Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: MCA**

Sub_Code: MCHS1002

2nd Semester Regular Examination: 2024-25

SUBJECT: Universal Human Values & Professional Ethics

BRANCH(S): MCA (2 Yrs)

Time: 3 Hours

Max Marks: 100

Q.Code: S267

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define the term ‘value’ as per the proposal discussed in the prescribed textbook, and explain 'value education' with reference to it.

b) What are the basic human aspirations? Explain how they relate to the common aspirations of human beings in daily life.

c) What are the differences between the needs of the Self and the Body?

d) What is self-regulation? How can it be ensured?

e) What is meant by 'trust' as per the proposal discussed in the prescribed textbook? Is it related to the ‘self’ or the ‘body’?

f) Define justice in the context of human-to-human relationships.

g) What are the four orders of nature? Show the interconnectedness of these orders with suitable sketch.

h) What do you mean by knowing, assuming, and recognizing in self?

i) Define professional ethics.

j) What is meant by ethical human conduct?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain the difference between 'natural acceptance' and the 'acceptance' that follows the process of self-exploration with suitable examples.

b) Define ‘happiness’, ‘unhappiness’ based on the proposal discussed in the text book. State the difference between ‘Happiness’ and ‘Excitement’. Where are we putting more efforts? Is it for ‘Happiness’ or ‘Excitement’? Explain with suitable examples in details.

c) What are the activities of ‘self’. Is it continuous? How does imagination inside affect our behaviour and work outside? What are the sources of these imaginations? Explain in details with suitable examples and sketch.

d) Is ‘good health’ a major concern for current generation? Describe the program for self-regulation to ensure good health in the body. Even though we recognize its importance, we often fail to practice it. What are the major reasons behind it?

e) Is it possible to understand relationship with definiteness? Justify your answer with suitable discussion on 'feelings in relationship'. What are the nine feelings in relationship? State and explain what the feeling of 'right evaluation' is? What is meant by 'under-evaluation', 'over-evaluation', and 'otherwise-evaluation'?

f) What do you mean by 'feelings of gratitude'?

I. Are you able to appreciate both "what has been done" and "what has not been done" (i.e., the complete picture)?

II. Do you have a feeling of gratitude for the other – continuous or the feeling of gratitude comes and goes?

III. Are you making effort for "ensuring the right feelings in yourself and expressing them to the other" or are you "expecting these feelings from the other"?

Reflect on the following questions based on your natural acceptance.

g) What do you mean by 'excellence'? State and explain different types of feelings 'affection', 'care', 'guidance', 'reverence', 'glory', and 'love'. Do these feelings have any role to work towards 'excellence'

h) What are the common human goals to ensure Harmony in the Society? Also state the Gross Misunderstanding prevalent in today's society.

i) How does justice ensure mutual happiness and fulfilment in relationships and lead to world family?

j) Do you observe 'struggle' or 'harmony' as innate in nature (excluding the human order) (excluding Human order) without the intervention of human being? State the roles of human being with rest of the three orders. What are your suggestions (at individual, family or society level) to ensure these roles in human being?

k) Explain how natural acceptance forms the basis of ethical conduct.

l) Describe any two issues in current professional ethics and how they can be addressed using holistic understanding.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 What do you mean by 'animal consciousnesses and 'human consciousnesses? In which consciousness level the majority of human being are living in current scenario? Explain with suitable examples. How can the value-based education serve as an initiative for transforming the current situation? **(16)**

Q4 Explain how you (the Self) are the seer, doer, and experiencer-not the body, with suitable examples. State the role of sense organs while seeing, doing, experiencing etc. Explain how Self is central to human existence, and body is merely an instrument. **(16)**

Q5 What do you mean by the quote "Realizing Existence as Co-existence at All Levels" in text book? Explain in details. How does co-existence in existence express itself at different levels of living of human being? Explain. **(16)**

Q6 What, in your opinion, has gone wrong so as to make many of the modern technology gadgets anti-ecological as well as contrary to real human welfare? After all, all these developments have been made for the good of people. Evaluate the significance of holistic technologies and production systems in promoting a value-based professional environment looking at the current world-wide challenges. **(16)**

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Total Number of Pages: 02 **Course: MCA**

Sub_Code: MCPC1005

2nd Semester Regular Examination: 2024-25

SUBJECT: OBJECT ORIENTED PROGRAMMING USING JAVA

BRANCH(S): MCA (2 Yrs)

Time: 3 Hours

Max Marks: 100

Q.Code: S320

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Describe the role of JVM in Java program execution.

b) What is the difference between String and StringBuffer in Java?

c) What is type casting? Give an example of explicit type casting in Java.

d) What is method overloading? Give a suitable example.

e) How is the super keyword used in inheritance?

f) Differentiate between checked and unchecked exceptions in Java.

g) Explain the life cycle of a thread in Java.

h) What is synchronization in Java multithreading?

i) What is the difference between AWT and Swing components?

j) Explain the life cycle of an applet.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Discuss the object-oriented features supported by Java with examples for each.

b) Write a Java program that accepts marks of 5 subjects from the user and calculates total, average, and grade using control statements.

c) What are Java's primitive data types? Describe each with range and size.

d) Create a Java class to demonstrate overloading of constructors and use of instance vs. static variables and methods.

e) Explain byte streams and character streams in Java with examples of classes that implement them.

f) Write a Java program to demonstrate multilevel inheritance and method overriding.

g) Explain the role of this and super keywords in Java with examples.

h) Describe different exception handling keywords in Java: try, catch, throw, throws, and finally with examples.

i) Write a Java program to create and use an interface and also extend it in another interface.

j) Create a Java AWT application to design a simple registration form using various AWT components.

k) Differentiate between AWT and Swing. Explain the hierarchy of Swing components.

l) Explain the Event Delegation Model in Java. How are mouse and keyboard events handled in this model?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 **a)** Explain the architecture of Java Virtual Machine (JVM) with a neat diagram. **(8 + 8)**

b) Write a Java program to accept details of a student (name, roll number, marks of 3 subjects) using constructor and methods. Calculate and display the average.

Q4 **a)** Explain types of inheritance in Java and how Java overcomes the ambiguity of multiple inheritance using interfaces. **(6 + 10)**

b) Write a Java program using interfaces and multiple inheritance to display employee details (Employee interface, Department interface, and a class implementing both).

Q5 **a)** What are exceptions? Explain built-in and user-defined exceptions with examples. **(6 + 10)**

b) Write a Java program to create a custom exception called InvalidAgeException that is thrown when a user enters an age less than 18.

Q6 **a)** What are Swing components? Compare Swing with AWT. Describe the hierarchy of Swing components with a neat diagram. **(6 + 10)**

b) Write a Java Swing program to create a feedback form with the following fields:
Name (JTextField)
Email (JTextField)
Feedback (JTextArea)
Rating (JComboBox)
Submit Button (JButton)
On clicking Submit, display the feedback details using a JOptionPane.

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Total Number of Pages: 02 **Course: MCA**

Sub_Code: MCPC1006

2nd Semester Regular Examination: 2024-25

SUBJECT: Software Engineering

BRANCH(S): MCA (2 Yrs)

Time: 3 Hours

Max Marks: 100

Q.Code: S412

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define software engineering.
b) What is a process framework?
c) Differentiate between functional and non-functional requirements.
d) Mention two advantages of the spiral model.
e) What is a use case diagram?
f) Define coupling and cohesion.
g) What is alpha testing?
h) Name two software reliability models.
i) Explain the purpose of a CRC card.
j) List two ISO 9000 quality standards applicable to software.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Discuss the layered technology approach in software engineering.
b) Explain the key characteristics of the Unified Process.
c) What are the steps in the requirements engineering process?
d) Describe data flow diagrams with a suitable example.
e) Write short notes on object-oriented design principles.
f) Explain the difference between black box and white box testing.
g) How is code documentation helpful in software development?
h) What is meant by risk refinement? Give an example.
i) Write a short note on software availability and maintainability.
j) Describe the purpose and structure of an SRS document.
k) What is the role of feasibility study in software development?
l) How is software quality assurance implemented?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3	Explain various software process models in detail. Compare the Waterfall, Incremental, and Spiral models in terms of flexibility, user involvement, and risk handling.	**(16)**
Q4	Describe the requirement elicitation techniques. How can case diagrams and sequence diagrams be used for requirement modeling?	**(16)**
Q5	Explain in detail the design process in software engineering. Compare and contrast function-oriented design with object-oriented design using examples.	**(16)**
Q6	Discuss the importance of software testing and maintenance. Elaborate on different testing strategies and explain how quality is ensured using ISO standards.	**(16)**

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Total Number of Pages: 02 **Course: MCA**
Sub_Code: MCPC1007

2nd Semester Regular Examination: 2024-25
SUBJECT: DATA STRUCTURES
BRANCH(S): MCA(2 yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: S459

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) List the advantages of linked-list over arrays.
b) What is the output of applying selection sort after second iteration for the number sequence: 15, 5, 45, 8, 27, 11
c) Define the terms “Time Complexity” and “Space Complexity” with an example.
d) Explain what is a circular queue with an example.
e) Explain what do you mean by a complete binary tree and almost complete binary tree with a suitable example.
f) Write the pseudocode for inserting an element into a stack. Explain whether “underflow” or “overflow” occurs during insertion.
g) Define a sparse matrix. How is it represented in memory?
h) Distinguish between terminal and non-terminal nodes of a binary tree. What is the difference between a binary tree and a general tree?
i) Differentiate between sorting and searching with an example. Differentiate between external sorting and internal sorting.
j) What do you mean by dynamic memory allocation? What are the functions used? Mention the syntax of each.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Write the algorithms for performing the enqueuer and dequeuer operations of queue.
b) Construct a Binary Search Tree for the following sequence:
20, 30, 10, 45, 56, 2, 60, 8, 15, 50
c) Write a pseudocode for inserting an element in a single linked-list at any position.
d) Perform quick sort on the following sequence:
35, 80, 40, 50, 60, 75, 20, 15, 8, 1
e) Convert the following arithmetic expression in infix form to postfix form using stack:
A + B/C – D * (E + F) * G

f) Explain various kinds of data structures with an example from each.

g) Explain different kinds of linked-lists with suitable examples.

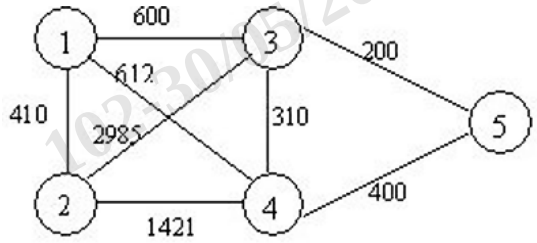
h) Explain different asymptotic notations used to evaluate an algorithm. Also, explain what is the best-case, worst-case, and average-case complexity of an algorithm.

i) Write a function to evaluate the postfix expression. Illustrate the same for the given postfix expression: ABC – D* + E^F + and assume A = 6, B = 3, C = 2, D = 5, E = 1, and F = 7.

j) Construct a binary tree from the Post-order and In-order sequence given below
In-order: GDHBAEICF
Post-order: GHDBIEFCA

k) Define hashing. Explain different hashing functions with examples. Discuss the properties of a good hash function.

l) Convert the given graph with weighted edges to minimal spanning tree using kruskal's algorithm (show each step):



Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 What is the advantage of double linked-list over a single linked-list? Write an algorithm to insert an element in the beginning of a double linked-list. **(16)**

Q4 What is B-Tree? What are the properties of a B-Tree? Generate a B-Tree of order 5 with the alphabets arrive in the sequence as follows: **(16)**

a g b k d h m j e s l r x c l n t u p

Q5 Explain the concept of hashing division method of hashing. Store the following values in a hash table of size 5: **(16)**
11, 25, 45, 85, 101, 102, 162, 197, 201.

Q6 Explain the working of merge sort on the following sequence: **(16)**
10, 15, 0,17,20, 25, 30,16, 70, 6, 30, 40, 56, 60, 65, 75

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Total Number of Pages: 02 **Course: MCA**

Sub_Code: MCPC1008

2nd Semester Regular Examination: 2024-25
SUBJECT: Computer Organization and Architecture
BRANCH(S): MCA (2 Yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: S544

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define WMFC and explain its role in instruction execution.
b) Differentiate between cache hit and cache miss.
c) What is thrashing and why does it occur?
d) Explain the concept of Very Long Instruction Word.
e) How are control hazards handled in a pipeline?
f) Explain the memory hierarchy with reference to speed and capacity.
g) Illustrate the use of array processors in arithmetic operations.
h) Provide the method for calculating the tag field in associative mapping.
i) List signal lines that serve as inputs to the ALU.
j) Define a cluster computer and state its key characteristics.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Illustrate the instruction execution process in a basic computer with an example involving instruction fetch, decode, and execution stages.
b) Explain the Von Neumann Architecture with a suitable diagram.
c) What are the major difficulties caused by pipeline conflicts in processors that support pipelining? Explain each.
d) Classify computer architecture based on Flynn's taxonomy.
e) Distinguish between hardwired and microprogrammed control units.
f) Discuss the superscalar architecture and differentiate it from super pipelined architecture.
g) Explain the concept and significance of distributed shared memory architecture.
h) Describe memory interleaving with suitable examples.
i) Design a 4 × 8 memory structure and label the address bus, data bus, and control bus.
j) Show the Cache read operation by using a flow chart.

k) Discuss exception handling in pipelined processors. Explain with an example how pipeline control flow is affected.

l) Outline the functions of the I/O subsystem in computer systems.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 Explain Booth's algorithm with a flowchart. Show how (+13) × (–12) is computed using Booth's algorithm. **(16)**

Q4 Explain the instruction cycle using a suitable step diagram. Describe instruction execution in a basic computer system and compute its performance based on relevant factors. **(16)**

Q5 What is pipelining? Explain data hazards and structural hazards with suitable examples for each. **(16)**

Q6 Elaborate on the virtual memory concept. For the page reference string `2 3 4 5 2 3 6 2 3 4 5 6`, calculate page faults using FIFO, LRU, and Optimal Page Replacement algorithms for both 3-frames and 4-frames configurations. **(16)**

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Total Number of Pages: 03

Course: MCA
Sub_Code: MCPC1009

2nd Semester Regular Examination: 2024-25
SUBJECT: Theory of Computation
BRANCH(S): MCA (2 Yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: S618

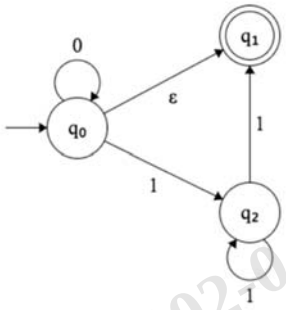
Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

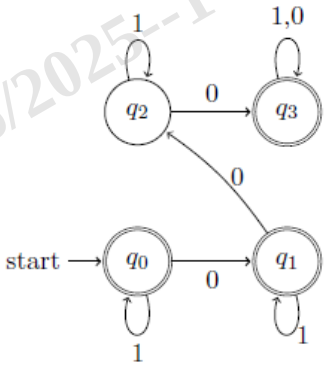
Q1 **Answer the following questions:** **(2 x 10)**

a) Differentiate Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA).

b) Convert the given NFA with epsilon-transitions to an equivalent NFA.



c) Identify the language accepted by the following DFA



d) State the Pumping Lemma for regular languages. What is its primary purpose?

e) List any two algebraic laws of regular expressions.

f) Describe the language of the following CFG.

$S \rightarrow aSb|\epsilon$

g) Define Chomsky Normal Form (CNF) with a suitable example.

h) Show that the grammar $S \rightarrow SS|a|b$ is ambiguous.

i) Define a Turing Machine. How does it differ from a PDA?

j) State Post's Correspondence Problem (PCP) and its significance.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

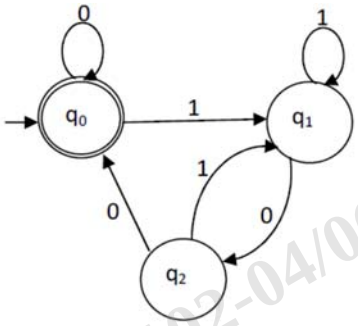
a) Let L be a set accepted by an NFA. Then prove that there exists a deterministic finite automaton that accepts L.

b) Show that the regular languages are closed under intersection and reversal.

c) Design a minimal DFA that accepts all strings over {a, b} where the number of a's is divisible by 3 and the string ends with b.

d) Define pumping Lemma for regular languages. Show that the language $L= \{a^n b^m \mid n \neq m\}$ is not regular using the Pumping Lemma.

e) Find the regular expression for the following DFA.



f) Show that the family of regular languages closed under Union, Intersection, Complementation, Concatenation, and star closure.

g) Consider the following languages

$L_1=\{ a^n b^n \mid n \geq 1\}$ and

$L_2=\{w \in \{a, b\}^* \mid w$ contains equal number of a's and b's$\}$.

Find the CFG for $L_1 \cup L_2$, $L_1.L_2$, L_1^* and L_2^*.

h) When a grammar is said to be ambiguous. Show that the following grammar is ambiguous.

$E \rightarrow E+E|E*E|a$

Construct an unambiguous grammar equivalent to the above grammar.

i) Construct a PDA accepting $\{a^n b^m a^n / m,n>=1\}$ by empty stack. Also construct the corresponding context-free grammar accepting the same set.

j) Construct a Turing Machine that recognizes the language L = {wcw | w in {a, b}*}.

k) Construct TM for the function $f(m,n) = m + n$. Where, *m* and *n* can be represented over an alphabet Σ = {1}.

l) Given a Turing Machine M, can you construct another TM M′ such that $L(M') = L(M)^R$? Explain.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 Let L_1 = {set of all strings starting with 1 and ending with 0 over an alphabet 0, 1}, L_2 = {set of all strings ending with 00 over an alphabet 0, 1}. Design the DFA which accepts set of all strings of $L_1 \cap L_2$. **(16)**

Q4 Find a regular grammar that generates the language (aa*(ab+a)*). Then construct a DFA that accepts the language generated by the above grammar. **(16)**

Q5 Construct a PDA that accepts the language on Σ = {a, b}, $L = \{w | n_a(w) = n_b(w) + 1\}$. Where, $n_a(w)$, $n_b(w)$ are number of a's and b's respectively. Define the Instantaneous Description (ID) of the PDA. Find the ID for the string "ababbab". **(16)**

Q6 Write shorts notes on following (any two) **(8 x 2)**

a) Enumerable language vs. recursive enumerable language

b) Undecidable Problem

c) Variants of Turing Machines