

2023

Time : 3 hours

Full Marks : 70

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

The figures in the margin indicate full marks.

*Answer from **all** the Sections as directed.*

Section – A

1. Choose the correct answer of the following : 1×10 = 10

(a) Which of the following options leads to the portability and security of Java ?

(i) Bytecode is executed by JVM

(ii) The applet makes the Java code secure and portable

(iii) Use of exception handling

(iv) Dynamic binding between objects

(b) In which memory a String is stored, when we create a string using new operator ?

(i) Stack

(ii) String memory

(iii) Heap memory

(iv) Random storage space

(c) How many threads can be executed at a time ?

(i) Only one thread

(ii) Multiple threads

(iii) Only main (main()method) thread

(iv) Two threads

(d) Number of primitive data types in Java are :

(i) 6 (ii) 7

(iii) 8 (iv) 9

(e) What is Runnable ?

(i) Abstract class

(ii) Interface

(iii) Class

(iv) Method

(f) Which of the following exception is thrown when divided by zero statement is executed ?

(i) NullPointerException

(ii) NumberFormatException

(iii) Arithmetic Exception

(iv) None of these

(g) Which class in Java is used to take input from the user ?

(i) Scanner

(ii) Input

(iii) Applier

(iv) None of these

(h) Which Java method is used to convert an object to string ?

(i) createString ()

(ii) toString ()

(iii) object.string()

(iv) newString()

(i) Which keyword is used to inherit classes in Java ?

(i) Extends

(ii) Inheritance

(iii) isChild

(iv) None of these

(j) What is the full form of AWT ?

(i) Absolute Window Toolkit

(ii) Abstract Window Toolkit

(iii) Absolute Wear Kit

(iv) Abstract Window Tools

2. State 'True or False' of the following : 1×10 = 10

(a) A final class cannot extend other classes. F

(b) JDB is used to find and fix bugs in the Java programs.

(c) The sleep() method does not release any locks of an object for a specific time or until an interrupt occurs.

(d) A package is a collection of class and interface.

(e) Implicit return type of constructor is the class object in which it is defined.

(f) The throw is a keyword introduce in Java for exception handling.

(g) The Java program can accept input from the command line.

(h) Objects in Java are Reference Variables.

(i) Wrapping up of data and related functions into a single entity is called encapsulation.

(j) Deadlock in Java is a condition when two or more threads try to access the same resources at the same time.

Section – B

2. Answer any **four** questions of the following : $2\frac{1}{2} \times 4 = 10$

(a) What is the purpose of Static methods and Static variables ?

(b) What is Final Keyword in Java ? Give an example.

(c) What is the difference between an Abstract Class and Interface in Java ?

(d) What is the difference between throw and throws keyword ?

(e) How does String class differ from String Buffer class ?

(f) What is constructor ? What are its special properties ?

Section – C

3. Answer any **four** questions of the following : 10×4 = 40

(a) What is thread ? Explain life cycle of thread with examples.

(b) Describe various components in swings.

(c) Write a Java program to count the total number of vowels and consonants in a string.

(d) Write a Java program to calculate factorial of given number.

(e) Write an AWT GUI application containing components - a label with caption Counter, a Textfield and a Button with caption Count. Each time the "Count" button is clicked, the counter value shall increase by 1 and it is displayed in TextField.

(f) Write a program to demonstrate different keyboard handling events.

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*Answer from **all** the Groups as directed.*

Group – A

(Objective Type Questions)

1. Select the correct answer of the following : 1×5 = 5

(a) Which of the following is not a biodiversity hotspot of India ?

(i) Sundaland

(ii) Andean region

(iii) Western Ghat

(iv) Terrai-Duar Savanna

(b) Which of the following is not a renewable source of energy ?

(i) Tidal energy

(ii) Biomass energy

(iii) Ethanol

(iv) Nuclear energy

(c) An example of secondary pollutant is :

(i) Carbon monoxide

(ii) Particulate matter

(iii) Photochemical smog

(iv) Dust

(d) Harmful effects of PAN on living organisms is / are :

(i) Eye irritation

(ii) Emphysema

(iii) Inhibits plant growth

(iv) All of these

(e) Which of the following is a type of biodegradable pollutant ?

(i) D. D. T. (ii) Garbage

(iii) Woods (iv) Both (ii) and (iii)

2. Fill in the blanks with suitable answer : 1×5 = 5

(a) The floating aquatic plants are known as _____.

(b) In a detritus food chain, the first trophic level is occupied by the _____.

(c) The United Nations Conference on Environment and Development, 1992 was held at _____.

(d) 'Green Muffler' is a term associated with _____ pollution.

(e) The major health hazard from Chernobyl nuclear disaster was _____.

Group – B

(Short-answer Type Questions)

3. Write short notes on any four of the following : 5×4 = 20

(a) Cauvery (Kaveri) river water dispute

(b) Concept of sustainable development

(c) Endemic species of India

(d) Montreal Protocol

(e) Greenhouse effect

(f) PAN

Group – C

(Long-answer Type Questions)

Answer any **four** questions of the following : 10×4 = 40

4. Dams are not environment friendly. Discuss

5. Suggest some measures adopted by you to mitigate air pollution.

6. What are the various threats to biodiversity. Describe the ex-situ methods for its conservation.

7. Describe ecological succession in a desert ecosystem with proper diagrams.

8. Define water pollution. Describe different effects of water pollution on living organisms.

9. What are the key features of National Environmental Policy ?

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*Answer from **all** the Parts as directed.*

Part – A

1. Choose correct answer in each of the following : 1×5 = 5

(a) The moment of inertia of a uniform rod of mass M and length L about a perpendicular bisector is :

(i) $\frac{ML^2}{12}$ (ii) $\frac{M^2L}{12}$

(iii) $\frac{ML^2}{6}$ (iv) $\frac{M^2L}{6}$

(b) The perimeter of the curve $r = a(\cos\theta)$ is :

(i) πa (ii) $2\pi a$

(iii) $3\pi a$ (iv) $4\pi a$

(c) Stream cipher is a kind of encryption that converts plain text by taking following number of bytes of the plain text at a time :

(i) 32 bytes (ii) 16 bytes

(iii) 8 bytes (iv) 1 byte

(d) The general solution of $y = px + p^2$; $p = \frac{dy}{dx}$ is :

(i) $y = x^2 + c$ (ii) $y = x^2 + x$

(iii) $y = c^2 + cx$ (iv) None of these

(e) Which of the following is a linear function ?

(i) $f : R^2 \to R$ defined as $f(x, y) = 3x + 5y$

(ii) $f : R^2 \to R$ defined as $f(x, y) = 3x + 5y + 2$

(iii) $f : R^2 \to R$ defined as $f(x, y) = 3x + 2$

(iv) None of these

2. Fill in the blanks : $1 \times 5 = 5$

(a) The value of $\int \cos^5 dx$ is _____.

(b) AES is an example of a _____ cipher.

(c) _____ of two convex sets is a convex set.

(d) The solution of $\frac{d^2y}{dx^2}+3\frac{dy}{dx}+2y=0$ is _____.

(e) The curve $y^2=x(x-1)^2$ is symmetrical about _____ axis.

Part – B

Answer any **four** questions of the following : $5\times4=20$

3. Integrate $\int\frac{dx}{(2+x)\sqrt{(1+x)}}$.

4. Find the reduction formula for $\int\sin^n x\,dx$.

5. Solve : $y\,dx-x\,dy=xy\,dx$.

6. Solve : $\frac{d^2y}{dx^2}+9y=x^2$.

7. Explain private key encryption algorithm DES.

8. Prove that the intersection of two convex sets is also a convex set.

Part – C

Answer any **four** questions of the following :

$10 \times 4 = 40$

9. Find the perimeter of the cardioid $r = a(1 + \cos\theta)$.

10. Find the entire length of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$.

11. Solve : $y = 2px + y^2p^3$, $p = \frac{dy}{dx}$.

12. Solve : $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = \sin(2x)$.

13. Explain private key encryption algorithm AES.

14. Solve the following LPP using simplex method :

Max $Z = 4x + 10y$

Subject to the constraints

$2x + y \leq 50$

$2x + 5y \leq 100$

$2x + 3y \leq 90$

$x, y \geq 0$

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Part – A

(Objective Type Questions)

1. Choose the correct answer of the following : 1×5 = 5

(a) Multiplexer is also known as :

(i) DEMUX

(ii) MUX

(iii) D / A converter

(iv) None of these

(b) EISA stands for :

(i) Extended Industry Standard Architecture

(ii) Extention Industry Standard Architecture

(iii) Extended Indian Standard Architecture

(iv) None of these

(c) Which Bus is unidirectional ?

(i) Address Bus

(ii) Data Bus

(iii) Control Bus

(iv) None of these

(d) Flags is a two Bistable state :

(i) Set or Reset

(ii) Test or Retest

(iii) Reset or Reset

(iv) None of these

(e) In GPR, total number of Pair of-Registers :

(i) 3

(ii) 4

(iii) 2

(iv) None of these

$2x + 3y \leq 90$

2. Fill in the blanks with appropriate answer : $1 \times 5 = 5$

(a) MAR stands for _____.

(b) LLP is also known as _____.

(c) In 8086 Microprocessor, Data Bus is _____.

(d) DMA stands for _____.

(e) Microprocessor is classified into _____ categories.

Part – B

(Short-answer Type Questions)

Answer any four questions of the following : $5 \times 4 = 20$

3. (a) Explain the Bus System.

(b) Differentiate between Pipelining and Parallel processing.

(c) Explain the Multiplexer with diagram.

(d) Differentiate between Half Adder and Full Adder with diagram.

(e) What is Computer Registers ?

(f) Differentiate between DX and SX of 80486 Microprocessor.

Part – C

(Long-answer Type Questions)

Answer any **four** questions of the following :

10×4 = 40

4. (a) What is Stack Organisation ? Explain the types of stack in stack organisation.

   (b) Describe the DMA Data transfer technique.

   (c) Describe the Microprocessor of Architecture and Organisation of the any microprocessor.

   (d) Explain the Microprogrammed control in computer system architecture.

   (e) Explain the Instruction Formats and Instruction Set in CSA.

   (f) Explain the following :

   (i) Ports

   (ii) PIC

   (iii) Associative memory

   (iv) 80486