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Total No. of Questions : 09

Total No : 02

B.Tech.(IT) (Sem.–3)

MATHEMATICS-III

Subject Code : BTAM-304-18

M.Code : 76393

Date of Examination: 20-12-2024

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. **Write briefly:**

a) Examine continuity of $f(x, y) = \begin{cases} \dfrac{xy}{x^2 + y^2}, & (x, y) \neq 0 \\ 0, & (x, y) = 0 \end{cases}$ at $(0, 0)$.

b) If $u = x^3 + y^3 - 3axy$, show that $\dfrac{\partial^2 u}{\partial y \partial x} = \dfrac{\partial^2 u}{\partial x \partial y}$.

c) State Cauchy convergence criterion.

d) Discuss convergence of $\sum \dfrac{1}{n^p}, (p > 0)$ using Cauchy's integral test.

e) Discuss uniform convergence of series.

f) Define Euler's equation.

g) Solve $y = px + e^{-p}$.

h) Solve $(1 + e^{x/y})\,dx + e^{x/y}(1 - x/y)\,dy = 0$.

i) Solve $(D^3 + D)y = 0$.

j) Solve $x^2y'' - xy' + y = 0$

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SECTION-B

2. Find the volume of the greatest rectangular parallelopiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

3. Discuss convergence of the sequence $\left\{\left(1 + \frac{1}{n}\right)^n\right\}$.

4. Discuss the convergence of the series $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{n}{n^2 + 1}$.

5. Solve $(xy^2 - e^{1/x^3})\,dx - x^2 y\,dy = 0$.

6. Solve by the method of variation of parameters $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$.

SECTION-C

7. Evaluate $\iint_R x^2 y^2\,dx\,dy$, where R is $x^2 + y^2 \leq 1$ by changing to polar coordinates.

8. Solve $y - 2px = \tan^{-1}(xp^2)$.

9. Solve $(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = 2\sin(\log(1 + x))$.

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Total No. of Pages : 02

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B.Tech. (IT) (Sem.–3)

COMPUTER ARCHITECTURE

Subject Code : BTES-302-18

M.Code : 76394

Date of Examination : 22-12-2024

me : 3 Hrs.

Max. Marks : 60

STRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly:

a) Who takes control of the buses during DMA?

b) Name various addressing modes.

c) What is cache coherency?

d) What are software interrupts?

e) Show the memory hierarchy with a diagram.

f) Explain the signed representation of the numbers.

g) What is floating point arithmetic?

h) What are the functions of the control unit?

i) What is instruction-level parallelism?

j) Draw a neat diagram for handshaking mode of data transfer.

SECTION-B

2. Show the step by step multiplication process using Booth's algorithm, to multiply two numbers (-15) × 35.

3. What is the difference between a hardwired control unit and a micro programmed control unit? Explain the relative advantages of each.

4. Draw and explain the circuit of Look Ahead carry generator.

5. What are pipelining hazards? Explain.

6. What are the replacement algorithms in cache? Explain in detail.

SECTION-C

7. A system uses 3 page frames for storing process pages in main memory. It uses the Optimal page replacement policy. Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string given below :

   4, 7, 6, 1, 7, 6, 1, 2, 7, 2

   Also calculate the hit ratio and miss ratio.

8. What is cache memory? What are the elements of cache design? What are cache memory principles?

9. What is pipelining? Explain the concepts of throughput and speedup. Also, explain the pipelining hazards.

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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (IT) (Sem.–3)

DATA STRUCTURE & ALGORITHMS

Subject Code : BTIT/301/18

M.Code : 76391

Date of Examination: 02-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write briefly:

a. How does the choice of data structure affect the efficiency of an algorithm?

b. How can a stack be used to implement the "undo" functionality in a text editor?

c. How can a linked list be used to implement a stack or a queue?

d. What is the difference between in-place sorting algorithms and out-of-place sorting algorithms?

e. What is the difference between a directed graph and an undirected graph?

f. What is the difference between a singly linked list and a doubly linked list?

g. In a situation where both linear search and binary search are viable options, what factors should be considered in deciding which one to use?

h. What is the purpose of asymptotic notations in algorithm analysis?

i. Where do we use ADT Queue?

j. What is a minimum spanning tree?

SECTION-B

2. How does the performance of linear search compare to binary search in terms of time and space complexity? Can binary search be used on a linked list data structure? If so, How?

3. How can a hash table be implemented using a linked list to handle collisions? What is the time complexity of adding or searching for an element in this hash table implementation?

4. How can merge sort be used to sort elements in a linked list? What is the time complexity of this operation?

5. How can a queue be used to implement a breadth-first search algorithm?

6. How can a binary search tree be used to efficiently search for a specific value in a large dataset?

SECTION-C

7. How can a balanced tree data structure, such as an AVL tree or a B-tree, be used to efficiently store and search for large amounts of data? What are the advantages and disadvantages of these types of trees? Illustrate with suitable examples.

8. How does the time complexity of selection sort compare to other sorting algorithms, such as bubble sort and insertion sort? Write down steps for Selection sort and bubble sort and explain using a sample array of numbers.

9. How can a graph data structure be used to represent a social network? How can Dijkstra's algorithm be used to find the shortest path between two vertices in a weighted graph? What is the time complexity of this algorithm?

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Total No. of Pages : 02

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B.Tech.(IT) (Sem.–3)

OBJECT ORIENTED PROGRAMMING

Subject Code : BTIT-302-18

M.Code : 76392

Date of Examination: 08-01-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
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3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly:

a) Differentiate between Call by value and Call by reference.

b) What is a constant? How it is declared and used?

c) Define Class. How object and class are related to each other? Give example.

d) Discuss the increment and decrement operators with example.

e) What do you mean by data abstraction and data encapsulation?

f) What is a destructor? How it is defined?

g) What is an inline function? What is the benefit of using inline functions?

h) How memory is allocated to objects? Give examples.

i) What is the use of this pointer? Discuss.

j) What are the uses of a scope resolution operator?

SECTION-B

2. What are the implications of public, protected and private visibility modes?

3. What is a virtual function? Explain need of virtual function through a suitable example.

4. Explain various types of constructor with examples.

5. What are various data types supported by C++? Give examples. Write memory requirement of each.

6. Explain the different ways to pass arguments to a function with the help of suitable example.

SECTION-C

7. What do you mean by Inheritance? Explain various types of inheritance with the help of suitable examples.

8. Explain various control statements of C with suitable examples.

9. What is Operator overloading? Write a program in C++ to overload binary operator * using friend function.

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