VTU - June / July. 2024 – IV Sem Question Papers

2022 - Scheme

IV Semester Question Papers June/July - 2024

Sl.No	Name of the Subject	Subject Code
1	Analysis and Design of Algorithms	BCS401
2	Advanced Java	BIS402
3	Microcontrollers	BCS402
4	Computer Graphics and Visualization	BCG402
5	Artificial Intelligence	BAD402
6	Database Management Systems	BCS403
7	Discrete Mathematical Structures	BCS405A
8	Graph Theory	BCS405B
9	Biology for Engineers (CSE)	BBOC407
10	Universal Human Values Course	BUHK408

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Analysis and Design of Algorithms

Time: 3 hrs.   Max. Marks: 100

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

|		Module – 1	M	L	C
Q.1	a.	What is an algorithm? Explain the fundamentals of algorithmic problem solving.	10	L2	CO1
	b.	Develop an algorithm to search an element in an array using sequential search. Calculate the best case, worst case and average case efficiency of this algorithm.	10	L3	CO1
		OR			
Q.2	a.	Explain asymptotic notations with example.	10	L2	CO1
	b.	Give the general plan for analyzing the efficiency of the recursive algorithm. Develop recursive algorithm for computing factorial of a positive number. Calculate the efficiency in terms of order of growth.	10	L3	CO1
		Module – 2			
Q.3	a.	Explain Strassen's matrix multiplication approach with example and derive its time complexity.	10	L3	CO2
	b.	What is divide and conquer? Develop the quick sort algorithm and write its best case. Make use of this algorithm to sort the list of characters: E, X, A, M, P, L, E.	10	L2	CO2
		OR			
Q.4	a.	Distinguish between decrease & conquer and divide & conquer algorithm design techniques with block diagram. Develop insertion sort algorithm to sort a list of integers and estimate the efficiency.	10	L3	CO2
	b.	Define topological sorting. List the two approaches of topological sorting and illustrate with examples.	10	L2	CO2
		Module – 3			
Q.5	a.	Define AVL tree with an example. Give worst case efficiency of operations on AVL tree. Construct an AVL tree of the list of keys: 5, 6, 8, 3, 2, 4, 7 indicating each step of key insertion and rotation.	10	L3	CO3
	b.	Define Heap. Explain the bottom-up heap construction algorithm. Apply heap sort to sort the list of numbers 2, 9, 7, 6, 5, 8 in ascending order using array representation.	10	L3	CO3
		OR			
Q.6	a.	Define 2-3 tree. Give the worst case efficiency of operations on 2-3 tree. Build 2-3 tree for the list of keys 9, 5, 8, 3, 2, 4, 7 by indicating each step of key insertion and node splits.	10	L3	CO3
	b.	Design Horspool algorithm for string matching. Apply this algorithm to find the pattern BARBER in the text: JIM_SAW_ME_IN_A_BARBERSHOP	10	L3	CO3
		Module – 4			
Q.7	a.	Apply Dijkstra's algorithm to find the single source shortest path for given graph [Fig.Q7(a)] by considering 's' as source vertex. Illustrate each step.	10	L3	CO4
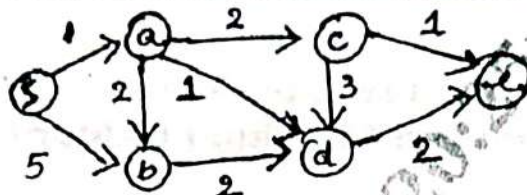
Fig.Q7(a)

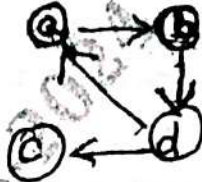|				
	b.	Define transitive closure. Write Warshall's algorithm to compute transitive closure. Illustrate using the following directed graph.	10	L3	CO4

Fig.Q7(b)

OR

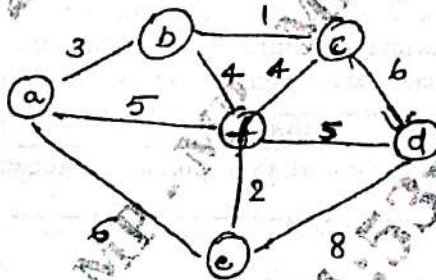|					
Q.8	a.	Define minimum spanning tree. Write Kruskal's algorithm to find minimum spanning tree. Illustrate with the following undirected graph.	10	L3	CO4

Fig.Q8(a)

	b.	Construct Huffman Tree and resulting code for the following:	10	L3	CO4

Character	A	B	C	D	E
Probability	0.4	0.1	0.2	0.15	0.15

(i) Encode the text : ABACABAD
(ii) Decode the text : 100010111001010

Module – 5

Q.9	a.	Explain n-Queen's problem with example using backtracking approach.	10	L2	CO5
	b.	Solve the following instance of the knapsack problem by the branch-and-bound algorithm. Construct state-space tree.	10	L3	CO5

Item	Weight	Value
1	4	$ 40
2	7	$ 42
3	5	$ 25
4	3	$ 12

The knapsack's capacity W is 10.

OR

Q.10	a.	Differentiate between Branch and Bound technique and Backtracking. Apply backtracking to solve the following instance of subset-sum problem S = {3, 5, 6, 7} and d = 15. Construct a state space tree.	10	L3	CO5
	b.	Explain greedy approximation algorithm to solve discrete knapsack problem.	10	L2	CO5

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CBCS SCHEME

Fourth Semester B.E./B.Tech.Degree Examination, June/July 2024
Advanced Java

Time: 3 hrs.   Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	What is collection Frame Work? Explain the methods defined by the following Interfaces: (i) Collection (ii) List (iii) Sorted Set (iv) Queue	10	L2	CO1
	b.	What are Legacy Classes? Explain any four legacy classes of Java's collection Frame work with suitable program.	10	L2	CO1
		OR			
Q.2	a.	Explain how collectors can be accessed using an iterator with example.	5	L3	CO1
	b.	What are the various changes that collection framework underwent recently?	5	L1	CO1
	c.	With an example program, explain how to store user-defined classes in collections.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain any two character extraction methods of string class.	5	L2	CO2
	b.	Explain the various string constructors used in Java with examples.	10	L2	CO2
	c.	Explain additional string methods.	5	L2	CO2
		OR			
Q.4	a.	Briefly describe special string operations with syntax and examples.	5	L2	CO2
	b.	Explain the following methods of string buffer class with examples : (i) capacity ( ) (ii) reverse ( ) (iii) insert (iv) append ( )	10	L2	CO2
	c.	Explain any four string modification methods of string class.	5	L2	CO2
		Module – 3			
Q.5	a.	Explain the four types of the swing buttons, with demonstration program.	10	L3	CO3
	b.	Explain MVC connector Architecture.	5	L2	CO3
	c.	What are the two key swing features? Discuss.	5	L1	CO3
		OR			
Q.6	a.	Explain the following : (i) JLabel and Image Icon. (ii) JTextField	10	L2	CO3
	b.	Write a program to demonstrate a simple swing application.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain the life cycle of Servlets.	5	L2	CO4
	b.	Describe the core interfaces that are provided in Jakarta (Javax), Servlet, http package.	5	L2	CO4
	c.	Define JSP. Explain the different types of JSP tags by taking suitable example.	10	L2	CO4
		OR			

Q.8	a.	Explain any two cookies method.	5	L1	CO4
	b.	With a code, explain how to handle HTTP get requests and HTTP post requests.	10	L2	CO4
	c.	Explain how cookies can be handled using servlets.	5	L4	CO4
Module – 5					
Q.9	a.	Explain different steps involved in JDBC process with a code snippet.	10	L3	CO5
	b.	List and elaborate Database Metadata Object methods.	5	L2	CO5
	c.	List and explain three kinds of exception occurred in JDBC.	5	L2	CO5
OR					
Q.10	a.	Mention all steps to create the association between the database and a JDBC/ODBC bridge.	12	L3	CO5
	b.	Explain the four types of JDBC drivers.	8	L2	CO5

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BAD402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

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

			M	L	C
		Module – 1			
Q.1	a.	Define Artificial Intelligence. Explain the foundation of AI in detail.	10	L1	CO1
	b.	Explain all four different approaches to AI in detail.	10	L1	CO1
		OR			
Q.2	a.	Give PEAS specification for : i) Automated taxi driver ii) Medical diagnostic system.	10	L1	CO1
	b.	Differentiation : i) Fully observable Vs partially observation ii) Single agent Vs Multiagent iii) Deterministic Vs stochastic iv) Static Vs Dynamic.	10	L1	CO1
		Module – 2			
Q.3	a.	Explain five components and well defined problem. Consider an 8-puzzle problem as an example and explain.	10	L2	CO2
	b.	Discuss in detail in Infrastructure for search algorithm.	10	L2	CO2
		OR			
Q.4	a.	Write an algorithm for Breadth – first search and explain with an example.	10	L2	CO2
	b.	Explain Depth first search techniques in detail.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the A* search to minimize the total estimated cost.	10	L3	CO3
	b.	Write an algorithm for hill climbing search and explain in detail.	10	L3	CO3
		OR			
Q.6	a.	In the below graph, find the path from A to G. Using Greedy Best First search and A* search algorithm. The values in the table represent heuristic values of reaching the goal node G pass current node.	10	L3	CO3

A	5
B	6
C	4
D	3
E	3
F	1
G	0

Fig Q6(a)

	b.	Explain the syntax and semantion of propositional logic.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain the syntax and semantics of the first order logic	10	L2	CO2
	b.	Explain the following with respect to the first order logic i) Assertions and Queries in first order logic ii) The Kinship domain iii) Numbers, sets and lists.	10	L2	CO2
		OR			
Q.8	a.	Explain unification and lifting in detail.	10	L3	CO4
	b.	Explain Forward chaining algorithm with an example.	10	L3	CO4
		Module – 5			
Q.9	a.	Explain basic probability Notation in detail.	10	L3	CO5
	b.	Explain Baye's rule and its use in detail.	10	L3	CO5
		OR			
Q.10	a.	Explain Independence in Quantifying uncertainty with example.	10	L3	CO5
	b.	Explain knowledge Acquiting in detail.	10	L3	CO5

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CBCS SCHEME

BCG402

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Fourth Semester B.E./B.Tech.Degree Examination, June/July 2024
Computer Graphics and Visualization

Time: 3 hrs.

Max. Marks: 100

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

			M	L	C
		Module – 1			
Q.1	a.	What is computer graphics? Explain applications of computer graphics with examples.	10	L2	CO1
	b.	Explain in detail graphics pipeline architecture.	10	L2	CO1
		OR			
Q.2	a.	With necessary steps explain Bresenham's line drawing algorithm. Consider the line from (6, 6) to (12, 8). Use the algorithm to rasterize the line.	10	L3	CO1
	b.	Explain the various graphics functions with example.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain 2D geometric transformations in detail.	10	L2	CO2
	b.	Develop openGL program to create and rotate a triangle about the origin and fixed point.	10	L3	CO2
		OR			
Q.4	a.	Explain homogeneous co-ordinate representation.	10	L2	CO2
	b.	Develop openGL program to create and rotate cube.	10	L3	CO2
		Module – 3			
Q.5	a.	Explain in detail various logical devices.	10	L2	CO3
	b.	Explain traditional animation technique in detail with example.	10	L2	CO3
		OR			
Q.6	a.	Explain input modes in detail with neat diagram.	10	L2	CO3
	b.	Explain character animation and periodic motions in detail.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain Cohen-Sutherland algorithm with example and neat diagram.	10	L3	CO4
	b.	Explain in detail, The Phong Lighting model.	10	L2	CO4
		OR			
Q.8	a.	Explain color models.	10	L2	CO4
	b.	Write a short note on (i) Normalization and View port transformation. (ii) 2D point clipping.	06 04	L4	CO3
		Module – 5			
Q.9	a.	Explain the concept of hidden surface removal.	10	L2	CO5
	b.	Explain perspective projection with neat diagram.	10	L2	CO5
		OR			
Q.10	a.	Develop openGL program to draw a polygon and allow user to move the camera suitably to experiment with perspective viewing.	10	L3	CO5
	b.	Explain orthographic and axonometric projection. Bring out the differences.	10	L2	CO5

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CBCS SCHEME

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Microcontrollers

Time: 3 hrs.

Max. Marks: 100

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

			M	L	C
		Module – 1			
Q.1	a.	Explain the architecture of an arm embedded device with a neat diagram.	10	L2	CO1
	b.	How are monitor and control internal operations performed in ARM core? Explain in brief.	10	L2	CO1
		OR			
Q.2	a.	Explain memory management in ARM core. Compare cache and tightly coupled memory.	10	L2	CO1
	b.	Explain mechanism applied by ARM core to handle exception, interrupts using different vector table.	10	L2	CO1
		Module – 2			
Q.3	a.	Examine data processing instructions requirement in the manipulation of data register? Explain in brief data processing instructions.	10	L2	CO2
	b.	Explain with examples the following 32-bit instruction of ARN processor i) CMN ii) MLA iii) MRS iv) BIC v) LDR.	10	L2	CO2
		OR			
Q.4	a.	Explain the following with example : i) Stock operation ii) Swap instructions.	10	L2	CO2
	b.	Explain Branch instructions in ARM with suitable example. Demonstrate Branch instruct usage flow of execution with an example program.	10	L2	CO2
		Module – 3			
Q.5	a.	How registers are allocated to optimize the program? Develop an assembly level program to find the sum of first to integer numbers.	10	L2	CO3
	b.	How complier handles a "for loop" with variable number of iterations N and loop controlling with an example.	10	L2	CO3
		OR			
Q.6	a.	Explain the following terms with an appropriate example : i) Pointer Aliasing ii) Portability Issues.	10	L2	CO3
	b.	How function calling is efficiently used by ARM through APCS with an example program.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain ARM processors exception and modes with a neat diagram.	10	L2	CO4
	b.	Explain exception priorities and link register offset.	10	L2	CO4
		OR			
Q.8	a.	List ARM firmware suite features. Explain firmware execution flow and Red Hat Boot.	10	L2	CO4
	b.	Explain IRQ and Fir exception, also to enable and disable IRQ and FIQ interrupts.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain basic architecture of cache memory.	10	L2	CO5
	b.	Explain process involved in main memory mapping to a cache memory.	10	L2	CO5
		OR			
Q.10	a.	Explain with diagram set associative cache. How are efficiency is measured?	10	L2	CO5
	b.	Briefly explain cache line replacement policies with an example.	10	L2	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Database Management Systems

Time: 3 hrs.

Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	Define database. Elaborate component modules of DBMS and their interactions.	10	L2	CO1
	b.	Describe the three-schema architecture. Why do we need mappings among schema levels?	06	L2	CO1
	c.	Explain the difference between logical and physical data independence.	04	L2	CO1
		OR			
Q.2	a.	Draw an ER diagram for an COMPANY database with employee, department, project as strong entities and dependent as weak entity. Specify the constraints, relationships and ratios in the ER diagram.	10	L3	CO3
	b.	Define the following terms with example for each using ER notations: Entity, attribute, composite attribute, multivalued attribute, participation role.	10	L3	CO3
		Module – 2			
Q.3	a.	Discuss the update operations and dealing with constraint violations with suitable examples.	08	L2	CO2
	b.	Illustrate the relational algebra operators with examples for select and project operation.	06	L2	CO2
	c.	Discuss the characteristics of relations that make them different from ordinary table and files.	06	L2	CO2
		OR			
Q.4	a.	Perform (i) Student U instructor (ii) Student ∩ Instructor (iii) Student – Instructor (iv) Instructor – Student on the following tables:	04	L3	CO2

Student

Fname	Lname
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

Instructor

Fname	Lname
John	Smith
Ricardo	Browne
Susan	Mao
Francis	Johnson
Ramesh	Shah

			M	L	C
	b.	Consider the following relational database schema and write the queries in relational algebra expressions: EMP(Eno, Ename, Salary, Address, Phone, DNo) DEPT(DNo, Dname, DLoc, MgrEno) DEPENDENT(Eno, Dep_Name, Drelation, Dage) (i) List all the employees who reside in 'Belagavi'. (ii) List all the employees who earn salary between 30000 and 40000 (iii) List all the employees who work for the 'Sales' department (iv) List all the employees who have at least one daughter (v) List the department names along with the names of the managers	10	L3	CO2

			06	L3	CO2
	c.	Consider the two tables T_1 and T_2 shown below:			

T_1

P	Q	R
10	a	5
15	b	8
25	a	6

T_2

A	B	C
10	b	6
25	c	3
10	b	5

Show the results of the following operations:

(i) $T_1 \bowtie_{T_1.P=T_2.A} T_2$

(ii) $T_1 \bowtie_{T_1.Q=T_2.B} T_2$

(iii) $T_1 \bowtie_{(T_1.P=T_2.A \ AND \ T_1.R=T_2.C)} T_2$

Module – 3

Q.5	a.	Discuss the informal design guidelines for relation schema design.	08	L2	CO4
	b.	Define 1NF, 2NF, and 3NF with examples.	06	L2	CO4
	c.	Write the syntax for INSERT, UPDATE and DELETE statements in SQL and explain with suitable examples.	06	L2	CO3

OR

Q.6	a.	Discuss insertion, deletion and modification anomalies. Why are they considered bad? Illustrate with examples.	10	L2	CO3
	b.	Illustrate the following with suitable examples: (i) Datatypes in SQL (ii) Substring Pattern Matching in SQL.	10	L2	CO3

Module – 4

Q.7	a.	Consider the following relations: Student(<u>Snum</u>, Sname, Branch, level, age) Class(<u>Cname</u>, meet_at, room, fid) Enrolled(<u>Snum</u>, <u>Cname</u>) Faculty(<u>fid</u>, fname, deptid) Write the following queries in SQL. No duplicates should be printed in any of the answers. (i) Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach. (ii) Find the names of all classes that either meet in room R128 or have five or more students enrolled. (iii) For all levels except JR, print the level and rthe average age of students for that level. (iv) For each faculty member that has taught classes only in room R128, print the faculty member's name and the total number of classes she or he has taught. (v) Find the names of students not enrolled in any class.	10	L3	CO3
	b.	What do understand by correlated Nested Queries in SQL? Explain with suitable example.	04	L2	CO3
	c.	Discuss the ACID properties of a database transaction.	06	L2	CO4

OR

Q.8	a.	What are the views in SQL? Explain with examples.	04	L3	CO5
	b.	In SQL, write the usage of GROUP BY and HAVING clauses with suitable examples.	06	L2	CO3
	c.	Discuss the types of problems that may encounter with transactions that run concurrently.	10	L2	CO5

		Module – 5			
Q.9	**a.**	What is the two phase locking protocol? How does it Guarantee serializability.	06	L2	CO5
	b.	Describe the wait-die and wound-wait protocols for deadlock prevention.	08	L2	CO5
	c.	List and explain the four major categories of NOSQL system.	06	L2	CO3
		OR			
Q.10	**a.**	What is Multiple Granularity locking? How is it implemented using intension locks? Explain.	10	L2	CO5
	b.	Discuss the following MongoDB CRUD operations with their formats: (i) Insert (ii) Delete (iii) Read	06	L2	CO4
	c.	Briefly discuss about Neo4j data model.	04	L2	CO4

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CBCS SCHEME

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Discrete Mathematical Structures

Time: 3 hrs.   Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	Define tautology. Prove that for any propositions p, q, r the compound proposition. $[(p \wedge \lnot q) \to r] \to [p \to (q \vee r)]$ is a tautology	06	L2	CO1
	b.	Test whether the following is a valid argument: If Ram studies then he will pass 12th. If Ram passes 12th then his father gifts him a bike. If Ram doesn't play video game then he will pass 12th. Ram did not get a bike. ∴ Ram played video game.	07	L3	CO1
	c.	Give direct proofs of the statements: i) If k and *l* are odd then k + *l* is even. ii) If k and *l* are odd then k*l* is odd.	07	L2	CO1
		OR			
Q.2	a.	Define (i) Proposition (ii) Open statement (iii) Quantifiers	06	L2	CO1
	b.	Using the laws of logic, prove the following logical equivalence: $[(\lnot p \vee \lnot q) \wedge (F_0 \vee p) \wedge p] \Leftrightarrow p \wedge \lnot q$	07	L2	CO1
	c.	Write the following statement in symbolic form and find its negation: "If all triangles are right angled then no triangle is equilateral".	07	L2	CO1
		Module – 2			
Q.3	a.	Prove by using mathematical induction. $1^2 + 2^2 + \dots \dots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$	06	L2	CO1
	b.	How many words can be made with or without meaning from the letters of the word "STATISTICS"? In how many of these a and c are adjacent? In how many vowels are together?	07	L3	CO2
	c.	Find the coefficient of $x^3 y^8$ in the expansion of $(2x - y)^{11}$.	07	L2	CO2
		OR			
Q.4	a.	Obtain the recursive definition for the sequence in each of the following cases: (i) $a_n = 5n$ (ii) $a_n = 3n + 7$ (iii) $a_n = n^2$ (iv) $a_n = 2 - (-1)^n$	06	L2	CO2
	b.	A woman has 11 close relations and wishes to invite 5 of them to dinner. In how many ways can she invite them if (i) there is no restriction on her choice. (ii) 2 persons will not attend separately (iii) 2 persons will not attend together.	07	L3	CO2
	c.	In how many ways can we distribute 7 apples and 5 oranges among 3 children such that each child gets atleast one apple and one orange?	07	L3	CO2

		Module – 3			
Q.5	a.	State pigeon hole principle. Using pigeon hole principle find the minimum number of persons chosen so that atleast 5 of them will have their birthday in the same month.	06	L3	CO3
	b.	Let A = {a, b, c, d} and B = {1, 2, 3, 4, 5}. Find the number of 1-1 functions and onto functions from (i) A to B (ii) B to A	07	L2	CO3
	c.	Let A = {1, 2, 3, 4, 5}. Define a relation R on A × A by (x_1, y_1) R (x_2, y_2) iff $x_1 + y_1 = x_2 + y_2$. (i) Verify that R is an equivalence relation (ii) Determine the equivalence class of [(2, 4)]	07	L2	CO3
		OR			
Q.6	a.	Consider the functions f and g from R to R defined by $f(x) = 2x + 5$ and $g(x) = \frac{1}{2}(x - 5)$. Prove that g is inverse of f.	06	L2	CO3
	b.	Let A = {1, 2, 3, 4} and R be the relation on A defined by xRy if and only if x < y. Write down R as a set of ordered pairs. Write the relation matrix and draw the digraph. List out the in degrees and out degrees of every vertex.	07	L2	CO3
	c.	Let A = {1, 2, 3, 6, 9, 12, 18} and define R on A by xRy iff 'x divides y'. Prove that (A, R) is a POSET. Draw the Hasse diagram for (A, R).	07	L2	CO3
		Module – 4			
Q.7	a.	How many integers between 1 and 300 (inclusive) are divisible by (i) atleast one of 5, 6 or 8. (ii) None of 5, 6 and 8.	06	L3	CO4
	b.	At a restaurant 10 men handover their umbrellas to the receptionist, In how many ways can their umbrellas be returned so that (i) no man receives his own umbrella. (ii) atleast one gets his own umbrella. (iii) atleast two gets their own umbrellas.	07	L3	CO4
	c.	The number of virus affected files in a system is 1000 (to start with) and this increases by 250% every 2 hours. Use a recurrence relation to determine the number of virus affected files in the system after 12 hours.	07	L3	CO4
		OR			
Q.8	a.	In how many ways one can arrange the letters of the word "CORRESPONDENTS" so that there are (i) no pair (ii) atleast 2 pairs of consecutive identical letters.	06	L3	CO4
	b.	4 persons P_1, P_2, P_3, P_4 who arrive late for a dinner party find that only one chair at each of five tables T_1, T_2, T_3, T_4 and T_5 is vacant. P_1 will not sit at T_1 or T_2. P_2 will not sit at T_2. P_3 will not sit at T_3 or T_4. P_4 will not sit at T_4 or T_5. Find the number of ways they can occupy the vacant chairs.	07	L3	CO4
	c.	Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ for $n \geq 2$ with $a_0 = 5$, $a_1 = 12$.	07	L2	CO4
		Module – 5			
Q.9	a.	If * is an operation on Z defined by xy = x + y + 1, prove that (Z, *) is an abelian group.	06	L2	CO5
	b.	Explain Klein-4 group with example.	07	L2	CO5
	c.	State and prove Lagrange's theorem.	07	L2	CO5
		OR			
Q.10	a.	Prove that intersection of two subgroups of a group G is also a subgroup of G.	06	L2	CO5
	b.	Prove that $(Z_4, +)$ is a cyclic group. Find all its generators.	07	L2	CO5
	c.	Let G = S_4 for $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$ Find the subgroup H = <α> determine the left cosets of H in G.	07	L3	CO5

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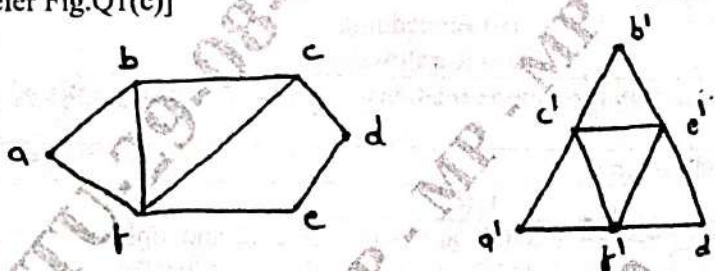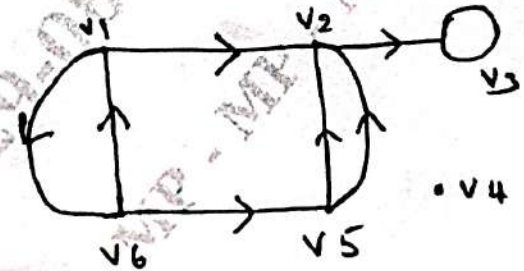
Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Graph Theory

Time: 3 hrs.

Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	Define graph. List and explain the types of graph.	08	L1	CO1
	b.	Prove that the number of vertices of odd degree in a graph is always even.	06	L2	CO1
	c.	Define isomorphic graph and verify the following graphs are isomorphic or not. [Refer Fig.Q1(c)] Fig.Q1(c)	06	L2	CO1
		OR			
Q.2	a.	Explain the following graphs: (i) Bi-partile graph (ii) Sub graphs (iii) WALK (iv) Path	10	L1	CO1
	b.	Prove that a simple graph with n vertices and K components can have at most $(n – K)(n – K + 1)/2$ edges.	10	L2	CO1
		Module – 2			
Q.3	a.	State and prove necessary condition of a graph to be a Euler graph.	10	L2	CO2
	b.	List and explain the different operations on graph.	10	L2	CO2
		OR			
Q.4	a.	Define diagraph. Find the indegree and outdegree of the following graph [Fig.Q4(a)]. Fig.Q4(a)	08	L2	CO2
	b.	Illustrate the travelling salesman problem using a graph.	06	L2	CO2
	c.	List and explain different digraphs and binary relations.	06	L2	CO2
		Module – 3			
Q.5	a.	Define a tree. Prove that in a graph G there is one and only one path between every pair of vertices, G is a tree.	06	L1	CO3

1 of 2

	b.	Explain the following: (i) Cut-edge (ii) Cut-vertex (iii) Cut-set	06	L1	CO3
	c.	Find and construct the following: (i) Minimum possible height of 11 vertex binary tree (ii) A binary tree for a given 11 such that the farthest vertex is as far as possible from the root that must have exactly 2 vertices at each level, except at zero level.	08	L2	CO3

OR

Q.6	a.	Prove that every circuit has an even number of edges in common with any cut set.	10	L2	CO3
	b.	Prove that ring 50 m of any two cut-sets in a graph is either a third cut-set or an edge disjoint union of cut-sets.	10	L2	CO3

Module – 4

Q.7	a.	Define the following: (i) Planar graph (ii) Embedding (iii) Non-planar (iv) Kuratowski's 2 graph	08	L2	CO4
	b.	Explain the simple observation mode relationship between planar graph and dual G*.	08	L2	CO4
	c.	Write a note on path matrix.	04	L1	CO4

OR

Q.8	a.	Prove that two graphs G1 and G2 are isomorphic if and only if their incidence matrices A(G1) and A(G2) differ only by permutations of rows and columns.	10	L2	CO5
	b.	Describe the observations that can be made about circuit matrix B(G) 01 and graph G.	10	L2	CO5

Module – 5

Q.9	a.	Prove that every tree with two or more vertices is 2 - chromatic.	10	L2	CO5
	b.	Explain the following for chromatic polynomial: (i) Finding a maximal independent set (ii) Finding all maximal independent set.	10	L2	CO5

OR

Q.10	a.	Prove that the vertices of every planar graph can be properly colored with five colors.	10	L2	CO5
	b.	Explain the Greedy colouring algorithm.	10	L2	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Biology for Engineers (CSE)

Time: 3 hrs.

Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	Discuss the various components of Eukaryotic cells.	10	L3	CO1
	b.	Identify the applications of stem cells.	5	L2	CO1
	c.	Explain the functions of vitamins.	5	L2	CO1
		OR			
Q.2	a.	Compare Prokaryotic and Eukaryotic cells.	10	L3	CO1
	b.	Explain the properties of Carbohydrates.	5	L2	CO1
	c.	Explain the functions of Lipids.	5	L2	CO1
		Module – 2			
Q.3	a.	Highlighting the properties of cellulose, justify cellulose as an effective water filter.	10	L3	CO1
	b.	Explain the working and development of DNA vaccines by taking suitable example.	10	L2	CO1
		OR			
Q.4	a.	What are Bioplastics? Justify the use of PHA as Bioplastic mentioning its properties and applications.	10	L3	CO1
	b.	Discuss the following : (i) Meat analogs of protein. (ii) Lipids as cleaning agents.	10	L2	CO1
		Module – 3			
Q.5	a.	What is Electro Encephalogram (EEG)? Discuss the types of Brain activity detected with EEG. Write any three applications.	10	L3	CO2
	b.	What are Pace Makers? Explain basic design and construction of Pace Makers.	10	L2	CO2
		OR			
Q.6	a.	Justify Lungs as purification system.	10	L3	CO2
	b.	Explain architecture of Rod and Core cells with suitable diagram.	10	L2	CO2
		Module – 4			
Q.7	a.	What is ultrasonography? Explain the uses and working principle.	10	L2	CO3
	b.	What is lotus leaf effect? Explain the mechanism and applications of super Hydrophobic effect.	10	L2	CO3
		OR			
Q.8	a.	The structure and design of Kingfisher beak lead to the design of Bullet trains. Explain.	10	L2	CO3
	b.	Explain the working and applications of Bionic Leaf Technology.	10	L2	CO3

Module – 5					
Q.9	a.	Explain the use of Electrical tongue in food science.	10	L2	CO4
	b.	Explain the advantages and limitations of Artificial Intelligence for disease diagnosis.	10	L2	CO4
OR					
Q.10	a.	Explain Bioengineering solutions for muscular dystrophy and Osteroporosis.	10	L2	CO4
	b.	Explain most commonly used Bioprinting Techniques.	10	L2	CO4

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024

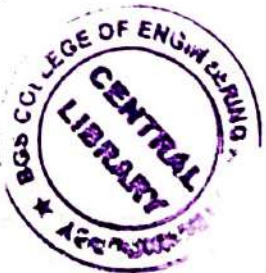## Universal Human Values Course

Time: 1 hr.] [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries one mark.
2. Use only Black ball point pen for writing / darkening the circles.
3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.
4. Darkening two circles for the same question makes the answer invalid.
5. Damaging/overwriting, using whiteners on the OMR sheets are strictly prohibited.

1. Harmony should be maintained in
   a) Between body and life
   b) Between self and society
   c) Between life and environment
   d) All of the above

2. The foundational value in relationship is
   a) Respect   b) Love   c) Trust   d) Glory

3. Ensuring right understanding and feeling in the others is called
   a) Care   b) Affection   c) Gratitude   d) Guidance

4. Harmony in the family is the building block for harmony in the
   a) Society   b) Individual   c) Friend   d) Relative

5. The total numbers of feelings in human relationship
   a) 5   b) 10   c) 9   d) 8

6. Comprehensive human goal is right understanding prosperity, trust (fearlessness) and
   a) Co-existance   b) Happiness   c) Abhay   d) None

7. There is justice in relationship when there is
   a) Mutual fulfilment   b) Self regulation   c) Freedom   d) None

8. The extension of family is
   a) Self   b) Body   c) Society   d) Nature

9. The feeling of relatedness to all human beings is called
   a) Love   b) Affection   c) Gratitude   d) Respect

10. Acceptance of excellence in others is called
    a) Reverence   b) Glory   c) Gratitude   d) Guidance

11. The only effective way to ensure professional ethics is by developing
    a) Knowledge   b) Ethical conduct
    c) Ethical competence   d) Professional activities

12. How does unethical practices in various professions can be resolved
    a) Through skills   b) Through knowledge
    c) Through practical   d) Via right understanding

13. What provides clear guidance and policy frame work conducive to the development of an un-fragmented human society and a universal human order
    a) Humanistic education   b) Humanistic constitution
    c) Profession   d) Ethical Human conduct

14. The right understanding gained through self exploration also enables us to identify the definitiveness of human conduct. What is this called?
    a) Ethical Human conduct   b) Values   c) Policy   d) Utility values

15. Primary step to move towards the holistic alternative is to develop the right understanding among humans and the commitment to
    a) Do practical   b) Remain calm   c) Live accordingly   d) Teach others

16. The right understanding helps us identify the comprehensive human goal in terms of
    a) Samadhan   b) Sanridhi   c) Sah-astiva   d) All of these

17. The humanistic education will facilitate the process of self exploration which will lead to continuous
    a) Education   b) Self evolution   c) Development   d) People friendly

18. The values of human being can be enumerated as
    a) Nine   b) Thirty   c) Eighteen   d) Twenty four

19. Which of the following is not a characteristic of professionalism?
    a) Kindness   b) Competency   c) Morality   d) Complacency

20. There are six characteristics of a professional style which is not a professional style?
    a) Ethical   b) Emotional   c) Responsible   d) Intellectual

21. All the units of nature can be classified into _____ orders
    a) Two   b) Three   c) Four   d) Six

22. Which of the following does not form an order in nature?
    a) BIO   b) Animal   c) Consciousness   d) Human

23. Which of the following statements is true.
    a) Material units have only two kinds of activities recognizing and fulfilling
    b) Material units have three kinds of activities assuming, recognizing and fulfilling
    c) Material units have only four kinds of activities knowing, assuming, recognizing and fulfilling
    d) None of the statement

24 Which of the following statement is not true?
a) There is inter connectedness in nature
b) There is recyclability and self regulation in nature
c) There is struggle for survival in nature
d) There is mutual fulfillment in nature

25 According to quantity, which of the following is true for the orders in nature
a) Bio order >> Physical order >> Animal order >> Human order
b) Animal order >> Bio order >> Physical order >> Human order
c) Physical order >> Bio order >> Animal order >> Human order
d) None of the above

26 What are the fundamental components of ecosystems?
a) Plants and Animals
b) Air and water
c) Rocks and minerals
d) All of these

27 The third order of nature is
a) Material order   b) Animal order   c) Plant order   d) Human order

28 The activities in human body are
a) Composition   b) Decomposition   c) Respiration   d) All of these

29 The systems in nature are
a) Cyclic
b) Mutually fulfilling
c) Both a and b
d) None of these

30 The natural characteristics/Svabhava of a human being are
a) Perseverance   b) Bravery   c) Generosity   d) All of these

31 Harmony should be maintained in
a) Between body and life
b) Between self and society
c) Between life and environment
d) All of the above

32 I being the
a) doer, seer and Enjoyer
b) doer
c) seer
d) enjoyer

33 Which of the following is NOT response of the self?
a) Knowing   b) Assuming   c) Recognizing   d) Preconditioning

34 Activities of self (I) are
a) Happiness,
b) Prosperity
c) Desire, thought and expectation.
d) None

35 The requirement of body is right utilization and nurturing
a) Desire   b) Protection   c) Thought   d) Expectation

36 The ____ is an instrument of ____
a) I, Body   b) Body, I   c) Both a and b   d) None

37 The activity of desire, thought and expecting together is called as
a) Body   b) Health   c) Imagination   d) Future

38 Imaging is ____ with time
a) Continuous   b) Discontinuous   c) Random   d) Different

39 Where there is harmony among the parts of the body it is known as
a) Swasthya   b) Samyam   c) Prosperity   d) None

40 Knowing means having the
a) Assumption
b) Right understanding
c) Right feeling
d) None

41 The purpose of value – Education is to
a) Foster universal core values
b) Make syllabus easy
c) Develop values in individual
d) Both A and C

42 Self exploration uses two mechanisms i) Natural Acceptance   ii) ____?
a) Experiential validation
b) Reason
c) Logical Thinking
d) Theoretical concept

43 Once we know what is valuable to us, these values becomes the basis, the anchor for
a) Knowledge   b) Actions   c) Society   d) None of these

44 To fulfill Human Aspirations, what are necessary
a) Both values and skills
b) Values
c) Skills
d) None of these

45 Which the following are the encompassing principles underlying the successful implementation of value education?
A) Conviction   B) Connection   C) Critical thinking   D) Commitment
choose the most appropriate answer from the options given below :
a) A, C and D only   b) B, C and D only   c) A, B and D only   d) None of these

46 Value and skills should go hand in hand
a) True   b) False   c) Cannot tell   d) None of these

47 Are the content of self – exploration
a) Program   b) Desire   c) Both a and b   d) None

48 Human life is lived at four levels individual, Family, Society and ____
a) Nature   b) Nurture   c) World   d) Universe

49 Any course content on value education needs to be
a) Universal   b) Rational   c) Natural   d) All of these

50 Value education enables us to
a) To understand our needs
b) Visualize our goals correctly
c) Indicate the direction for their fulfillment
d) All of the above

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