Total Pages—5

SBCS–(2.1)

2019

Time : 3 hours

Full Marks : 80

Answer **all** questions.

The figures in the right-hand margin indicate marks.

Candidates are required to answer in their own words as far as practicable.

(NUMERICAL ANALYSIS AND STATISTICAL METHODS)

1. (*a*) Write down Newton-Raphson Formula for finding $\sqrt{a}$ where a is a positive number and hence $\sqrt{5}$. 10

(*b*) Solve the following equation using Gauss Jordan method

$$x_1 + 2x_2 + x_3 = 8$$

$$2x_1 + 3x_2 + 4x_3 = 20$$

$$4x_1 + 3x_2 + 2x_3 = 16$$

10

(*Turn Over*)

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Or

(*c*) Solve by Gauss–Jacobi method

$$5x + 2y + z = 12$$
$$x + xy + 2z = 15$$
$$x + 2y + 5z = 20$$ 10

(*d*) Solve the following system of equation by Gauss elimination method.

$$2x + 3y - z = 5$$
$$4x + 4y - 3z = 3$$
$$2x - 3y + 2z = 2$$ 10

2. (*a*) Use Lagrange's interpolation formula, find $y(10)$ given that $y(5) = 12$, $y(6) = 13$, $y(9) = 14$ and $y(11) = 16$. 10

(*b*) By dividing the range into 10 equal parts evaluate $\int_0^{\pi} \sin x dx$ using Trapezoidal rule and verify your answer with actual integration. 10

Or

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(*c*) Evaluate $I = \int_1^2 \frac{2x^2}{1+x^4} dx$ using Simpson's $\frac{1}{3}$rd rule. 10

(*d*) Use Newton's backward interpolation formula to construct an polynomial of degree 3 for the given data.

$f(-0.75) = -0.07181250$ $f(-0.5) = -0.024750$

$f(-0.25) = 0.33493750$ $f(0) = 1.10100$ 10

3. (*a*) If X is uniformly distributed over (0, 20) calculate the probability that (*i*) $X < 3$ (*ii*) $X > 10$ (*iii*) $1 < X < 8$ and also define cumulative distribution function of a random variable. 10

(*b*) Find mean and variance of Binomial distribution with Parameter n and P using moment generating function. Also define expected value of Discrete and continuous random variable. 10

Or

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(c) At a party N men throw their hats into the center of a room. The hats are mixed up and each man randomly selects one. Find the expected number of men that select their own hats. 10

(d) A pair of dice is rolled 180 times. What is the probability that a total of 7 occurs

(*i*) at least 25 times

(*ii*) between 33 and 41 time inclusive

(*iii*) exactly 30 times 10

4. (*a*) (*i*) Let P be an odd prime, prove that if there exists an integer x such that $P|x^2 + 2$ then $P \equiv 1$ or $3 \pmod 8$ 5

(*ii*) Find $d(180)$, $\sigma(180)$, $\mu(180)$ 5

(*b*) Find a positive integer n such that $\frac{n}{2}$ is a square, $\frac{n}{3}$ is a cube and $\frac{n}{5}$ is a fifth power. 10

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Or

(*c*) What is the remainder when the following sum is divided by 4

$$1^5 + 3^5 + \ldots + 97^5 + 99^5$$ 10

(*d*) (*i*) Find all odd primes P for which 2 is square (mod P) 5

(*ii*) Find whether $x^2 = 219 \pmod{419}$ has a solution. 5

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Total Pages—4

SBCS–(2.2)

2019

Time : 3 hours

Full Marks : 80

Answer **all** the questions.

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(OPERATING SYSTEM)

1. What is operating system ? Explain different types of operating system with examples and discuss about their advantages and disadvantages in detail. 20

Or

(*a*) What is I/O interrupts ? Discuss about memory mapped I/O devices and I/O interface. 10

(*b*) State and explain different operating system architecture and services in detail. 10

(*Turn Over*)

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2. (*a*) What are the objectives and minimal set of requirement for the file management system? Write down the file attributes in detail. 10

(*b*) What is directory ? Explain directory structure and operation with example. 10

Or

(*c*) What are different access methods to a File ? Discuss about sequential and index sequential access in detail. 10

(*d*) Discuss about the method of File Protection and Access control. 10

3. (*a*) Define process and its type. Give a brief description about the different states of a process life cycle with suitable diagram. 10

(*b*) Explain the characteristics of deadlock. How can you prevent deadlock from a system using resource allocation graph ? 10

Or

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(*c*) Explain different scheduling criteria for SJF and FCFS for the given data: 10

Process	Arrival time	Brust time
P_1	00	05
P_2	02	02
P_3	04	02
P_4	07	03
P_5	09	04

(*d*) What do you mean by PCB ? Explain with suitable diagram the working of PCB controller. 10

4. (*a*) What is virtual memory ? How it is implemented ? Discuss about the working principle of virtual memory. 10

(*b*) What is paging ? Discuss basic paging techniques in detail. How a page table is implemented ? 10

Or

(*c*) What is Fragmentation ? What are its different types ? Compare between internal and external fragmentation. 10

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(*d*) Consider the following page reference string:
2, 1, 0, 2, 3, 1, 0, 3, 0, 2, 1, 2, 0, 1

Assume demand paging with three frames, how many page faults would occurs for the following page replacement algorithm: FIFO, LRU, optimal 10

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Total Pages—4

SBCS–(2.3)

2019

Time : 3 hours

Full Marks : 80

Answer all the questions.

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(COMPUTER ORGANIZATION AND ARCHITECTURE)

1. (*a*) What is a Microprocessor ? What is need of Microprocessor ? Explain how an instruction is executed by a Microprocessor. 10

(*b*) What is instruction cycle ? Explain the steps in a simple instruction cycle. Also explain how operations are performed during a fetch cycle. 10

Or

(*Turn Over*)

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(*c*) What is addressing mode ? Explain different types of addressing modes. 10

(*d*) What is instruction set ? Explain elements of an instruction set. 10

2. (*a*) What is interfacing ? Explain the structure of I/O module. 10

(*b*) Define the term interrupt and its various classes with the help of a diagram, explain how interrupts are handled when they occur while an instruction is being executed. 10

Or

(*c*) What is an interrupt ? Explain the processing of an interrupt in 8086 microprocessor with diagram. 10

(*d*) Discuss the Direct Memory Access (DMA) with suitable diagram. 10

3. (*a*) Draw the Karnaugh map and simplify the following Boolean function. Draw the logic

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diagram with

(*i*) AND-OR gate

(*ii*) NAND gates

$F(A, B, C, D) = \Sigma(0, 2, 8, 9, 10, 11, 14, 15)$ 10

(*b*) What is meant by a functionally complete set of gates in digital circuits ? Show that a NAND gate is functionally complete. 10

Or

(*c*) Explain with example the different rules used in Boolean Algebra. 10

(*d*) Explain how AND, OR operation can be implemented using NAND Gate. 10

4. (*a*) What are Flip-flops ? Describe the J–K flip-flop with the help of a logic diagram. 10

(*b*) What is shift register ? Explain the general capabilities of shift registers. 10

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Or

(*c*) What is decoder ? Explain 3 to 8 line decoder with diagram. 10

(*d*) Explain the working principle of Binary adder and Parallel adder. 10

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2019

Time : 3 hours

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Answer **all** questions.

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(INTRODUCTION TO DATABASE MANAGEMENT SYSTEM)

1. (*a*) What is Database Management System ? Why we should prefer database management system instead of file management system ? 10

(*b*) Explain the three level of data abstraction with their function. 10

Or

(*c*) What is ER diagram ? Explain the component of ER diagram. 10

(*Turn Over*)

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(*d*) Differentiate between physical data independence and logical data independence. 10

2. (*a*) What is index sequential file ? Explain implicit index and limit indexing. 10

(*b*) What do you mean by direct file ? How it is differ from index sequential file ? 10

Or

(*c*) Differentiate between series file and sequential file. 10

(*d*) What do you mean by file ? Explain different type of file organisation. 10

3. (*a*) What do you mean by normalization ? Explain the different types of normal forms. 10

(*b*) What do you mean by integrity rule ? Explain Entity Integrity and Referential Integrity. 10

Or

(*c*) Explain the different types of relational algebra operations with examples. 10

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(*d*) What do you mean by join operator ? Explain inner and outer join. 10

4. (*a*) What do you mean by transaction ? Explain the property of a transaction. 10

(*b*) Explain concurrency control in Database Management system. 10

Or

(*c*) What is locking scheme ? Explain different types of locking. 10

(*d*) Differentiate between deadlock avoidance and deadlock defection technique. 10

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