

Total No. of Questions : 5]

SEAT No. :

P5137

[Total No. of Pages : 2

[5823]-301

S.Y. B.Sc. (Computer Science)

CS-231 : DATA STRUCTURES AND ALGORITHMS-I

(2019 Pattern) (Semester - III) (Paper-I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Neat diagrams must be drawn whenever necessary.*

Q1) Attempt any 8 of the following.

[8×1=8]

- a) Define Data object.
- b) Define In-place sorting.
- c) What is circular linked list?
- d) State the principle used in 4-queen problem.
- e) Define Queue.
- f) What is time complexity?
- g) What is best case & worst case time complexity of merge sort algorithm?
- h) "Linked list can be accessed randomly" state true/false. Justify.
- i) Round-robin algorithm is example of which type of queue?
- j) List any two applications of stack.

Q2) Attempt any 4 of the following.

[4×2=8]

- a) Define Big Oh (O) and Big Omega (Ω) Notations.
- b) Define Array. List of an array.
- c) Differentiate between singly linked list and doubly linked list.
- d) Convert following expression to equivalent postfix and prefix notation.
 $(A+B)*C-(D-E) \wedge (F+G)$
- e) What are operations performed on dequeue?

P.T.O.

Q3) Attempt any two of the following: **[2×4=8]**

- a) Define Data structure and explain types of Data structure.
- b) Sort the following data using bubble sort method:
30, 40, 10, 50, 25, 35, 15
- c) Write a 'C' function to create doubly linked list.

Q4) Attempt any two of the following: **[2×4=8]**

- a) Show the stack contents and output while converting following infix expression to postfix expression. $A/B \wedge C + D * E - A * C$
- b) What is linear queue? How to implement it? Explain in detail.
- c) List the variants of sequential search. Explain any one with an example.

Q5) Attempt any one of the following: **[1×3=3]**

- a) List advantageous & disadvantageous of circular queue.
- b) Write a short note on generalized linked list.



Total No. of Questions : 5]

SEAT No. :

P5138

[Total No. of Pages : 2

[5823]-302

S.Y. B.Sc. (Computer Science)
CS -232 : SOFTWARE ENGINEERING
(New CBCS 2019 Pattern) (Semester-III) (Paper-II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Assume suitable data if necessary.*

Q1) Attempt any Eight of the following.

[8×1=8]

- a) Define process Flow.
- b) List any two agile principles.
- c) What are the different building blocks of UML?
- d) Write any two purposes served by SRS.
- e) Define abstraction.
- f) List the advantages of waterfall model.
- g) What is requirement validation?
- h) Write the purpose of activity diagram.
- i) List any two umbrella activities of software process.
- j) Define Artifacts.

Q2) Attempt any Four of the following.

[4×2=8]

- a) What is Functional independence? Which qualitative criteria is applied to assessed independence.
- b) Define diagrams. Write classification of UML diagrams.
- c) List the elements of Andysis model.
- d) Write the role of scrum.
- e) Write advantages of RAD model.

Q3) Attempt any two of the following.

[2×4=8]

- a) Explain spiral model in detail.
- b) Explain different approaches for requirements elicitation.
- c) Draw UML use case diagram for online shopping. (credit card processing)

P.T.O.

Q4) Attempt any Two of the following. **[2×4=8]**

- a) Explain phases of xp process with suitable diagram.
- b) Draw UML class diagram for railway reservation system.
- c) Define unified process. Explain phases of unified process.

Q5) Attempt any One of the following. **[1×3=3]**

- a) Explain types of design patterns.
- b) Explain the human factors considered during agile software development.



Total No. of Questions : 3]

SEAT No. :

P5139

[5823]-303

[Total No. of Pages : 2

S.Y. B.Sc. (Computer Science)

MATHEMATICS

**MTC - 231 : Groups and Coding Theory
(2019 Pattern) (Semester - III) (23221)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Non-programmable scientific calculator is allowed.*

Q1) Attempt any five of the following.

[5×2=10]

- a) If $a|b$ and $a|c$, then show that $a|(b+c)$.
- b) Find all generators of the group $(\mathbb{Z}_6, +_6)$.
- c) Check whether the permutation $\sigma = (1\ 2\ 5\ 4\ 6\ 3)(7\ 8)$ is even or odd. Justify?
- d) Let $G = (\mathbb{Z}_4, +_4)$ be a group and $H = \{\bar{0}, \bar{2}\}$ be a subgroup of G . Find all right cosets of H in G .
- e) Find the hamming distance between x and y , where $x = 1100010$, $y = 1010001$.
- f) Prepare composition table of addition for $(\mathbb{Z}_5, +_5)$.
- g) State whether the following statement is True or False:
“Union of two subgroups is a subgroup.” Justify your answer with proper example.

Q2) Attempt any three of the following.

[3×5=15]

- a) Let G be a group such that $a^2 = e, \forall a \in G$. Then prove that G is abelian.

P.T.O.

- b) Let $\sigma = (1\ 5\ 2)(4\ 3)$, $\tau = (6\ 1\ 9\ 7)$ be two permutations. Compute $\sigma\tau\sigma^{-1}$.

- c) Let $H = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ be a parity check matrix. Determine $(2, 5)$ group

code $e_H : B^2 \rightarrow B^5$.

- d) Let R be a relation on \mathbb{Z} defined by xRy if and only if $5x + 6y$ is divisible by 11, for $x, y \in \mathbb{Z}$. Show that R is an equivalence relation on \mathbb{Z} .
- e) Let $a, b, x, y \in \mathbb{Z}$. If $a \equiv b \pmod{n}$, then prove that :
- $ax \equiv bx \pmod{n}$
 - $(a + x) \equiv (b + x) \pmod{n}$

Q3) Attempt any one of the following.

[1×10=10]

- a) Find gcd of 4999 and 1109 and also find integers m, n such that $(4999, 1109) = m(4999) + n(1109)$.
- b) i) For the set $\phi^+ = \phi - \{0\}$, of non-zero rationals, the binary operation $*$ is defined as $a * b = \frac{ab}{3}$. Show that $(\phi^+, *)$ is an abelian group.
- ii) Encrypt the message “URD” using $f(x) = (3x + 7) \pmod{26}$.



Total No. of Questions : 3]

SEAT No. :

P5140

[5823]-304

[Total No. of Pages : 2

S.Y. B.Sc. (Computer Science)

MATHEMATICS

MTC - 232 : NUMERICAL TECHNIQUES

(2019 Pattern) (Semester - III) (23222)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Non-programmable scientific calculator is allowed.*

Q1) Attempt any five of the following.

[5×2=10]

- a) State the trapezoidal rule for numerical integration.
- b) Given that, $y' = x^2 + y^2$ with $y(0) = 1$. Find $y(0.1)$ by Euler's Method.
- c) Prove that, $(1+\Delta)(1-\nabla) = 1$ by usual notation.
- d) Find relative error of the number $5/7$ whose approximate value is 0.714.
- e) Write the Newton-Raphson formula for square root of any real number.
- f) Given that, $y(10) = 130, y(20) = 180, y(30) = 200, y(40) = 275, y(50) = 450$. Prepare Newton's Backward difference table.
- g) Write Simpson's $\left(\frac{1}{3}\right)^{\text{rd}}$ rule for numerical integration.

Q2) Attempt any three of the following.

[3×5=15]

- a) Derive divided difference interpolation formula.
- b) Evaluate $\int_1^7 (1 + \log x) dx$ by using Simpson's $\left(\frac{3}{8}\right)^{\text{th}}$ rule (Take $h = 1$).

P.T.O.

- c) Given that, $y(1) = 2$, $y(2) = 4$, $y(3) = 8$, $y(4) = 16$, $y(5) = 32$. Obtain $y(1.5)$ by using Newton Forward interpolation formula.
- d) Find real root of equation $x^3 - 4x - 9 = 0$ in the interval $[2, 3]$ correct upto 2 decimal places by using Regula - Falsi method.
- e) Given that $y(1) = 0$, $y(3) = 1$, $y(4) = 48$, $y(6) = 180$, $y(10) = 900$. Obtain $f(5)$ by using Lagrange's interpolation formula.

Q3) Attempt any one of the following.

[1×10=10]

- a) Given that, $\frac{dy}{dx} = 1 + xy^2$, $y(0) = 1$, $h = 0.1$. Find $y(0.1)$, $y(0.2)$ by using Runge - Kutta method of fourth order.
- b) i) Find the real root of the equation $x \cdot \sin x + \cos x = 0$ correct to three decimal places using Newton - Raphson method (Take $x_0 = 2.5$)
- ii) Given that, $y' = x^2 + y$, $y(0) = 1$. Obtain $y(0.1)$ by using Euler's Modified Method.



Total No. of Questions : 5]

SEAT No. :

P5141

[5823] - 305

[Total No. of Pages : 2

S.Y. B.Sc. (Computer Science)

ELECTRONICS

**ELC 231 : Microcontroller Architecture and Programming
(2019 Pattern) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three Questions from Q.No. 02 to Q.No. 05.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*

Q1) Attempt any five of the following.

[5×1=5]

- a) Which port of 8051 requires external pull up resistors?
- b) Which registers are used as data pointer in indirect addressing mode.
- c) What extension is used to save 'C' Language program.
- d) Name the timer register of 8051 microcontroller used as bit addressable.
- e) Define step angle of stepper motor.
- f) In half duplex, data is transmitted in only one direction at a time-comment.

Q2) Answer the following.

[2×5=10]

- a) Draw and explain interfacing of external 16 kb RAM with 8051 microcontroller?
- b) Explain function of following instructions.
 - i) CLR A
 - ii) NOP
 - iii) RR A
 - iv) SUBB A, # 05 H
 - v) SWAP A

P.T.O.

Q3) Answer the following. [2×5=10]

- a) Explain internal RAM organisation of 8051 microcontroller.
- b) Write 8051 C program to generate square wave with 2500 Hz frequency on pin 2.7. Use Timer 1 in mode 2. Assume XTAL frequency = 12 MHz.

Q4) Answer the following. [2×5=10]

- a) Explain in brief classification of 8051 instructions. (any 5)
- b) Write C program for LCD interface to 8051 for displaying 'ELECTRONICS'.

Q5) Write short notes (any four) [4×2½=10]

- a) Difference between LCALL and ACALL (any 2).
- b) Timer mode 2 of 8051.
- c) Immediate addressing mode.
- d) Interrupts in 8051.
- e) Difference between simplex and full duplex.
- f) Input output (I/O) ports of 8051.



Total No. of Questions : 5]

SEAT No. :

P5142

[Total No. of Pages : 2

[5823]-306

S.Y. B.Sc. (Computer Science)

ELECTRONICS

ELC -232 : Digital Communication and Networking

(2019 Pattern) (Semester-III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagram must be drawn wherever necessary.*
- 5) *Use of calculator is allowed.*

Q1) Attempt any five

[5×1=5]

- a) Define bit rate.
- b) What is modulation?
- c) What is TDMA?
- d) How many voice channels are multiplexed together in the basic group of FDM.
- e) What is MAN?
- f) In which topology networking devices connected together at center point.

Q2) Answer the following.

[2×5=10]

- a) Explain with block diagram electronic communication system.
- b) Differentiate between Asynchronous and synchronous transmission.

Q3) Answer the following.

[2×5=10]

- a) Explain QPSK modulator.
- b) Give any five features of FDMA.

Q4) Answer the following.

[2×5=10]

- a) Explain FDM technique used in communication system.
- b) What is networking devices? Explain router end hub.

P.T.O.

Q5) Write short notes on any four of the following.

[4×2½=10]

- a) Modulation Index
- b) DSSS (Direct Sequence Spread Spectrum)
- c) Ring topology
- d) CSMA protocol
- e) Types of noise
- f) Networking device switch

