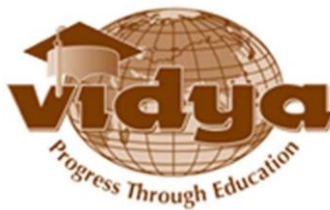


**S4 CSE QUESTION BANK**

**COMPUTER SCIENCE & ENGINEERING**



**VIDYA ACADEMY OF SCIENCE AND TECHNOLOGY TECHNICAL CAMPUS  
KILIMANOOR**

(A unit of Vidya International Charitable Trust)

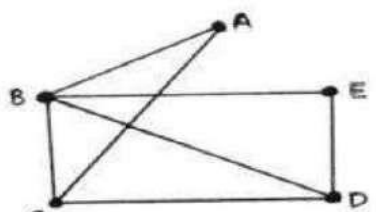
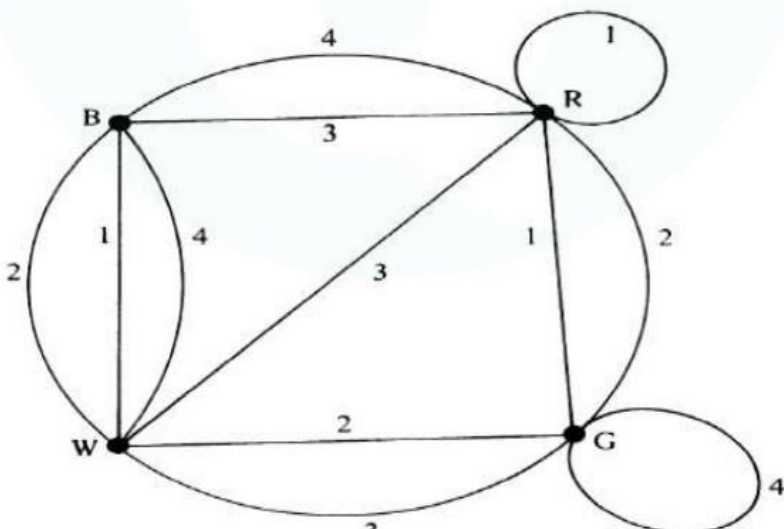
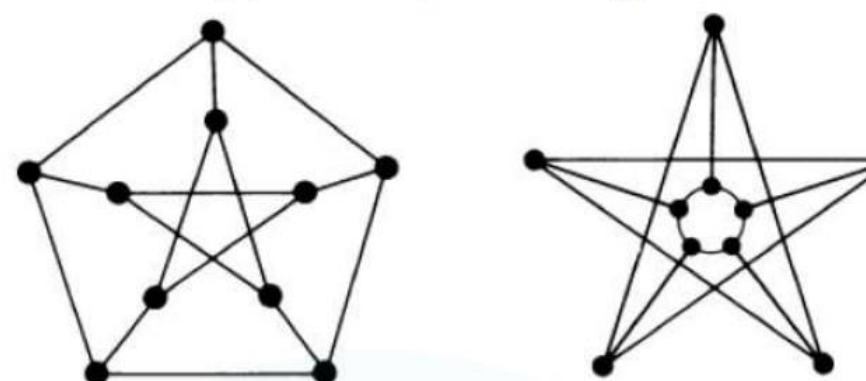
**Accredited by NAAC with "B++" grade**

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<b>Code</b>	<b>Subject</b>
MAT 206	Graph Theory
CST 202	Computer Organization and Architecture
CST 204	Database Management Systems
CST 206	Operating Systems
HUT 200	Professional Ethics
MCN 202	Constitution of India

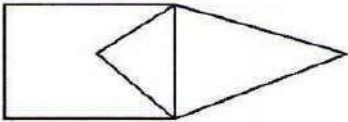
## MAT 206 - GRAPH THEORY

<b>MODULE 1</b>			
Sl. No	Questions	Marks	KTU/KU Month/Year
1	Consider a graph $G$ with 4 vertices: $v_1, v_2, v_3$ and $v_4$ and the degrees of vertices are 3,5,2 and 1 respectively. Is it possible to construct such a graph $G$ ? If not, why?	3	DEC17, DEC19
2	Prove that a simple with $n$ vertices and $K$ components can have atmost $(n-k)(n-k+1)/2$ edges.	3	JUNE 2023,SEP2020, JULY 2021
3	If a connected graph $G$ is decomposed into two subgraphs $g_1$ and $g_2$ , then prove that there must be at least one vertex common between $g_1$ and $g_2$ .	3	DEC18, JUNE 2022
4	Write a note on Konigsberg Bridge Problem	3	SEP2020
5	A graph has exactly 10 vertices, 4 vertices of degree 3, 4 vertices of degree 2 and 2 isolated vertices. How many edges does the graph have?	3	ModelQ uestion
6	19 students in a nursery school play a game each day, where they hold hands to form a circle. For how many days can they do this, with no students holding hands with the same playmates more than once? Substantiate your answer with graph theoretic concepts.	4	ModelQ uestion

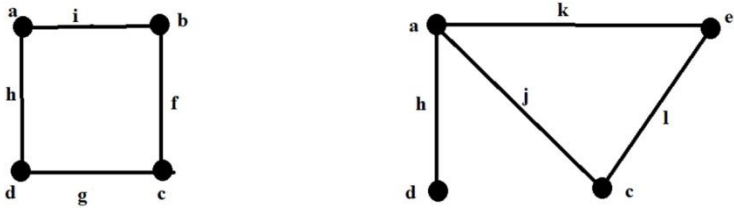
7	<p>Using the graph classify each sequence as a walk, a path or a circuit</p> <ol style="list-style-type: none"> <li>1. <math>E \rightarrow C \rightarrow D \rightarrow E</math></li> <li>2. <math>A \rightarrow C \rightarrow D \rightarrow E \rightarrow B \rightarrow A</math></li> <li>3. <math>B \rightarrow D \rightarrow E \rightarrow B \rightarrow C</math></li> <li>4. <math>A \rightarrow B \rightarrow C \rightarrow D \rightarrow B \rightarrow A</math></li> </ol> 	4.5	SEP2020
8	<p>Z</p> <p>a) Define subgraphs. What are edge disjoint and vertex disjoint subgraphs? Construct two edge disjoint subgraphs of the graph G.</p> 	4	SEP 2020
9	<p>b) Check whether the two graphs are isomorphic or not. Justify your answer.</p> 	7	SEP2020, JUNE 2022, JUNE 2023

10	Is it possible to have simple graphs with the following degree sequences? If yes, draw the graphs a)2,3,3,3,3,3,4,5 b)1,3,3,4,5,6,6 c)1,2,3,3,4,5,	5	SEP2020
11	Prove that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$ .	3	June 2022
12	Define walk, path and circuit with examples.	3	June 2023, June 2022, July 2021
13	Prove that the number of vertices of odd degree in a graph is always even.	7	June 2022 June 2023
14	If a graph has exactly two vertices of odd degree, then prove that there must be a path joining these two vertices.	7	June 2022
15	What is the maximum number of edges in a simple graph with n vertices? Justify your answer.	3	JULY 2021

### MODULE 2

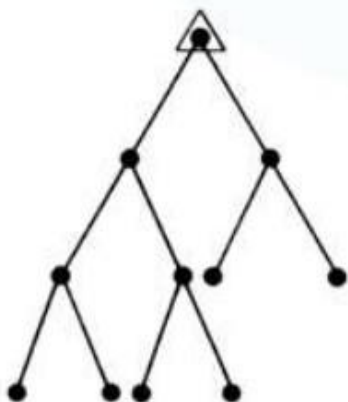
Sl. No	Questions	Marks	KTU/KU Month/Year
1	Consider the graph G given below: 	3	DEC17
2	Define Euler graph. Is G an Euler? If yes, write an Euler line from G Define Hamiltonian circuits and paths with examples. Find out the number of edge-disjoint Hamiltonian circuits possible in a complete graph with five vertices.	5	DEC 17 SEP20 20, DEC 2020

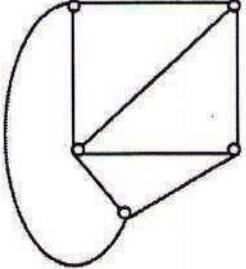
3	State Travelling-Sales man Problem and how TSP solution is related with Hamiltonian Circuits?	5	SEP2020, JULY 2021, JUNE 2023
4	Differentiate between symmetric and asymmetric digraphs with examples and draw a complete symmetric digraph of four vertices.	3	DEC2019, JUNE 2023
5	Consider a complete graph G with 11 vertices. a) Find the maximum number of edges possible in G. b) Find the number of edge-disjoint Hamiltonian circuits in G	4	DEC18
6	A connected graph G is a Euler graph if and only if it can be decomposed into circuits.	6	DEC18
7	The total number of different ,not edge disjoint, Hamiltonian circuits in a complete graph of n vertices is $(n-1)!/2$ . Prove.	6	DEC19
8	Explain digraphs and binary relation on digraphs.	4	SEP2020, JUNE 2023
9	Draw a graph which is Eulerian but not Hamiltonian	3	June 2022
10	In a complete graph with n vertices, prove that there are $\frac{n-1}{2}$ edge-disjoint Hamiltonian circuits, if n is an odd number $\geq 3$ .	7	June 2022, July 2021
11	1) For a binary relation “is greater than” on the set $X = \{3,4,7,5,8\}$ i) Draw the digraph representing the above relation ii) Write its relation matrix 2) Define equivalence digraph with an example	7	June 2022
12	Prove that a connected graph G is an Euler graph if and only if all vertices of G are of even degree.	7	June 2022
13	Explain strongly connected and weakly connected graphs with the help of examples.	3	July 2021

14	 <p>Find the union, intersection and ring sum of the above graphs.</p>	9	July 2021
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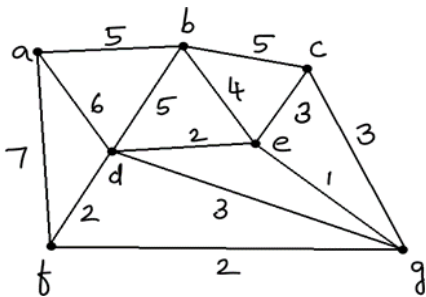
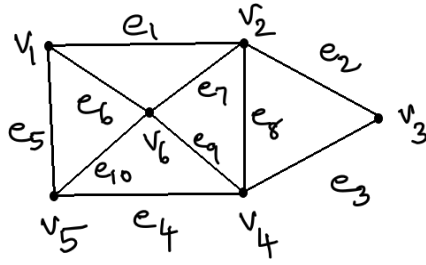
15	For which values of m, n is the complete graph $K_{m,n}$ an Euler graph ? Justify your answer.	7	June 2023, July 2021
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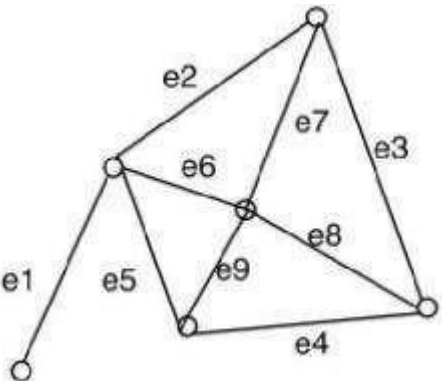
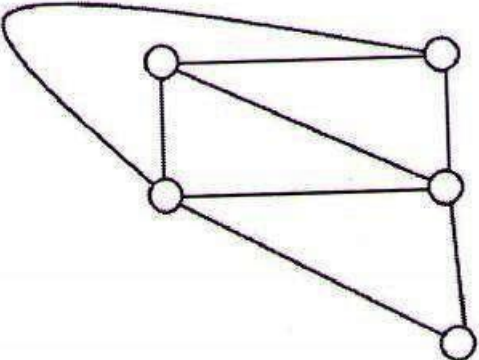
**MODULE 3**

Sl. No	Questions	Marks	KTU/KU Month/Year
1	Define a rooted binary tree with an example. Draw all trees of n labeled vertices for $n = 3$ and $n = 4$ .	5	SEP2020
2	Define rooted binary tree. Find the path length of the following tree 	4	SEP2020

3	Prove that a tree with $n$ vertices has $n-1$ edges.	5	Model Question
4	Prove that the distance between vertices of a connected graph is a metric.	5	Model Question
5	Write an algorithm for finding the shortest spanning tree (Kruskal algorithm)	6	Model Question
6	List down any two properties of trees and also prove the theorem: A graph is a tree if and only if it is minimally connected.	6	Model Question
7	Let $G = (V, E)$ be a connected graph, and let $T = (V, S)$ be a spanning tree of $G$ . Let $e = (a, b)$ be an edge of $G$ not in $T$ . Prove that, for any edge $f$ on the path from $a$ to $b$ in $T$ , $(V, (S \cup \{e\}) - \{f\})$ is another spanning tree for $G$ .	4	DEC17
8	Define spanning trees. Consider the graph $G$ given below and obtain any three spanning trees from $G$ . Calculate the number of distinct spanning trees possible from a complete graph with $n$ vertices.	5	DEC17
			
9	Prove that there is one and only one path between every pair of vertices in a tree.	3	June 2022
10	Draw all unlabelled trees with 5 vertices.	3	June 2022
11	Prove that every tree has either one or two centers	7	June 2022, July 2021



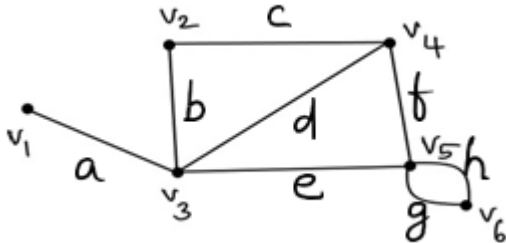
12	<p>Apply Kruskal's algorithm to find the minimal spanning tree for the following weighted graph.</p> 	7	June 2022
13	<p>For any spanning tree of a connected graph with <math>n</math> vertices and <math>e</math> edges, prove that there are <math>n-1</math> tree branches and <math>e-n+1</math> chords. For the following graph find two spanning trees and hence show that an edge that is a branch of one spanning tree can be a chord with respect to another spanning tree of same graph.</p> 	7	June 2022
14	Prove that a connected graph $G$ with $n$ vertices and $n-1$ edges is a tree.	3	July 2021, June 2023
15	Prove that a binary tree with $n$ vertices has $(n+1)/2$ pendant vertices.	7	July 2021, june 2023
<b>MODULE 4</b>			
Sl. No	Questions	Mar ks	KTU/KU Month/Year

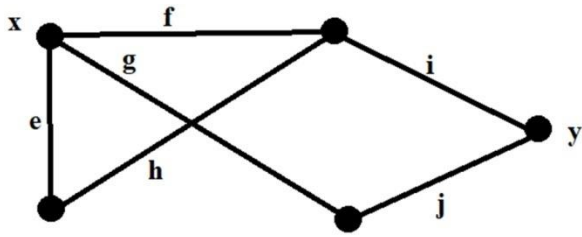
1	<p>Find the edge connectivity of <math>G</math>.</p> 	3	JUNEV 2023
2	<p>Draw two Kuratowski's graphs and also prove that Kuratowski's first graph is nonplanar using appropriate inequality.</p>	4	DEC17
3	<p>Draw a geometric dual(<math>G^*</math>) of <math>G</math> given and also write about the relationship between a planar graph <math>G</math> and its dual <math>G^*</math></p> 	6	DEC18
4	<p>Prove the statement "Every circuit has an even number of edges in common with any cut-set".</p>	4	DEC18
5	<p>Define edge connectivity and vertex connectivity.</p>	3	JUNE 2023,Mo del Question
6	<p>Prove that : A graph has a dual if and only if it is planar.</p>	7	Model Question
7	<p>Prove that: The complete graph of five vertices is nonplanar.</p>	6	Model Question

8	Write a short note on Connectivity and separability.	5	Model Question
9	Prove that the edge connectivity of a graph cannot exceed the degree of the vertex with the smallest degree in $G$ .	3	June 2022
10	Define planar graph and non-planar graph with examples.	3	June 2022 JUNE 2023
11	Illustrate the statement: “The ring sum of any two cut-sets in a graph is either a third cut-set or an edge disjoint union of cut-sets”, in the following graph.	7	June 2022
12	Define edge connectivity, vertex connectivity separable and non-separable graph. Give an example for each.	7	June 2022
12	Define fundamental circuits and fundamental cut-sets.	3	July 2021
13	Define cut-set. Prove that every circuit in $G$ has an even number of edges in common with any cut-set.	8	July 2021
14	Construct the geometric dual of the graph below	6	July 2021
15	Let $G$ be a connected graph and $e$ an edge of $G$ . Show that $e$ is a cut-edge if and only if $e$ belongs to every spanning tree.	5	July 2021

**MODULE 5**

SL. NO	Questions	Marks	KTU/KU Month/Year
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1	Explain Floydwarshall algorithm with suitable examples.	10	SEP2020
2	Prove that the chromatic polynomial of a complete graph with 4 vertices is $\lambda(\lambda - 1)(\lambda - 2)(\lambda - 3)$ .	3	June 2022
3	For the following graph find the i. Incidence matrix ii. Path matrix between $v_2$ and $v_5$ iii. Circuit matrix  	7	June 2022
4	Draw a connected graph and show that the rank of its incidence matrix is one less than the number of vertices.	7	June 2022
5	Prove that every tree with two or more vertices is 2-chromatic	7	June 2022
6	Prove that a covering $g$ of a graph is minimal if and only if $g$ contains no path of length three or more.	7	June 2022
7	Construct the adjacency matrix and incidence matrix of the graph	3	July 2021
8	Define chromatic number. What is the chromatic number of a tree with two or more vertices?	3	July 2021, June 2023
9	Prove that a graph with at least one edge is 2-chromatic if and only if it has no circuits of odd length.	7	June 2023
10	Let $B$ and $A$ be the circuit matrix and the incidence matrix of a graph $G$ which is free from loops, whose columns are arranged using the same order of edges. Show that $AB^T = BA^T = 0 \pmod{2}$ .	9	July 2021
11	Show that chromatic polynomial of a tree with $n$ vertices is $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$	7	July 2021
12	Define path matrix of a graph. Find the path matrix $P(x, y)$ for the graph below.	7	July 2021



13	Prove that every planer graph is 5 colorable	7	June 2023
14	Define chromatic number with an example.	3	June 2023
15	Prove that a graph with at least one edge is 2-chromatic if and only if it has no circuits of odd length.	7	June 2023

**Course Code: CST 202**

**Course Name: Computer Organization and  
Architecture**

<b>Module I</b>			
Sl. No	Questions	Marks	Year
1	With a neat diagram explain the internal architecture of CPU?	3	June2023
2	Why is the Wait-for-Memory-Function-Completed step required when performing memory transfer operations?	3	June2023(S)
3	What are condition codes, list the different condition codes?	5	June2023
4	Enumerate the sequence of actions (control signals) involved in executing an unconditional branch instruction?	3	June2023
5	What do you mean by addressing modes, with proper examples explain in detail about various address modes?	10	June2023(R), June2023(S)
6	Write down the sequence of actions needed to fetch and execute instruction: STORE R1,[R2]	4	June2023
7	Draw the diagram of a multi-bus organization with 3 buses, write the control sequence for the instruction ADD [R1],R2,R3 for the above mentioned multi-bus organization.	9	June2023
8	Draw the diagram of single bus organization, write the control sequence for the instruction ADD [R2],R3 for the above mentioned single bus organization.	8	June 2022, June2023(S)
9	With the help of a neat figure, describe the data path inside the processor?	6	June2023(S), June 2022
10	Give the control sequence for implementing the conditional branch instruction Branch.on-Negative in a single bus processor organization.	4	June2023(S)
11	Write the three-address, two-address and one-address representations of the operation below with relevant assumptions, evaluate following: i, $(A+B) * (C+D)$ ii, $C \leftarrow [A] + [B]$	10	June2023(S), June 2022

12	Name the registers which are connected to both external and internal bus? What are the signals associated with these registers?	3	June 2022
<b>Module II</b>			
1	What are the basic components of Register Transfer Logic method?	3	June2023(S)
2	Draw the hardware implementation of a 4-bit combinational shifter.	3	June2023(S)
3	What is micro-operation, With help of examples explain shift micro-operation	3	June2023
4	Check the correctness of the following statements and justify your results i)All unfunctional pipeline are static. But all static pipeline are not unfunctional. ii)All dynamic pipelines are multifunctional. But all multifunctional pipeline are not dynamic because different time	3	June2023
5	Design an adder circuit with one selection variable S and 2 inputs A and B. When S:0 circuit performs A+B, when S:1 it performs A-B by taking twos complement of B?	9	June2023(R), June2023(S)
6	Write a short note about accumulator register	5	June2023
7	How do a binary adder circuit can be used for the implementation of logical g operation AND, OR, NOT, XOR	8	June2023
8	Show the hardware implementation of the following conditional control 7 statements T1: $C \leftarrow A$ T2: $C \leftarrow B$ , where A, B, C are registers	7	June2023
9	Describe processor organization with diagram using i) scratchpad memory ii) Two-port memory iii) Accumulator register	10,7	June2023(S), June 2022
10	Draw and explain about true/complement circuit?	4	June 2022
11	Give the structure of status register, which is connected to 8bit ALU .	8	June 2023, June2022
12	Design 4-bit combinational logic shifter which will perform the operation given below with 2 controls variable H1&H0? i) Shrl ii) clear iii) Load all bits with 1	6	June 2022
<b>Module III</b>			
1	Draw the flowchart for Booth's Multiplication Algorithm	3	June 2023(S)
2	Explain the classification of pipeline processors	10	June 2023(S)

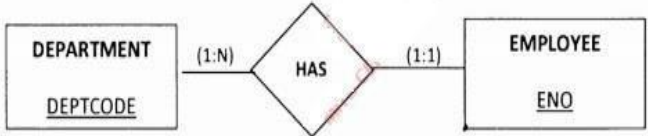
3	Show how the multiplication of 1101 and 1011 is performed by a sequential 4 circuit multiplier	4	June 2023(S)
4	What do you mean by array multiplier, design 3x3 array multiplier and list out its 7 disadvantages	7	June 2023
5	Multiply following using booth's multiplication algorithm: 7 and -3	6	June 2023
6	Describe in detail about data hazards and resolution techniques?	8	June 2023(S), June 2022
7	Describe in detail about instruction hazards and their solution	8	June 2023
8	Draw a 3X2 array multiplier?	3	June 2023(S), June 2022
9	Draw the hardware arrangement for restoring integer division. Show how the 10 division of 1000 by 11 is performed by restoring integer division.*	10	June 2023(S)
10	Draw the flowchart of Booth's multiplication algorithm and multiply -5 X -4 using booths algorithm?	8	June 2022
11	Identify the various types of hazards occurring during the execution of the following program in a pipelined system. Where the pipeline consist of five stages, opcode fetch , instruction decode, operand fetch, execution, store the result. All stages take equal time duration MOV [R1],[R2] MOV R3,[R1] SUB R2,R3 ADD R1,R3 CALL 5000 MOV R2,R3	6	June 2022
12	Explain the various method available to get rid of data hazards inside the system	6	July 2021
	<b>Module IV</b>		
1	Give the advantages and disadvantages of hardwired control over microprogrammed control.	3	June 2023(S)
2	What is a control word? With an example. show how a control word can be 3 defined.	3	June 2023(S)
3	Draw and discuss about PLA control logic?	3	June 2023
4	With a block diagram, explain how control signals are generated using hardwired control	10	June 2023
5	With a diagram, explain how control signals are generated using hardwired control	8	June 2023
6	What are the different elements involved in micro-program control unit explain 6 with a neat diagram	6	June 2023



7	With the help of a flowchart for sign-magnitude addition/subtraction, explain the 10 t steps involved in developing a hardwired control unit	10	June 2023
8	With the help of a diagram explain the functioning of a micro-program sequencer in a micro-programmed controlled processor?	10	June 2023(S), June 2022
9	Compare instruction formats of horizontal and vertical microinstructions?	4	June 2023, June 2022
10	Discuss about sequence register and decoder method of control organization	4	June 2023
11	Explain with an example one flip-flop per state method of control organization?	6	June 2022
<b>Module V</b>			
1	Differentiate between program-controlled I/O and interrupt-driven I/O	3	June 2023(S)
2	Explain the term locality of reference. How is this related to cache memory?	3	June 2023(S), July 2021
3	Why dynamic RAMs need constant refreshing? Give the structure also	3	June 2023
4	Differentiate about memory mapped I/O and I/O mapped I/O?	3	June 2023
5	Explain how interrupts can be used for coordinating I/O transfer.	7	June 2023(S)
6	Outline how Direct Memory Access is implemented? Differentiate between cycle stealing DMA and burst mode DMA.	7	June 2023(S)
7	Give the internal organization of 2MX8 memory module using 512 K X8 static memory chip	6	June 2023
8	Compare Asynchronous DRAMs and Synchronous DRAM	5	June 2023
9	Explain the hit and miss condition occurring during the read and write operation g on cache memory. Also give the importance of dirty bit during the writing operation.	8	June 2023
10	Differentiate centralized and distributed bus arbitration mechanism used in DMA?	6	June 2023
11	How does the various mapping scheme present in cache memory differ from each other.	9	June 2023(S)
12	Explain internal organization of 1 K X 8 memory chip with suitable diagram	5	June 2022

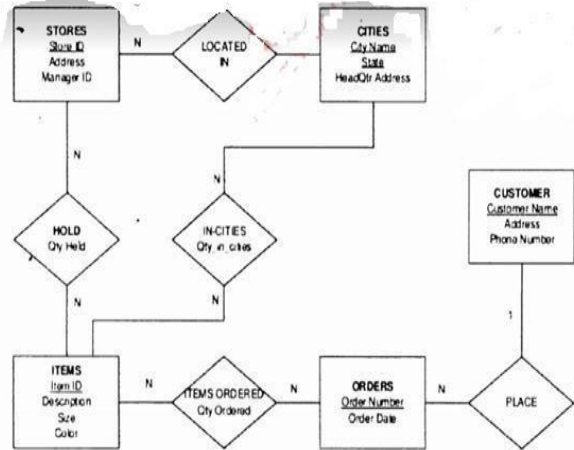
Course code: CST 204

Course Name: Database Management Systems

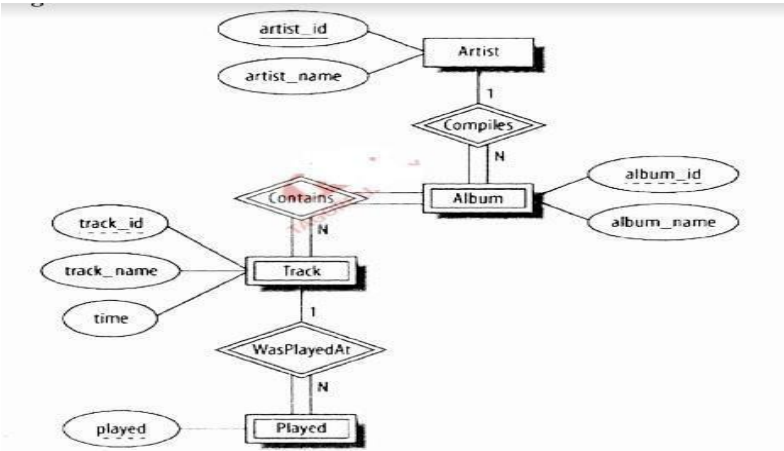
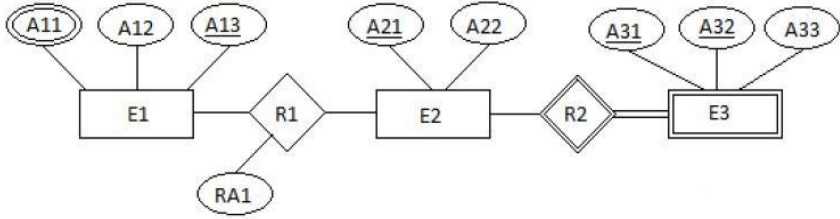
Module I			
Sl. No	Question	Marks	Year
1	List any three categories of users, highlighting any one important characteristic of each category	3	April 2018, July 2021
2	What are the major difference between structured, unstructured and semi structured data.	3	July 2021
3	List out any threes salient features of database systems.	3	JUNE 2017, JUNE 2022
4	With the help of a neat diagram explain the three-schema architecture of DBMS	9	JULY 2017
5	Explain the following terms briefly (a) Participation constraint (b) Overlap Constraint (c) Covering Constraint	9	JULY 2017
6	Can we represent the situation modelled by the ER diagram without relationship “Has”. If so, draw new diagram. If not give reasons (Entities are EMPLOYEE and DEPARTMENT). Attribute names are given under Entity names; Keys are underlined. 	3	JUNE 2017
7	Give <i>good</i> examples (using ER notation) for unary and ternary relationships with a <i>very brief</i> explanation.	3	DEC 2018

8	<p>Consider a scenario where artists act in movies: an artist can act in <i>different</i> movies and movie can have <i>many</i> artists. Assuming suitable attributes show how the situation can be represented using relations with foreign keys. (A relational schema showing primary and foreign keys is sufficient. Minimal number of attributes is required)</p>	3	DEC 2018
9	<p>Consider the bank database given above and answer the following questions</p> <ol style="list-style-type: none"> <li>List the strong (nonweak) entity types in the ER diagram.</li> <li>Is there a weak entity type? If so, give its name, partial key and identifying relationship.</li> <li>What constraints do the partial key and the identifying relationship of the weak entity type specify in this diagram?</li> <li>List the names of all relationship types, and specify the (min, max) constraint on each</li> </ol> <p>Participation of an entity type in a relationship type.</p> <ol style="list-style-type: none"> <li>Suppose that every customer must have at least one account but is restricted to at most two loans at a time, and that a bank branch cannot have more than 1,000 loans. How does this show up on the (min, max) constraints?</li> </ol>	8	June 2023
10	<p>A company has the following scenario: There are a set of salespersons. Some of them manage other salespersons. However, a salesperson cannot have more than one manager. A salesperson can be an agent for many customers. A customer is managed by exactly one salesperson. A customer can place any number of orders. An order can be placed by exactly one customer. Each order lists one or more items. An item may be listed in many orders. An item is assembled from different parts and parts can be common for many items. One or more employees assemble an item from parts. A supplier can supply different parts in certain quantities. A part may be supplied by different suppliers.</p>	7	July 2021
11	<p>Draw an ER diagram based on the following information, •</p> <ul style="list-style-type: none"> <li>Manufacturers have a name, which we may assume is unique, an address, and a phone number</li> <li>Products have a model number and a type. Each product is made by one manufacturer, and different manufacturers may have different products with the same model number. However, you may assume that no manufacturer would have two products with the same model number</li> <li>Customers are identified by their unique social security number. They have email addresses, and physical addresses. Several customers may live at the same (physical)</li> </ul>	7	June 2023

	address, but we assume that no two customers have the same email address • An order has a unique order number, and a date. An order is placed by one customer. For each order, there are one or more products ordered, and there is a quantity for each product on the order.		
12	<p>Draw an ER diagram to model the application with the following assumptions. Specify key attributes of each entity type and (min, max) constraints on each relationship type.</p> <ul style="list-style-type: none"> <li>• Each home uniquely defined by home identifier, street address, city, state, a number of bedrooms and a number of bathrooms and an associated owner.</li> <li>• Each owner has a Social Security Number, first name, last name, phone, and profession.</li> <li>• An owner can spouse one or more homes.</li> <li>• Agents represent owners in the sale of a home. An agent can list many homes, but only one agent can list a home.</li> <li>• An agent has a unique agent number, name, phone number and an associated office.</li> <li>• When an owner agrees to list a home with an agent, a commission and a selling price are determined.</li> <li>• An office has office identifier, phone number, the manager name, address and an optional agent number.</li> <li>• Many agents can work at one office.</li> <li>• A buyer entity type has a Social Security Number, first name, last name, phone, preferences for the number of bedrooms and bathrooms, and a price range.</li> <li>• An agent can work with many buyers, but a buyer works with only one agent.</li> </ul>	14	June 2023
<b>Module II</b>			

1	<p>In the ER diagram below, names of entity sets and relationship are shown in capital and corresponding attributes are listed under each name. Key attributes are underlined. All the participation are total. Use the standard synthesis procedure to convert ER diagram into corresponding relational schema. Clearly show foreign keys and primary keys.</p> 	6	JUNE 2017
2	<p>Consider the following relation schema with referential integrity constraints: STUDENT (<u>rollNo</u>, name, degree, year, sex, deptNo, advisor)  DEPARTMENT (<u>deptId</u>, name, hod, phone)  PROFESSOR (<u>empId</u>, name, sex, startYear, deptNo, phone)  Write SQL DDL statements for the following:</p> <ol style="list-style-type: none"> <li>Create table STUDENT, DEPARTMENT, PROFESSOR including primary and foreign key integrity constraints.</li> <li>Add an address attribute in the table STUDENT</li> </ol> <p>Write an SQL statement to delete the "CS" department. Given the referential integrity constraints, explain what happens when this statement is executed.</p>	10	JUNE 2023
3	<p>Study the tables given below and write relational algebra expressions for queries that follow,</p>	9	JUNE 2017

	<p>STUDENT(<u>ROLLNO</u>,NAME,AGE,GENDER,ADDRESS,ADVISOR) COURSE(COURSEID,CNAME,RESULTS)</p> <p>PROFESSOR(PROFID,PNAME,PHONE)</p> <p>ENROLLMENT(ROLLNO,COURSEID,GRADE)</p> <p>Primary Keys are underlined. ADVISOR is a foreign key referring to PROFESSOR table. ROLLNO and COURSEID in ENROLLMENT are also foreign keys referring to the primary keys with same name.</p> <p>(i) Name of the female students</p> <p>(ii) Name of Male students along with advisor name</p> <p>(iii) Roll Number and name of students who have not enrolled for any course.</p>		
4	<p>Consider the database with primary keys underlined</p> <p>Suppliers(<u>SID</u>, Sname, address)</p> <p>Parts(<u>pid</u>, Pname, color)</p> <p>Catalog(<u>Sid</u>,<u>Pid</u>, Cost)</p> <p>Sid is the key of suppliers, pid is the key of parts, and sid and pid together form the key of the catalog. The catalog relation lists the price charged by suppliers.</p> <p>Write relational algebra for the following queries.</p> <p>(i) Find the names of suppliers who supply some red part.</p> <p>(ii) Find the sids of suppliers who supply some red or green part.</p> <p>(iii) Find the sids of suppliers who supply some red part and some green part.</p>	9	JULY 2017
5	<p>The relation schema for library describing members, books, and issue information is given below. Foreign keys have the same name as primary keys,</p> <p>BOOKS(<u>ACC_NO</u>,ISBN,TITLE,EDITION,YEAR)</p> <p>MEMBERS(<u>MEMBERID</u>,MEMBENAME,MEMBERTYPE)</p> <p>ISSUETO(<u>ACC_NO</u>,<u>MEMBER_ID</u>,DATEOFISSUE)</p>	9	April 2018

	<p>Write relational algebra for the following queries</p> <ul style="list-style-type: none"> <li>(i) ACCESSION NUMBER(S) and Name(s) of third edition books Published in 2018</li> <li>(ii) Name and dates of issue of books taken by a member with name "PRIYA"</li> <li>(iii) Names of books not taken by any member</li> </ul>		
6	<p>Use standard synthesis procedure to generate the set of relations corresponding to the ER Diagram below. Identify primary key and foreign key of generated relations</p>  <p>The ER diagram shows the following entities and relationships:</p> <ul style="list-style-type: none"> <li><b>Artist</b> (Entity): Attributes: <u>artist_id</u>, artist_name</li> <li><b>Album</b> (Entity): Attributes: <u>album_id</u>, album_name</li> <li><b>Track</b> (Entity): Attributes: <u>track_id</u>, track_name, time</li> <li><b>Played</b> (Entity): Attribute: <u>played</u></li> <li><b>Compiles</b> (Relationship): Connects Artist (1) and Album (N)</li> <li><b>Contains</b> (Relationship): Connects Album (1) and Track (N)</li> <li><b>WasPlayedAt</b> (Relationship): Connects Track (1) and Played (N)</li> </ul>	4 4	April 2018 Dec 2018
7	<p>What is entity integrity constraint? Why is it important?</p>	3	May 2019, JUNE 2022
8	<p>Using the following ER diagram, create a relation database. Give your assumptions.</p>  <p>The ER diagram shows the following entities and relationships:</p> <ul style="list-style-type: none"> <li><b>E1</b> (Entity): Attributes: <u>A11</u>, A12, A13</li> <li><b>E2</b> (Entity): Attributes: A21, A22</li> <li><b>E3</b> (Entity): Attributes: A31, A32, A33</li> <li><b>R1</b> (Relationship): Connects E1 and E2</li> <li><b>R2</b> (Relationship): Connects E2 and E3</li> <li><b>RA1</b> (Relationship): Connects E1 and R1</li> </ul>	3	May 2019

9	<p>Consider the following relations for a database that keeps track of business trips of salespersons in a sales office:</p> <p>SALESPERSON(Ssn, Name, StartYear, DeptNo)  TRIP(Ssn, FromCity, ToCity, DepartureDate, ReturnDate, TripId)  EXPENSE(TripId, AccountNo, Amount)</p> <p>a) A trip can be charged to one or more accounts. Specify the foreign keys for this schema, stating any assumptions you make.</p> <p>b) Write relation algebra expression to get the details of salespersons who have travelled between Mumbai and Delhi and the travel expense is greater than Rs. 50000.</p> <p>c) Write relation algebra expression to get the details of salesperson who had incurred the greatest travel expenses among all travels made.</p>	9	MAY 2019
10	<p>Consider the UNIVERSITY database with the following relations:  STUDENT (rollNo, name, degree, year, sex, deptNo, advisor)  DEPARTMENT (deptId, name, hod, phone)  PROFESSOR (empId, name, sex, startYear, deptNo, phone)  COURSE (courseId, cname, credits, deptNo) ENROLLMENT (rollNo, courseId, sem, year, grade) TEACHING (empId, courseId, sem, year, classRoom) PREREQUISITE(preReqCourse, courseID)</p> <p>Write relational algebra expressions for the following queries:</p> <ol style="list-style-type: none"> <li>For each department, find its name and the name, sex and phone number of the head of the department.</li> <li>Find courses offered by each department.</li> <li>Find those students who have registered for all courses offered in the department of Computer Science.</li> <li>Obtain the department Ids for departments with no lady professor.</li> <li>Obtain the rollNo of girl students who have obtained at least one S grade.</li> </ol>	10	June 2023
11	<p>Consider the following schema,  Suppliers (sid, sname, address)  Parts (pid, pname, color)  Catalog (sid, pid, cost)</p> <p>The primary key fields are underlined.</p> <p>Write relational algebra expressions for the following queries:</p> <ol style="list-style-type: none"> <li>Find the name of parts supplied by supplier with sid=105</li> <li>Find the names of suppliers supplying some green part for less</li> </ol>	8	JUNE 2022



	<p>than Rs 1000</p> <p>iii) Find the IDs of suppliers who supply some red or green part</p> <p>iv) Find the names of suppliers who supply some red part</p>		
12	<p>Write SQL DDL statements based on the following database schema (Assume suitable domain types):</p> <p>Employee (eid, name, designation, salary, comp_id)</p> <p>Company (comp_id, cname, address, turnover)</p> <p>i) Create the above mentioned tables assuming each company has many employees. Mention the primary key, foreign key and not null constraints.</p> <p>ii) Insert values into both the tables. Mention in which order insertions will be carried out. ii) Modify the table Employee to include a new column “years_of_exp” iv) Increment the salary of employees whose salary is less than Rs25000 by 5%</p>	8	JUNE 2022
<b>Module III</b>			
1	What is an assertion? How they differ from triggers?	4	June2023
2	<p>Consider the following relation schema and write SQL queries to find: EMPLOYEE(Fname, Minit, Lname, SSN, Bdate, Address, Sex, Salary SuperSSN, Dno) DEPARTMENT(Dname, Dnumber, MgrSSN, MgrStartDate) DEPT_LOCATIONS(Dnumber, Dlocaions) PROJECT(Pname, Pnumber, Plocation,Dnum) WORKS_ON(ESSN, Pno,Hours)</p> <p>i. Retrieve the name and address of all employees who work for the 'Research' department.</p> <p>ii. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.</p> <p>iii. Retrieve the name of each employee who works on all the projects controlled by department number 5.</p> <p>iv. Make a list of all project numbers for projects that involve an employee whose last name is 'Smith' as a worker or as a manager of the department that controls the project.</p> <p>v. Retrieve the SSN of all employees who work on project number 1, 2, or 3.</p>	10	June203

3	<p>Consider the following relations</p> <p>FACULTY(FNO,NAME,GENDER,AGE,SALARY,DNUM)</p> <p>DEPARTMENT(DNO,DNAME,DPHONE)</p> <p>COURSE(CNO,CNAME,CREDITS,ODNO)</p> <p>TEACHING(FNO,CNO,SEMESTER)</p> <p>DNUM i a foreign key that identifies the department to which a faculty belongs.ODNO is a foreign key identifying the department that offersthe course.Write SQL expressions for the following queries</p> <p>Course numbers and names of 3-credited courses offered by “CS”</p>	9	April 2018
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	<p>Department.</p> <p>Name of faculty members teaching 3 subjects.</p> <p>Nam of departments along with number of courses offered by each of them,in the increasing order of number o courses,Exclude department whichdo not offer any course.</p>		
4	<p>For the relations listed below,Write SQL statements for the update thatfollow(Assume suitable domain names for attributes)</p> <p>ALBUMS(ALBUM_ID,ALBUM_NAME,PRODUCED_BY,YEAR)</p> <p>SONGS(SONG_ID,SONG_START,DURATION,ALBUM_ID)</p> <p>(iv) Update the year of the album with name “SUHANA RATH” to 2018</p> <p>(v) Delete the album “yadon ki barish” along with all songs in it.</p>	5	April 2018
5	<p>In the following tables ADVISOR and TAUGHTBY are foreign keys referring to the table PROFESSOR. ROLLNO and COURSEID in ENROLLMENT refer to tables with primary keys of the same name.</p> <p>STUDENT(ROLLNO,NAME,AGE,GENDER,ADDRESS,ADVISOR)</p> <p>COURSE(COURSEID,CNAME,TAUGTBY,CREDITS)</p> <p>PROFESSOR(PROFID,PNAME,PHONE)</p> <p>ENROLLMENT(ROLLNO,COURSEID,GRADE)</p> <p>Write SQL expressions for the following queries</p> <p>(iv) Name of course taught by prof “raju”</p> <p>(v) Name of students who have not enrolled for any coursetaught by prof “ganaphy”</p> <p>(vi) For each course, name of course and number of students enrolled for the course</p>	9	JUNE 2017

6	<p>With the help of an example, illustrate the use of SQL TRIGGER.</p> <p>Consider a disk with block size <math>B = 512</math> bytes. A block pointer is <math>P = 6</math> bytes long and a record pointer is <math>PR = 7</math> bytes long. A file has <math>r = 30,000</math> EMPLOYEE records of fixed length. Each record has the following fields: Name (30 bytes), Ssn (9 bytes), Department_code (9 bytes), Address (40 bytes), Phone (10 bytes), Birth_date (8 bytes), Sex (1 byte), Job_code (4 bytes), and Salary (4 bytes, real number). An additional byte is used as a deletion marker.</p> <ol style="list-style-type: none"> <li>Calculate the record size <math>R</math> in bytes.</li> <li>Suppose that the file is ordered by the key field Ssn and we want to construct a primary index on Ssn. Calculate The number of first-level index entries and the number of first-level index blocks</li> <li>Calculate the number of levels needed if we make it into a multilevel index.</li> </ol>	9	June 2023
7	Illustrate structure of B-Tree and B+ Tree and explain how they are different? 5	5	July 2021
8	<p>A file has <math>r = 20000</math> STUDENT records of fixed length. Each record has the following fields: NAME (30 bytes), SSN (9 bytes), ADDRESS (40 bytes), PHONE(9 bytes), BIRTHDATE (8 bytes), GENDER (1 byte), DEPTID (4 bytes), CLASSCODE (4 bytes), and PROGID (3 bytes). An additional byte is used as a deletion marker. The file is stored on the disk with block size <math>B = 512</math> bytes,</p> <p>Calculate the record size <math>R</math> in bytes.</p> <p>Calculate the blocking factor <math>bfr</math> and the number of file blocks <math>b</math> assuming an unspanned organization.</p> <p>Calculate the average time it takes to find a record by doing a linear search</p>	3	JUNE 2022
9	<p>For the relation schema below, give an expression in SQL for each of the queries that follows: employee (ID, person_name, street, city) works (ID, company_name, salary) company ( company_name, city) manages (ID, manager_id)</p> <ol style="list-style-type: none"> <li>Find the employees whose name starts with 'C'</li> <li>Find the name of managers of each company</li> <li>Find the ID, name, and city of residence of employees who works for "First Bank Corporation" and earns more than Rs50000</li> <li>Find the name of companies whose employees earn a higher salary, on average, than the average salary at "First Bank Corporation"</li> </ol>	8	JUNE 2022
10	Differentiate correlated and non-correlated nested queries with suitable examples	6	JUNE 2022
11	What is multi-level indexing? How does it improve the efficiency of searching an index file?	8	JUNE 2022
12	Insert the following keys, in the order given, into a B -tree of order 3: { 10, 50, 20, 5, 22, 25 }	6	JUNE 2022

**Module IV**

1	Define minimal cover. Let the given set of functional dependencies be: $E: \{B \rightarrow A, D \rightarrow A, AB \rightarrow D\}$ . Find the minimal cover of E	8	June 2023
2	Explain with example 2NF, 3NF and BCNF.	8	June 2023
3	Given a relation R(A1,A2,A3,A4,A5) with functional dependencies A1- $\rightarrow A2A4$ and $A4 \rightarrow A5$ check if the decomposition $A(A1,A2,A3)R2(A1,A4)$ and $R3(A2,A4,A5)$ is lossless	9	APRIL 2018
4	Briefly discuss BCNF and three #NF with suitable example	4	APRIL 2018
5	Give an example for a relation that has insertion, deletion and update anomalies. Which type(S) of functional dependency can formally model these anomalies?Quote one such dependency with your example	3	JUN E 2017
6	Consider a relation R(A,B,C,D,E,F) with A as the only key. Assume that dependencies $E \rightarrow F$ , $C \rightarrow DEH$ hold on R.  Is R in 2NF?if not,Decompose into 2NF Is R in	6	JUN E 2017

	3NF?if not, decompose to 3NF		
7	Define Boyce code Normal form(BCNF).Give an example of a relation that is in 3NF but not in BCNF	3	JULY 2017,JUNE 2022
8	Let $E=\{B \rightarrow A, D \rightarrow A, AB \rightarrow D\}$ is a set of functional dependencies. Find a minimal cover for E	3	JULY 2017
9	Write an algorithm to compute the attribute closure of a set of attributes (X) under a set of functional dependencies (F). Explain three uses of attribute closure algorithm.	10	July 2021
10	Suppose, a relational schema R (P,Q, R, S) and set of functional dependencies F and G are as follow: $F : \{ P \rightarrow Q, Q \rightarrow R, R \rightarrow S \}$ $G : \{ P \rightarrow QR, R \rightarrow S \}$ . Check the equivalency of functional dependencies F and G.	3	JUNE 2022
11	Consider a relation R(A, B, C, D, E) with FDs $AB \rightarrow C, AC \rightarrow B, BC \rightarrow A, D \rightarrow E$ . Determine all the keys of relation R. Also decompose the relation into collections of relations that are in BCNF.	8	JUNE 2022
12	Consider a relation schema R (A,B,C,D) with the following functional dependencies $A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow B$ . Determine whether the decomposition of R into $R_1 ( A , B )$ , $R_2 ( B , C )$ and $R_3 ( B , D )$ is lossless or lossy. Write the complete steps.	6	JUNE 2022
<b>Module V</b>			
1	Explain the concept behind the following (i)Log based recovery(ii)Deferred database modification	10	JULY 2017
2	What is a schedule? Define the concepts of recoverable, cascade less and strict schedules, and compare them in terms of their recoverability.	8 6	June 2023 DEC 2018
3	Argue that two-phase ensures serializability	4	JUNE 2017, APRIL 2018
4	Illustrate lost update and dirty read problem with the help of an example	4	JUNE 2017
5	List out salient features of big data	3 3 4 3	JJUNE 2017, APRIL 2018 DEC 2018 MAY 2019
6	How is GIS databases different from conventional databases	3	JUNE 2017, APRIL 2018

7	Discuss four ACID properties and its importance	6	APRIL 2018,JUNE 2022
8	How conversions of locks are achieved in concurrency control?	3	July 2021
9	Check whether the given schedules are conflict serializable or not i) S1 : R1(X) , R2(X) , R1(Y) , R2(Y) , R3(Y) , W1(X) , W2(Y) ii) S2 : R1(X) , R2(X) , R2(Y) , W2(Y) , R1(Y) , W1(X)	6	JUNE 2022
10	What is two phase locking protocol? How does it guarantee serializability?	6	JUNE 2022
11	Explain the need for multimodal database. List the important characteristics of ArangoDB.	7	June 2023
12	What are the main characteristics of NOSQL systems in the areas related to data models and query languages?	8	JUNE 2022

## CST 206 OPERATING SYSTEMS

<b>MODULE 1</b>			
<b>Sl. No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU/KU Month/Year</b>
1	Write the difference between timesharing systems and multiprogrammed systems	3	KU SEP 2020
2	How many times “Welcome” will be printed for the following code void main() { fork(); fork(); fork(); printf (“Welcome\n”);}	3	KU SEP 2020, KTU JUNE 2022
3	What is the purpose of a system call? Describe how a system call made by a user application is handled?	7	KTU JUNE 2022
4	Explain the micro kernel approach to system design with the help of a diagram. How do user programs and kernel services interact in microkernel architecture	7	KTU JUNE 2022
5	Explain layered architecture in OS. Point out its advantages and	5	KU SEP 2020
6	What are the major activities of an operating system with regard to file management	3	KTU JUNE 2023
7	Write the operations taking place during the booting of a system	3	KTU JUNE 2023
8	What is an Operating System? Explain any 3 types of Operating System	7	KTU JUNE 2023
9	What is a system call? What are the different ways to pass parameters to system call? List basic types of system call with examples.	7	KTU JUNE 2023
10	Write notes on the following operating system structures. (i) Microkernel structure (ii) Simple Structure (iii) Layered Structure	8	KTU JUNE 2023
11	Describe the differences between symmetric and asymmetric multiprocessing. What are the advantages and disadvantages of multiprocessor systems?	6	KTU JUNE 2023
12	What are the major activities of an operating system with regard to file management	3	KTU JUNE 2023



**MODULE 2**

Sl. No	Questions	Marks	KTU/KU Month/Year																								
1	Discuss the different states of a process.	3	KU MARCH 2017 KU JULY 2017 KU APRIL 2018 KU DEC 2018 KTU JUNE 2023																								
2	What is meant by Process Control Block? Discuss it's significance.	9	KU MARCH 2017 KU MAY 2017 KU JULY 2017 KU DEC 2018																								
3	<p>Draw the Gantt Chart , find the average waiting time for the following algorithms</p> <p>i) FCFS ii) Pre-emptive Priority iii) Non-pre-emptive priority</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Process</th> <th style="text-align: center;">Arrival Time(ms)</th> <th style="text-align: center;">Burst time(ms)</th> <th style="text-align: center;">Priority</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">P1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">8</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">P2</td> <td style="text-align: center;">2</td> <td style="text-align: center;">6</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">P3</td> <td style="text-align: center;">2</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">P4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">9</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">P5</td> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> </tr> </tbody> </table>	Process	Arrival Time(ms)	Burst time(ms)	Priority	P1	0	8	4	P2	2	6	1	P3	2	1	2	P4	1	9	2	P5	3	3	3	9	KU DEC 2018, KTU JUNE 2022
Process	Arrival Time(ms)	Burst time(ms)	Priority																								
P1	0	8	4																								
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P4	1	9	2																								
P5	3	3	3																								

4	<p>Find the average waiting time and average turnaround time for the processes given in the table below using:- i) SRT scheduling algorithm ii) Priority scheduling algorithm</p> <table border="1"> <thead> <tr> <th>Process</th> <th>Arrival Time (ms)</th> <th>CPU Burst Time (ms)</th> <th>Priority</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>0</td> <td>5</td> <td>3</td> </tr> <tr> <td>P2</td> <td>2</td> <td>4</td> <td>1</td> </tr> <tr> <td>P3</td> <td>3</td> <td>1</td> <td>2</td> </tr> <tr> <td>P4</td> <td>5</td> <td>2</td> <td>4</td> </tr> </tbody> </table>	Process	Arrival Time (ms)	CPU Burst Time (ms)	Priority	P1	0	5	3	P2	2	4	1	P3	3	1	2	P4	5	2	4	9	KU MAY 2019
Process	Arrival Time (ms)	CPU Burst Time (ms)	Priority																				
P1	0	5	3																				
P2	2	4	1																				
P3	3	1	2																				
P4	5	2	4																				
5	What is meant by race condition? Explain with the help of an example.	3	KTU JUNE 2022																				
6	List and explain the various synchronous and asynchronous methods of message passing in IPC.	3	KTU JUNE 2022																				
7	<p>Assume you have the following jobs in a system that to be executed with a single processor. Now,</p> <table border="1"> <thead> <tr> <th>Process ID</th> <th>Arrival Time</th> <th>Burst Time (ms)</th> </tr> </thead> <tbody> <tr> <td>P0</td> <td>0</td> <td>75</td> </tr> <tr> <td>P1</td> <td>10</td> <td>40</td> </tr> <tr> <td>P2</td> <td>10</td> <td>25</td> </tr> <tr> <td>P3</td> <td>55</td> <td>30</td> </tr> <tr> <td>P4</td> <td>95</td> <td>45</td> </tr> </tbody> </table> <p>i) Create a Gantt chart illustrating the execution  ii) Find the average waiting time  iii) Find the average turnaround time</p> <p>For the above processes, when the system uses  a) Preemptive Scheduling    b) RR Scheduling (Time Quantum = 15 ms)</p>	Process ID	Arrival Time	Burst Time (ms)	P0	0	75	P1	10	40	P2	10	25	P3	55	30	P4	95	45	8	KTU JUNE 2023		
Process ID	Arrival Time	Burst Time (ms)																					
P0	0	75																					
P1	10	40																					
P2	10	25																					
P3	55	30																					
P4	95	45																					
8	Explain the different states of a process and transition between them with the help of a diagram	5	KTU JUNE 2022																				
9	Explain the different buffering mechanisms used in message passing system	3	KTU JUNE 2023																				
10	Define the parameters for multilevel feedback queue scheduling? How it is better compared to multilevel queue scheduling?	3	KTU JUNE 2023																				
11	With an example, illustrate the interprocess communication using Shared memory	7	KTU JUNE 2023																				
12	What are threads? What are the benefits of multithreaded programming? List the ways of establishing relationship between user threads and kernel thread	6	KTU JUNE 2023																				

**MODULE 3**

<b>MODULE 3</b>			
1	Explain resource allocation graph with an example	8	KU MARCH 2017,KTU JUNE 2022
2	Consider a banking system that maintains an account balance with two functions: deposit (amount) and withdraw (amount). These two functions are passed the amount that is to be deposited or withdrawn from the bank account balance. Assume that a husband and wife share a bank account. Concurrently, the husband calls the withdraw() function and the wife calls deposit(). Describe how a race condition is possible and what might be done to prevent the race condition from occurring.	6	KU JUNE 2017
3	What are the conditions which may lead to deadlock?	4	KU JUNE 2017
4	What is Dining Philosopher's Problem? Explain.	5	KU JULY 2017,KTU JUNE 2022 KTU JUNE 2023
5	How can test and set instruction be used to ensure mutual exclusion?	3	KU APRIL 2018
6	How does the signal() operation associated with monitors differ from the corresponding operation defined for semaphores?	3	KU APRIL 2018
7	What do you mean by deadlock? What are the four necessary conditions for a deadlock to occur?	3	KU APRIL 2018
8	Consider a system with four processes P1, P2, P3, P4, and four types of resources R1, R2, R3, R4. The maximum no: of instances of resources of each type are 5, 7, 7 and 7 respectively. What will be the order of processing of jobs if the allocated matrix and the maximum claim (that each process can claim) matrix are as given below.	6	KU APRIL 2018

	<table border="1"> <thead> <tr> <th colspan="5">Allocated Matrix</th> <th colspan="4">Maximum Claim</th> </tr> <tr> <th></th> <th>R1</th> <th>R2</th> <th>R3</th> <th>R4</th> <th>R1</th> <th>R2</th> <th>R3</th> <th>R4</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>2</td> <td>1</td> <td>3</td> <td>2</td> <td>3</td> <td>5</td> <td>6</td> <td>4</td> </tr> <tr> <td>P2</td> <td>0</td> <td>0</td> <td>1</td> <td>2</td> <td>1</td> <td>3</td> <td>4</td> <td>6</td> </tr> <tr> <td>P3</td> <td>1</td> <td>2</td> <td>1</td> <td>1</td> <td>1</td> <td>4</td> <td>3</td> <td>2</td> </tr> <tr> <td>P4</td> <td>1</td> <td>1</td> <td>0</td> <td>2</td> <td>2</td> <td>3</td> <td>1</td> <td>2</td> </tr> </tbody> </table>	Allocated Matrix					Maximum Claim					R1	R2	R3	R4	R1	R2	R3	R4	P1	2	1	3	2	3	5	6	4	P2	0	0	1	2	1	3	4	6	P3	1	2	1	1	1	4	3	2	P4	1	1	0	2	2	3	1	2		
Allocated Matrix					Maximum Claim																																																				
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P4	1	1	0	2	2	3	1	2																																																	
9	<p>Consider the following snapshot of a system with five processes P0,P1, P2, P3, P4 and four resources A,B,C and D</p> <table border="1"> <thead> <tr> <th rowspan="2">Process</th> <th>Max</th> <th>Allocation</th> <th>Available</th> </tr> <tr> <th>A B C D</th> <th>A B C D</th> <th>A B C D</th> </tr> </thead> <tbody> <tr> <td>P0</td> <td>0 2 1 0</td> <td>0 1 1 0</td> <td>1 5 2 0</td> </tr> <tr> <td>P1</td> <td>1 6 5 2</td> <td>1 2 3 1</td> <td></td> </tr> <tr> <td>P2</td> <td>2 3 6 6</td> <td>1 3 6 5</td> <td></td> </tr> <tr> <td>P3</td> <td>0 6 5 2</td> <td>0 6 3 2</td> <td></td> </tr> <tr> <td>P4</td> <td>0 6 5 6</td> <td>0 0 1 4</td> <td></td> </tr> </tbody> </table> <p>Using Banker's algorithm, answer the following questions:-</p> <p>i) How many instances of resources A, B, C, D are there?</p> <p>ii) What is the content of Need matrix?</p> <p>iii) Is the system in a safe state? If it is, find the safe sequence.</p>	Process	Max	Allocation	Available	A B C D	A B C D	A B C D	P0	0 2 1 0	0 1 1 0	1 5 2 0	P1	1 6 5 2	1 2 3 1		P2	2 3 6 6	1 3 6 5		P3	0 6 5 2	0 6 3 2		P4	0 6 5 6	0 0 1 4		9	KU 2019, KU 2020 DEC SEP																											
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10	What do you mean by deadlock? What are the four necessary conditions for a deadlock to occur? Describe various deadlock prevention mechanisms.	8	KTU JUNE 2023																																																						
11	What is a semaphore? Describe how semaphores can be used as a process synchronisation mechanism?	7	KTU JUNE 2023																																																						
12	Consider the following snapshot of the system with five processes P1, P2, (7) P3,P4,P5 and four resources A, B, C, D. Using Bankers Algorithm, check whether the system is in safe state or not.	7	KTU JUNE 2023																																																						

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

**MODULE 4**

1	What is the function of a translation look-aside buffer (TLB).	5	KU JUNE 2017,KTU JUNE 2022																		
2	Compare the memory organization schemes of contiguous memory allocation, pure segmentation, and pure paging with respect to the following issues: i. External fragmentation ii. Internal fragmentation iii. Ability to share code across processes	6	KU JUNE 2017,KTU JUNE 2022																		
3	With a diagram, explain how paging is done with TLB.	6	KU APRIL 2018,KTU JUNE 2022																		
4	Differentiate logical address and physical address with an example.	4	KU MAY 2019 KU DEC 2019 KTU JUNE 2023																		
5	Does paging suffer from fragmentation? Explain.	6	KU MAY 2019 KU SEP 2020																		
6	Consider the following page reference string : 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0 Indicate page faults and calculate total number of page faults for FIFO algorithm, assuming that number of frames as three and four. Remember initially all the frames are empty. Check whether Belady's anomaly happens.	7	KU SEP 2020																		
7	Calculate the number of page faults for the following reference string with three page frames, using the following algorithm. 9,2,3,1,2,5,3,4,6,9,9,1,0,5,4,6,2,3,0,1 (i)FIFO (ii)Optimal (iii)LRU	9	KTU JUNE 2022																		
8	Explain the terms (i) Dynamic Loading (ii) Dynamic Linking	3	KTU JUNE 2023																		
9	With the help of a diagram explain how logical address is translated to physical address in case of segmentation scheme. Consider the following segment table of a process. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Segment</th> <th>Base</th> <th>Limit</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>219</td> <td>600</td> </tr> <tr> <td>1</td> <td>2300</td> <td>14</td> </tr> <tr> <td>2</td> <td>90</td> <td>100</td> </tr> <tr> <td>3</td> <td>1327</td> <td>580</td> </tr> <tr> <td>4</td> <td>1952</td> <td>96</td> </tr> </tbody> </table> Compute the resultant physical addresses for the following logical addresses. (i) 0, 430 (ii) 1, 10 (iii) 2,500 (iv) 3, 400 (v) 4, 112	Segment	Base	Limit	0	219	600	1	2300	14	2	90	100	3	1327	580	4	1952	96	5	KTU JUNE 2023
Segment	Base	Limit																			
0	219	600																			
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10	consider the following page reference stream, R:3, 2, 4,3, 4,2,2,3, 4, 5, 6,7, 7, 6, 5, 4, 5, 6,7,2, 1. Assuming demand paging with three frames, how many page faults would occur for the following page replacement algorithms. i) LRU replacement ii) FIFO replacement iii) optimal replacement	9	KTU JUNE 2023
11	Define Demand Paging. Explain Swapping with a neat diagram	6	KTU JUNE 2023
12	Consider a fixed partitioned memory management scheme with fixed partitions (S) are 150K,300K,550K,400K,250K and 200K (in order). Five processes are ready for execution each with memory requirement as P1(240K), p2(120K), P3(380K), P4(300K) and P5(350K). Write the allocation in each of the following cases and calculate the internal fragmentation and external fragmentation (if any) in each case. (i) First Fit (ii) Best Fit (iii) Worst Fit	8	KTU JUNE 2023

### MODULE 5

1	Explain any two file allocation methods	5	KU DEC 2019
2	Write short notes on protection domain	6	KU SEP 2020
3	Differentiate physical formatting and logical formatting of magnetic disk	6	KU SEP 2020
4	Describe linked and indexed allocation methods for files with the help of neat diagrams	10	KTU JUNE 2022
5	Suppose that a disk drive has 200 cylinders numbered from 0 to 199 and the current position of the head is at cylinder 100. For the given disk queue of requests:20,89,130,45,120, and 180 draw the head movement in FCFS, SSTF, CSCAN disk scheduling algorithm and compute the total head movements( in cylinders) in each.	9	KTU JUNE 2022
6	List out the logical structures of a directory with figure	5	KTU JUNE 2023
7	With neat sketches illustrate the following disk space allocation algorithms (i) Contiguous allocation (ii) Linked allocation (iii) Indexed allocation?	9	KTU JUNE 2023
8	Discuss Protection. Write notes about the protection strategies provided for files.	6	KTU JUNE 2023

9	Consider a disk queue with requests for VO to blocks on cylinders 98, 183, 41,122, 14, 124,65,67. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Find out the total head movement incurred while servicing these requests, if following scheduling algorithms are used-(i) FCFS (i) SSTF (ii) C-SCAN (iv) LooK	8	KTU JUNE 2023
10	Discuss the steps in handling a page fault	3	KTU JUNE 2023
11	How is disk formatting done	3	KTU JUNE 2023



## HUT 200 PROFESSIONAL ETHICS

<b><u>Module 1</u></b>			
SI No	Questions	Marks	KTU,Year
1	What are the two approaches to Engineering ethics?	3	July 2021
2	List two methods of developing self confidence.	3	July 2021
3	Explain about academic integrity and write the five pillars of academic integrity.	14	July 2021
4	Explain the core elements of a strong work ethics.	14	July 2021
5	Why sharing and caring are important for a professional?	3	Dec 2020
6	Define work Ethics .	3	Dec 2020
7a	With the help of examples, distinguish between 'morality' and 'ethics' .	7	Dec 2020
b	Explain the different aspects of academic integrity	7	Dec 2020
8 a	Explain the different types of human value	7	Dec 2020
b	Explain the role of Co-operation and commitment in ethical practice	7	Dec 2020
8	Define empathy. What is the difference between empathy and sympathy	3	Dec 2021
9	What is a civic virtue and how is it related to respect for others?	3	Dec 2021
10a	Explain the role of caring and sharing in a workplace	5	Dec 2021
b	How integrity plays' a major role in work ethics. Discuss with suitable examples.	9	Dec 2021
11a	Explain the need of cooperation and commitment	8	Dec 2021
b	Write a note on "Social Expectations"	6	Dec 2021
<b><u>Module 2</u></b>			
SI No	Questions	Marks	KTU,Year
1	What are the situations when moral dilemmas arise?	3	July 2021

2	What are the types of ethics depending upon the morality of humanity?	3	July 2021
3 a	Explain the three main levels of moral developments, devised by Carol Gilligan.	7	July 2021
b	Discuss on three types of inquiries.	7	July 2021
4	List and explain the varieties of moral issues.	14	July 2021
5	What is moral autonomy?	3	Dec 2020
6	List out the models of professional role	3	Dec 2020
7a	Explain the various reasons for an employ'ee to behave unethically in an organisation.	7	Dec 2020
b	What are the logical steps in solving moral dilemma?	7	Dec 2020
8a	Compare Gilligan's theory with Kohlberg theory on moral development	7	Dec 2020
b	Explain the term consensus and controversy in Engineering ethics.	7	Dec 2020
9	Compare and contrast tradition and custom. Give an example	3	Dec 2021
10	Explain Normative Senses	3	Dec 2021
11 a	What is professionalism ?	4	Dec 2021
11 b	Discuss the motives of professionalism and the models for professional engineers.	10	Dec 2021
12	Compare and Contrast Kohlberg's and Gilligan's Theories with real life examples.	14	Dec 2021

### **Module 3**

<b>Sl No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU,Year</b>
1	What are the advantages of codes of ethics?	3	July 2021
2	Differentiate between copyright and trademark.	3	July 2021
3	Explain about Bhopal Gas Tragedy and write its cause and fatal effect.	14	July 2021
4	Explain the Babylons Building Code and The United States Steamboat Code.	14	July 2021
5	List out the models of professional roles.	3	Dec 2020
6	Define plagiarism	3	Dec 2020

5 a	Explain the role of 'Codes of Ethics' in the service life of a professional Engineer.	7	Dec 2020
b	Explain the moral, conceptual, and factual issues that lead to challenger tragedy of 1986.	7	Dec 2020
6a	Evaluate the importance of accountability in a professional's life	7	Dec 2020
b	Evaluate how an Engineer can be a responsible experimenter.	7	Dec 2020
8	Why are codes of ethics important?	3	Dec 2021
9	Explain the term "Balanced outlook on law	3	Dec 2021
10	What are the different roles and functions of “code of ethics”	14	Dec 2021
11	Explain Bhopal gas tragedy. Discuss the violation of morals, ethics, and professional codes of standard in it.	14	Dec 2021

#### Module 4

Sl No	Questions	Marks	KTU,Year
1	Differentiate between copyright and trademark.	3	July 2021
2	What is meant by Occupational Crime?	3	July 2021
3 a	Explain the methods for managing conflict.	7	July 2021
b	Explain the types of Collective Bargaining.	7	July 2021
4	Explain the steps taken for conflict management.	14	July 2021
5	What is the significance of intellectual property rights?	3	Dec 2020
6	What is the difference between a bribe and a gift?	3	Dec 2020
7 a	Explain the various justifications for confidentiality.	7	Dec 2020
b	Explain how you can improve collegiality in an organisation where you are presently employed.	7	Dec 2020
8a	Explain the significance of different types of Authority in an organisation.	7	Dec 2020
b	Discuss about the various rights of an engine	7	Dec 2020
9	What is confidentiality and why is it needed.	3	Dec 2021
10	Explain collegiality and loyalty.	3	Dec 2021

11a	Discuss methods improve collegiality and loyalty	7	Dec 2021
b	Explain collective bargaining	7	Dec 2021
12a	What are occupational crimes and examples	7	Dec 2021
b	How conflicts can be managed in workplace ?	7	Dec 2021
<b><u>Module 5</u></b>			
<b>Sl No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU,Year</b>
1	List any three characteristics of Business Ethics.	3	July 2021
2	List any three ethical responsibilities of consulting engineer	3	July 2021
3 a	Explain the characteristics of Business ethics.	7	July 2021
b	Explain the role of computers in technological development.	7	July 2021
4	Explain the advantages and limitations of MNCs	14	July 2021
5	What is business ethics?	3	Dec 2020
6	Differentiate between patent and trade secret	3	Dec 2020
7 a	Explain human centred Environmental ethics with nature centred ethics.	7	Dec 2020
b	Explain the different types of issues in computer ethics.	7	Dec 2020
8 a	Discuss about the role of engineers as expert witness.	7	Dec 2020
b	What are the various conflict situations faced by a project manager managing a work site?	7	Dec 2020
9	What is environmental ethics?	3	Dec 2021
10	Justify the need of moral leadership in today's business environment.	3	Dec 2021
11	Discuss in detail about the moral and ethical issues involved in the use of computers and internet with examples.	14	Dec 2021
12	Discuss the following in detail a) Engineers as consultants b) Engineers as expert witnesses	14	Dec 2021

**Course Code: MCN 202**

**Course Name: CONSTITUTION OF INDIA**

<b><u>Module 1</u></b>			
<b>Sl No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU Year</b>
1	Explain the salient features of Indian Constitution	3	July 2021 (FN)
2	What do you mean by federal system of government? Give an example	3	July 2021 (FN)
3 a	What is preamble? Explain the importance of preamble in the implementation of Constitution	6	July 2021 (FN)
b	Explain different ways for acquiring Indian citizenship.	8	July 2021 (FN)
4a	Explain the salient features of Indian constitution.	8	July 2021 (FN)
b	Write notes on methods of termination of Indian citizenship.	6	July 2021 (FN)
5	Define Constitution. Why is it necessary for a Country	3	July 2021 (AN)
6	Explain the need and importance of Preamble	3	July 2021 (AN)
7 a	What is Preamble? Can it be used for the interpretation of the constitution? Also explain its significance	8	July 2021 (AN)
b	Describe the salient features of Indian Constitution	6	July 2021 (AN)
8 a	Give detail account on the historical background of Indian Constitution	6	July 2021 (AN)
b	What is citizenship? Discuss the various methods of acquiring Indian citizenship	8	July 2021 (AN)
9 a	List out the salient features of Indian Constitution	7	June 2023
b	Discuss the various aspects in the preamble of Indian Constitution	7	June 2023
10 a	Discuss the various methods to acquire Indian citizenship	8	June 2023
b	Explain any three citizenship amendment act	6	June 2023

**Module 2**

<b>Sl No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU,Year</b>
1	Explain the concept of “ Equality before Law”	3	July 2021 (FN)
2	“No person shall be prosecuted and punished for the same offence more than once”. Discuss this clause	3	July 2021 (FN)
3 a	Explain the concept of appeal by special leave	6	July 2021 (FN)
b	Discuss the classification of Directive Principles of State Policy in detail	8	July 2021 (FN)
4 a	What do you mean by right against exploitation? Explain	7	July 2021 (FN)
b	Distinguish between fundamental rights and directive principles of state policy	7	July 2021 (FN)
5	How is State defined under Article 12 of Indian Constitution	3	July 2021 (AN)
6	What is the basic difference between Fundamental Rights and Directive Principles of State Policy?	3	July 2021 (AN)
7 a	Describe the Rights to Constitutional Remedies and explain its significance	6	July 2021 (AN)
b	Explain the needs and importance of fundamental duties of Indian Citizen	8	July 2021 (AN)
8 a	What are Fundamental Rights? Examine each of them	8	July 2021 (AN)
b	State the Directive Principles of State Policy and explain its significance	6	July 2021 (AN)
9 a	What are the features of fundamental rights? Explain any two types of fundamental right.	9	June 2023
9 b	List out the Gandhian ideology included in directive principle	5	June 2023
10 a	What are the duties of Indian Citizens according to Constitution?	8	June 2023
10 b	List out the features of directive principles of state	6	June 2023

**Module 3**

<b>Sl No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU,Year</b>
1	Explain the procedure for impeachment of the President of India.	3	July 2021 (FN)
2	Explain the role of the Attorney General for India	3	July 2021 (FN)
3 a	Explain the powers of President of India.	8	July 2021 (FN)
b	Explain the constitutional position and essential qualifications of Vice-president of India.	6	July 2021 (FN)
4 a	Explain the qualification and disqualification for membership in the house of the people.	8	July 2021 (FN)
b	Explain various kinds of jurisdiction of Supreme Court	6	July 2021 (FN)
5	Explain the procedure for impeachment of the President of India.	3	July 2021 (AN)
6	Mention the Powers and Functions of the Attorney General for India	3	July 2021 (AN)
7 a	Explain various kinds of jurisdiction of Supreme Court of India	7	July 2021 (AN)
b	Explain the constitutional duties and powers of the Prime Minister	7	July 2021 (AN)
8 a	Explain the functions and powers of the President of India.	8	July 2021 (AN)
b	Explain in detail about the Union Government structure and functions	6	July 2021 (AN)
9.a	Describe the procedure for election and removal of the president of India	8	June 2023
9.b	Explain any three functions of Parliament	6	June 2023
10.a	Explain the powers and functions of the Prime Minister	9	June 2023
10.b	Supreme Court may in its discretion to grant to special leave to appeal. Examine the situation	5	June 2023

**Module 4**

<b>Sl No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU,Year</b>
1	Explain the procedure for the appointment of chief minister	3	July 2021 (FN)
2	Explain the duties of advocate general of the state.	3	July 2021 (FN)
3 a	Explain the powers and functions of the Governor of Kerala state.	6	July 2021 (FN)
b	Explain the composition and duration of state legislative council	8	July 2021 (FN)
4 a	Explain the qualification and disqualification for membership of the state legislature	7	July 2021 (FN)
b	Explain the constitution of High court. What are the essential qualifications required for the appointment of High court Judge?	7	July 2021 (FN)
5	What are the constitutional provisions relating to freedom of trade ,commerce and intercourse	3	July 2021 (AN)
6	List out the three types of emergencies under Indian constitution	3	July 2021 (AN)
7 a	Describe the duties and role of Comptroller and Auditor General of Indian (CAG)	8	July 2021 (AN)
b	Examine the administrative and financial relation between the Union and the State	6	July 2021 (AN)
8 a	Enumerate the powers and functions of Public Service Commission	8	July 2021 (AN)
b	Explain the characteristics of Administrative Tribunals. What are the reasons for the growth of Administrative Tribunals in India	6	July 2021 (AN)
9.a	Discuss the qualification and disqualification of the membership of state legislature	10	June 2023
9.b	What are the duties and functions of Advocate general of the state	4	June 2023
10.a	List out the different jurisdiction and powers enjoyed by the High Court and explain original and writ jurisdiction in detail	10	June 2023
10.b	What are the powers enjoyed by the Governor	4	June 2023



**Module 5**

<b>Sl No</b>	<b>Questions</b>	<b>Marks</b>	<b>KTU,Year</b>
1	Discuss the functions of comptroller and auditor general of India	3	July 2021 (FN)
2	Explain the distribution of tax revenue with respect to centre-state financial relation.	3	July 2021 (FN)
3 a	Explain parliamentary legislation in the state field	6	July 2021 (FN)
b	Discuss the effects of national and financial emergencies	8	July 2021 (FN)
4 a	Explain the procedure for amendment of the constitution	6	July 2021 (FN)
b	What is the need for administrative tribunals? Explain the functions of state administrative tribunals	8	July 2021 (FN)
5	Why do we need to form separate Union Territories	3	July 2021 (AN)
6	Distinguish between an ' Ordinary Bill' and 'Money Bill'	3	July 2021 (AN)
7 a	Explain the various writs issued by High court of Kerala	6	July 2021 (AN)
b	Discuss the constitutional position and powers of Governor	8	July 2021 (AN)
8 a	Explain the functions of the State Legislature	8	July 2021 (AN)
b	Explain the responsibilities and functions of Council of Ministers to State Legislative Assembly	6	July 2021 (AN)
9.a	What are the five extraordinary circumstances on which the Constitution empowers the Parliament to make laws on any matter enumerated in the State list?	10	June 2023
9.b	Briefly explain the grants – in – aid the state	4	June 2023
10.a	Explain three types of emergencies under Indian Constitution	10	June 2023
10.b	What are the functions of interstate council	4	June 2023