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Total Number of Pages: 02

Course: MCA
Sub_Code: MCPC2001

3rd Semester Regular Examination: 2025-26
SUBJECT: Design and Analysis of Algorithms
BRANCH(S): MCA
Time: 3 Hours
Max Marks: 100
Q.Code: U074

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 asymptotic notation. Give examples of Big-O and Omega.
b) Write the recurrence for Merge Sort and its solution.
c) What is a priority queue? Mention two of its applications.
d) State the Master's theorem.
e) What is activity selection problem?
f) Define longest common subsequence (LCS).
g) What is a disjoint-set forest?
h) State the difference between BFS and DFS.
i) What is a NP-complete problem?
j) What is the basic idea of the Rabin-Karp algorithm?

Part-II

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

a) Solve the recurrence: $T(n) = 2T(n/2) + n$.
b) Write and explain the steps of building a max-heap.
c) Explain the Quick Sort partition procedure with an example.
d) Describe the matrix chain multiplication problem.
e) Distinguish between greedy and dynamic programming approaches.
f) Explain the fractional knapsack problem with example.
g) Describe the operations: Make-Set, Union, and Find-Set.
h) Explain Kruskal's algorithm.
i) Discuss Dijkstra's algorithm and its limitations.
j) Explain the concept of polynomial-time verification.
k) Write short notes on Huffman coding.
l) Explain the naive string-matching algorithm.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Using recursion-tree method, solve the recurrence: $T(n) = 3T(n/4) + n \log n$. **(8)**

b) Analyze the worst-case running time of Heap Sort and explain each phase with diagrams. **(8)**

Q4 **a)** Explain dynamic programming in detail. Derive the optimal parenthesization for the matrix chain multiplication for the following chain: **(8)**
A1: 10 × 20, A2: 20 × 30, A3: 30 × 40, A4: 40 × 30.

b) Explain the Travelling Salesman Problem (TSP). Describe how approximation algorithms work for TSP with triangle inequality using a suitable example. **(8)**

Q5 **a)** Describe the LCS dynamic programming algorithm and compute LCS for: **(8)**
X = "ABCDGH", Y = "AEDFHR".

b) Discuss the concept of NP-completeness. Explain with the help of reducibility how SAT reduces to 3-SAT. **(8)**

Q6 **a)** Explain Bellman-Ford algorithm. Show each relaxation step for a sample weighted graph containing negative edges. **(8)**

b) A university wants to lay optical fiber between buildings. The cost (in lakhs) of laying cable between buildings is given below: **(8)**

Edge	Cost
A–B	12
A–C	10
B–C	6
B–D	8
C–D	4
C–E	7
D–E	3

Use Kruskal's algorithm to decide the minimum-cost network design (MST). Show all steps and compute the total cost.

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Course: MCA
Sub_Code: MCPC2002

3rd Semester Regular Examination: 2025-26
SUBJECT: Operating Systems
BRANCH(S): MCA
Time: 3 Hours
Max Marks: 100
Q.Code: U143

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 an Operating System.
b) Distinguish between preemptive and non-preemptive scheduling.
c) What is thrashing in virtual memory?
d) What is a system call? Give one example.
e) What do you mean by internal fragmentation?
f) What is Direct Memory Access (DMA)?
g) Define RAID.
h) What is a file descriptor?
i) Define mutual exclusion.
j) What is context switching?

Part-II

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

a) Describe the process state transition model with a diagram?
b) Write short notes on multithreading models.
c) Explain the working of Round Robin scheduling with example.
d) Write Peterson's solution for the critical section problem.
e) With an example, explain Multilevel Queue Scheduling.
f) Explain conditions for deadlock occurrence.
g) Apply Banker's algorithm to check system safety for a small numerical example.
h) Describe the steps of the message-passing model of IPC.
i) Explain segmentation with an example.
j) Explain the working of DMA in I/O management.
k) Compare contiguous and linked file allocation methods.
l) Write short notes on I/O buffering and caching.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A system has the following set of processes with their arrival time, burst time, and priority (1 = highest priority): **(16)**

Process	Arrival Time	Burst Time	Priority
P1	0	10	3
P2	2	4	1
P3	4	6	4
P4	6	5	2

You are required to:

(a) Draw the Gantt Charts for the following scheduling algorithms:

1. FCFS
2. SJF (non-preemptive)
3. Preemptive Priority Scheduling
4. Round Robin Scheduling with time quantum q = 3

(b) For each scheduling algorithm, compute the following for every process:

1. Completion Time (CT)
2. Turnaround Time (TAT)
3. Waiting Time (WT)
4. Response Time (RT)

Q4 A process generates the following page reference string: **(16)**
7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2
Assume that the system provides 3 page frames.
You are required to:

(a) Simulate the page replacement process using the following algorithms:

1. FIFO (First-In First-Out)
2. LRU (Least Recently Used)
3. Optimal Page Replacement

(b) For each algorithm, construct detailed page frame tables showing the status of frames after each page reference and clearly mark page faults.

(c) Compute the total number of page faults for each algorithm.

(d) Identify which algorithm gives the minimum number of page faults and provide a brief justification based on your simulation results.

Q5 A disk drive has cylinders numbered from 0 to 199. The disk head is initially positioned at cylinder 95 and is moving towards cylinder 0. The I/O request queue (in the order received) is as follows: **(16)**
45, 132, 10, 150, 38, 98, 125, 180
You are required to:

(a) Determine the seek sequence and calculate the total head movement using the following disk scheduling algorithms:

1. SCAN
2. C-SCAN
3. LOOK
4. C-LOOK

(b) For each algorithm, show:

1. Step-by-step seek sequence
2. Movement of the disk arm
3. Total number of cylinders traversed

Q6 Discuss security and protection mechanisms in OS, covering authentication, access control models, and design principles of security. **(16)**

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: MCPC2003

3rd Semester Regular Examination: 2025-26
SUBJECT: Artificial Intelligence and Machine Learning
BRANCH(S): MCA
Time: 3 Hours
Max Marks: 100
Q.Code: U226

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 an intelligent agent.
b) Why is admissibility of a heuristic important for A*?
c) Write any two differences between BFS and DFS.
d) What is simulated annealing?
e) Define Alpha–Beta pruning.
f) What is the role of a knowledge base in a knowledge-based agent?
g) State any two features of Wumpus World.
h) Give one real-world situation for each: (a) supervised learning, (b) reinforcement learning.
i) What is clustering?
j) What is bootstrapping in machine learning?

Part-II

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

a) Explain the types of agents used in AI with suitable examples.
b) Describe hill-climbing search and its limitations.
c) Explain the Min–Max algorithm with a simple game tree example.
d) Write short notes on:
   a) Propositional Logic b) Forward Chaining
e) Explain the architecture of a Knowledge-Based Agent.
f) Discuss the different types of machine learning with examples.
g) Explain the K-fold cross-validation method.
h) Describe association rule learning with a suitable example.
i) Explain regression methods in detail. Derive the simple linear regression model.
j) Explain reward and penalty mechanism in reinforcement learning. Discuss how it is useful?
k) Using a real dataset example, compare supervised vs unsupervised learning results and discuss how evaluation metrics differ.

l) Design a rule-based expert system architecture for a medical assistant for sorting and prioritizing patients based on the severity of their condition, detailing knowledge acquisition and conflict-resolution strategies.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) Explain Alpha–Beta pruning in detail. Derive how it reduces the search space compared to Min–Max. (8)

b) Discuss the Wumpus World environment and explain how a knowledge-based agent solves it using propositional logic. (8)

Q4 a) Explain First Order Predicate Logic (FOPL). Discuss Unification and Resolution with examples. (8)

b) Explain how a utility-based agent can outperform a goal-based agent in uncertain environments. Provide an example scenario. (8)

Q5 a) Describe the general model of a learning agent. Explain its components with a neat diagram. (8)

b) Differentiate between supervised, unsupervised, and reinforcement learning with real-time examples. (8)

Q6 a) What are expert systems? Explain the architecture and design steps for developing an expert system. (8)

b) Construct a non-trivial heuristic for the 8-puzzle problem and mathematically justify its admissibility. (8)

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Total Number of Pages: 02

Course: B.Tech
Sub_Code: MCPE2004

3rd Semester Regular Examination: 2025-26
SUBJECT: Internet & Web Technology
BRANCH(S): MCA
Time: 3 Hours
Max Marks: 100
Q.Code: U297

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) What is the role of the Internet layer in TCP/IP?
b) What is a subnet mask?
c) What is the purpose of page layout in web design?
d) Create an ordered list of 5 favorite movies and an unordered list of 5 Games.
e) Create an HTML page with internal links that jump to different sections of the same page.
f) Apply an external CSS file to an HTML page and style headings and paragraphs.
g) Write a script that counts the number of vowels in a string.
h) Write JavaScript to change an image when the mouse hovers over it.
i) What are the different ways to represent colors in HTML?
j) What is a session in PHP?

Part-II

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

a) I. Explain the structure of a URL and describe its components in detail.
II. Describe HTTP communication, HTTP methods, and status codes with examples.

b) I. What is CSS? Explain internal, external, and inline CSS with examples.
II. What is the CSS box model? Explain margin, padding, borders with diagrams.

c) I. What is XML? Explain its key components with examples.
II. Write the rules for well-formed XML What is an XML parser? Differentiate between schema and DTD.

d) I. Compare HTML and XML in detail.
II. Explain XML namespaces and their uses.

e) I. What is an array in Javascript. Write a program using Java script that will display the largest number among a set of given numbers.
II. Write a program to display current date and time on button click using Java script.

f) Write a PHP program to demonstrate pass-by-value and pass-by-reference. Discuss how PHP handles string manipulation. Explain the working of functions strlen(), strrev(), strpos(), and substr() with proper code examples.

g) I. Create an XML document containing:
- Employee details
- Add an internal DTD with rules for elements

II. Design a registration form with:
- Name, Email, Password, Gender, DOB
- Dropdown for country
- Checkbox for hobbies
- Submit and reset buttons

h) Provide the syntax of following HTML tags: image, paragraph, division, span, bold, headings with examples. Explain the use of divisions in HTML document.

i) Describe the use of following attributes in an html table with an example.
I. align
II. border
III. bgcolor
IV. cellspacing
V. cellpadding
VI. background

j) What is an operator in JavaScript? What is the difference between operator precedence and associativity? Design an HTML page which will take two number inputs from user and when user clicks on SUM, DIFFERNCE, MULTIPLY, DIVIDE button the corresponding output is displayed.

k) Write a PHP program to print all prime numbers between 1 and 100. Also displays the count of such numbers. What are the data types supported by PHP. Explain about each data type with example.

l) I. Write a PHP script to count the number of visits of a user using cookies.
II. Write a PHP program to check whether cookies are enabled in the browser

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) Explain how to create login/logout functionality using sessions. Include proper code. **(8)**

b) Explain the concept of **persistent sessions** and how to extend session lifetime in PHP. **(8)**

Q4 a) Write a program to store multiple session variables (name, age, email) and display them. **(8)**

b) Write PHP code to regenerate a new session ID on every page load for security. **(8)**

Q5 a) What are CSS selectors? Explain the various types of selectors (universal, class, ID, attribute, pseudo-class, pseudo-element, combinators) with suitable examples. **(8)**

b) Explain in detail the different CSS positioning methods (static, relative, absolute, fixed, sticky) with examples. **(8)**

Q6 Discuss HTML forms. Explain different form elements such as text fields, password, radio buttons, checkboxes, dropdowns, textarea, buttons, hidden fields, and HTML5 input types. Provide a form example. **(16)**

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Total Number of Pages: 02

Course: MCA
Sub_Code: MCPE2010

3rd Semester Regular Examination: 2025-26
SUBJECT: Blockchain Technology
BRANCH(S): MCA
Time: 3 Hours
Max Marks: 100
Q.Code: U372

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 blockchain.
b) What is decentralization in the context of blockchain?
c) What is hashing? State any two properties of a good hash function.
d) Define smart contract. Mention any one characteristic.
e) Mention two applications of blockchain in healthcare.
f) Define Bitcoin mining. Why is it necessary?
g) Differentiate between symmetric and asymmetric cryptography.
h) What are key pairs in Ethereum?
i) What is a distributed hash table?
j) Differentiate between public and private blockchains.

Part-II

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

a) Compare public, private, and hybrid blockchains in terms of access control, performance, and applications.
b) Discuss the working principles of SHA-1 and SHA-3 algorithms.
c) Discuss the architecture of the Ethereum Virtual Machine (EVM). How does it execute smart contracts?
d) Illustrate the importance of consensus algorithms in blockchain. Explain any two consensus methods in detail.
e) Explain the evolution of blockchain technology.
f) Explain how asymmetric cryptography secures transactions in Ethereum.
g) Describe the mining process in blockchain.
h) Explain distributed ledger technology. How is it different from traditional centralized databases?
i) Explain the Byzantine Generals Problem. How does blockchain ensure Byzantine fault tolerance?

j) Explain the fundamental characteristics of blockchain technology with suitable examples.
k) Discuss the major components of Ethereum clients and wallets.
l) Describe various components of the Bitcoin.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the complete architecture of blockchain in detail. Discuss its components, working principles, block structure, and block chaining process. **(16)**

Q4 Explain MAC, SHA-1, and SHA-2 in detail. Describe how hashing supports the overall blockchain security. **(16)**

Q5 Describe symmetric and asymmetric cryptography in detail. Explain how key pairs secure Ethereum-based decentralized applications. **(16)**

Q6 Discuss in detail the role of blockchain in insurance, healthcare, cloud computing, and artificial intelligence. Explain how blockchain enhances transparency, security, and automation in these sectors. **(16)**

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Total Number of Pages: 02

Course: MCA
Sub Code: HSHS2003

3rd Semester Regular Examination: 2025-26
SUBJECT: ENTREPRENEURSHIP DEVELOPMENT
BRANCH(S): MCA
Time: 3 Hours
Max Marks: 100
Q.Code: U026

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) What is the full form of FSSAI?
b) What is accounting cycle?
c) Explain the concept of a startup eco system.
d) What do you mean by 'zero defect and zero effect'?
e) Who is known as a drone entrepreneur?
f) What do you understand by product positioning?
g) What is Udyam Aadhaar and what is its significance?
h) What do you mean by gross working capital?
i) What is meant by depreciable assets? Which assets are generally not depreciable?
j) What are hybrid incubators? Give examples.

Part-II

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

a) What is the cash conversion cycle?
b) What are the factors to consider when selecting the location of an enterprise?
c) Explain the various steps involved in revival of a sick unit.
d) Explain the various factors affecting entrepreneurial growth.
e) What are the various marketing problems of MSME products?
f) Explain six differences between a trial balance and a balance sheet.
g) What are the various skills required to set up a small enterprise?
h) What are aggressive, conservative, and moderate working capital financing policies?
i) How can digital marketing be integrated into the promotion strategy?
j) What is meant by fair wages and living wages? Justify your answers with examples.
k) What is the difference between a subsidy and a grant?
l) Explain with examples how external factors can trigger industrial sickness.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Define Entrepreneurship. Discuss the various factors to be considered while selecting a business idea and location for a small enterprise.	**(16)**
Q4	'Skill development is the backbone of MSME sustainability'- Justify. Suggest a comprehensive roadmap for integrating skill development, innovation, and digitalization in MSMEs.	**(16)**
Q5	'Every intrapreneur is an innovator, but every innovator is not an intrapreneur'- Justify. Discuss the importance of education and training in developing entrepreneurs and intrapreneurs.	**(16)**
Q6	Discuss the challenges faced by entrepreneurs due to industrial regulations in India. Analyze the role of industrial policies in achieving Atmanirbhar Bharat.	**(16)**

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